Behavior Genetics Association

PSYCHOLOGISCH LABORATORIUM

Eighteenth Annual Meeting

Programs and Abstracts

University of Nijmegen
Nijmegen, The Netherlands
June 22 - 25, 1988
BEHAVIOR GENETICS ASSOCIATION

The purpose of the Behavior Genetics Association is to promote scientific study of the interrelationship of genetic mechanisms and behavior, both human and animal; to encourage and aid the education and training of research workers in the field of behavior genetics; and to aid in dissemination and interpretation to the general public of knowledge concerning the interrelationship of genetics and behavior, and its implications for health, human development, and education.

For additional information about the Behavior Genetics Association, please contact Prof. James R. Wilson, BGA Secretary, Institute for Behavioral Genetics, University of Colorado, Boulder, CO 80309-0447.


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Previous Presidents

Th. Dobzhansky, 1972-1973
John L. Fuller, 1973-1974
Gerald E. McClearn, 1974-1975
J. P. Scott, 1975-1976
Irving I. Gottesman, 1976-1977
W. R. Thompson, 1977-1978
Lee Ehrman, 1978-1979
V. Elving Anderson, 1979-1980
Norman D. Henderson, 1981-1982
John C. DeFries, 1982-1983
David W. Fulker, 1983-1984
Steven G. Vandenberg, 1984-1985
Sandra Scarr, 1985-1986
Ronald S. Wilson, 1986-1987

Previous Dobzhansky Awardees

Steven G. Vandenberg, 1977
Elliot Slater, 1978
Ernst W. Caspari, 1979
Benson E. Ginsburg, 1980
Sheldon C. Reed, 1981
Gardner Lindzey, 1982
Peter L. Broadhurst, 1983
Leonard L. Heston, 1984
Nikki Erlenmeyer-Kimling, 1985
Raymond Cattell, 1986
John L. Fuller & J. P. Scott, 1987
GENERAL INFORMATION

The 18th annual meeting of the Behavior Genetics Association will be held June 22-25, 1988, on the campus of the (Catholic) University of Nijmegen, The Netherlands. English speakers can approximate the pronunciation of Nijmegen as NICH MAKE un—that is, the j sounds as y, and the g sounds as German ch or k. The first two syllables are both stressed.

Per Sjeng Kerbusch: "For people coming in by airplane the most convenient way to travel to Nijmegen is by train. Shuttles are unknown in Europe and cabs are relatively expensive. In front of the arrival terminal in the Amsterdam airport (Schiphol), a railway station is situated from where a nice railway connection exists to Amsterdam Central Railway Station. From there direct trains run to Nijmegen (120 km). Total travel time is approximately 2 hours. People should consult the railway ticket counter at the Airport Railway Station. Hotels in Nijmegen are situated quite near the railway station. Hotel Altea is next to it, and Hotel Belvoir is to be reached by a 5-minute cab drive. The campus is situated some 2.5 miles from the railway station and the center of town. Bus Line 1 to Grootstal runs directly from the railway station to the University every 7 minutes. From the Belvoir, the bus stop is a short walk. At the University the bus stop in front of the dentistry lab [Tandheelkunde] is also next to the Aula, where the keynote address will be presented Wednesday evening, and a 2-minute walk from the Psychological Laboratory. Maps will be available at registration." [Pre-registrants should have received maps.]

The meeting rooms are in the Psychological Laboratory [see cover photo]. On site registration will begin at 3.30 p.m. (15.30) at a desk near the entrance to the building. Information about local restaurants and tours will be available at the registration desk. Paper sessions will begin on Thursday, June 22, at 8.30 a.m.; a (T) shown in the program schedule indicates that the paper is eligible for the Thompson Award. Unless otherwise indicated, all events will be held in the Psychological Laboratory (PL). For lunches, a canteen and two other eating establishments are within a short walk of the meeting site. No organized dinner has been scheduled for Thursday. This should allow members some i/a (individual activity) in sampling Dutch food.

The Friday night cocktail hour will begin at 7 p.m. (19.00) on board a boat, the M.P.S. Keizerstad, with the on-board banquet beginning about 8 p.m. (20.00). The cost of the banquet for non-members of the Association will be 55 guilders.

Dorret Boomsma has suggested that BGA members may wish to exchange computer programs (PC floppy disks) at the meeting. Dr. Kerbusch has arranged for an IBM clone (MS-DOS Olivetti) and an Apple Macintosh for this purpose. Interested persons should bring programs and floppy disks.

The address of the organizer is: Dr. Sjeng Kerbusch, Psychological Laboratory, University of Nijmegen, P.O. Box 9104, 6500 HE Nijmegen, The Netherlands. His BITNET address is u212854@HNYKUN1. His telephone number (from the U.S.) is: 011-31-80-515566. The time in Nijmegen is 8 hours later than the time (MDT) in Boulder, Colorado.
PROGRAM

Wednesday Afternoon and Evening, June 22

3.30-7.00  Registration. Hallway near meeting rooms in the Psychological Laboratory.

4.00  Executive Committee Meeting. Psychological Laboratory B.02.05.

4.30  Informal Meeting of Associate Members. Psychological Laboratory A.00.06.

7.30  KEYNOTE ADDRESS. Aula (Great Hall).

Norman D. Henderson, Ph.D., Professor of Psychology, Oberlin College, Oberlin, Ohio

“What Behavior Genetics Is All About”

Introduction by J. M. H. Vossen

8.30  Reception (cash bar). Aula.

Thursday Morning, June 23

8.30-10.00  Paper Session (Room A.00.06, PL). Genetics and Rodent Behavior. CHAIR: J.H.F. van Abeelen.


8.30-12.00  Paper Session (Room A.00.25, PL). Human Development. CHAIR: D.W. Fulker.

Behavioral-genetic analyses of toddler’s inhibition across three situations and over three ages. A.P. Matheny, Jr.

How much can WISC-R subtest scores be boosted or reduced? C. Capron & M. Duyme.

Quantitative genetic analysis of longitudinal trends in IQ in the Colorado Adoption Project. K. Phillips & D.W. Fulker. (T)

Thursday Morning, June 23 (continued)

Paper Session (continued).

Derivation of the LSXSS recombinant inbred strains of mice. J.C. DeFries, J.R. Wilson, V.G. Erwin & D.R. Petersen.

Four independent gene-induced differences in sensorimotor development in coisogenic mice. M. Noel.


Studies of the genetics of absence epilepsy in rats. B.W.M.M. Peeters, M. Inoue, E.L.J.M. van Luijtenaar & A.M.L. Coenen. (T)

Effect of opponent strain on attacking behavior: Possible involvement of H-2 region? M.H. Francois & M. Nosten. (T)

10.00  COFFEE BREAK

10.30-12.00  Paper Session (Room A.00.06, PL). Rodent Behavior: Topics in Development. CHAIR: P. Roubertoux.


Genetic correlates of rhythm of activity in synchronized mode in BALB/c and C57BL/6 inbred mice. J. Beau.

10.30-12.00  Paper Session (continued).

Systematic rating bias of childhood temperament: Effect on behavior genetic data. H. Coon & G. Carey. (T)


A twin study of reading disability: Evidence for genetic and environmental etiologies. M.C. LaBuda & J.C. DeFries. (T)

10.30-12.00  President’s Symposium (Room A.00.25, PL). Molecular Genetics and Psychiatric Disorders. CHAIR: Raymond Crowe, Dept. of Psychiatry, University of Iowa College of Medicine, Iowa City, Iowa

INTRODUCTION:  Raymond Crowe

AFFECTIVE ILLNESS

David Pauls, Child Study Center, Yale University School of Medicine, New Haven, Connecticut
Thursday Morning, June 23 (continued)

Paper Session (continued).


A catastrophe theoretical approach to conflict in two rat inbred strains, genetically selected for active avoidance behavior, and their hybrids. P. Koene & J.M.H. Vossen. (T)


Some aspects of exploration and aggression in mutant staggerer mice. A. Hamidou & J.-M. Guastavino. (T)


12.00 LUNCH BREAK

Thursday Afternoon, June 23

1.00-3.00 Workshop (Room A 00.06, PL). Issues in the Description and Measurement of Agonistic Behaviors in Rodents with Relevance to Genetic Analysis. MODERATOR: Stephen C. Maxson, Dept. of Psychology and Bio-behavioral Sciences Graduate Degree Program, The University of Connecticut, Storrs, Connecticut

PARTICIPANTS:

Michèle Carlier, Université René Descartes, Paris, France

Benson E. Ginsburg, The University of Connecticut, Storrs, Connecticut

Ruth Guttmann, Hebrew University of Jerusalem, Israel

Berend Olivier, Duphar B.V., The Netherlands

Geert van Oortmerssen, Rijksuniversiteit Groningen, The Netherlands

Pierre Roubertoux, Université René Descartes, Paris, France

3.00 COFFEE BREAK

3.30-5.00 Paper Session (Room A 00.06, PL). Theory and Methods in Human Research. CHAIR: J.C. DeFries.

Modelling the relationship of age at onset to liability to disease. M.C. Neale.


1.00-2.15 Paper Session (Room A 00.25, PL). Studies of Human Twins. CHAIR: D.I. Boomsma.

Genetic contributions to behavioral consistency and change: Data from a six-year follow-up of the Finnish Twin Cohort. R.J. Rose, J. Kaprio & M. Koskenvuo.

2.30-5.25 Symposium (Room A 00.25, PL). Genetic Dissection of Behavior in Drosophila. CHAIR: John M. Ringo, Dept. of Zoology, University of Maine, Orono, Maine

[PRESENTED IN MEMORY OF JOSEPH GROSSFIELD]

2.30 Introduction: John M. Ringo

2.35 "Genetic Lesions in the Central Complex of Drosophila melanogaster."

Martin Heisenberg, Institut für Genetik und Mikrobiologie, Würzburg, FRG.

(Part of the text is not fully visible due to the image quality.)
Thursday Afternoon, June 23 (continued)

Paper Session (continued).


A behavior genetic model for the simultaneous analysis of longitudinal first and second order statistics. C.V. Dolan, P.C.M. Molenaar & D.I. Boomsma. (T)


3.00 
Symposium (continued).

"Genetic Mapping of for: a Behavioral Gene in Drosophila melanogaster."

Marla B. Sokolowski and J. Steven de Belle, Dept. of Biology, York University, North York, Ontario, Canada.

3.25 "Behavioral and Cytogenetic Analysis of the Fruitless Phenotype."

Don A. Galley, Dept. of Biology, Brandeis University, Waltham, MA.

3.50 COFFEE BREAK

4.00 "Studies on a Congenital Heart Defect in Drosophila."

John M. Ringo, Dept. of Biology, University of Maine, Orono, Maine.

4.25 "Molecular and Genetic Analysis of Drosophila Biorhythms."

C. P. Kyriacou, Dept. of Genetics, University of Leicester, Leicester, UK.

4.50 "Genetic Foundations of Coordinated Biological Activities During Synaptic Modulation."

Alberto Ferrus, Instituto Cajal, CSIC, Madrid, Spain.

5.15 Discussion: Marla B. Sokolowski

Friday Morning, June 24

9.00-10.30 Paper Session (Room A.00.06, PL). Human Behavior: Genetics of Behavioral Disorders. CHAIR: J.M.H. Vossen.

Offspring of autistic individuals. S.M. Singer.

Psychometric indicators of liability to schizophrenia in children at genetic risk. S.O. Moldin, L. Erlenmeyer-Kimling & B.A. Cornblatt. (T)

Premenstrual symptom reporting in twins and their relationship to neuroticism and depression. O. van den Akker, G. Stein, M. Neal & R. Murray.


Genetical and environmental modulation of associations between personality and willingness to drive when drunk. R.G. Martin.

Effects of family background on heterogeneous forms of alcohol abuse. S.B. Gilligan & C.R. Cloninger. (T)

10.30 COFFEE BREAK


Interactions between the hymenopteran wasp Asobara tabida and the rover/sitter Drosophila melanogaster larval foraging polymorphisms. D.E. MacDonald, M.B. Sokolowski & L.E.M. Vet. (T)

Genetic differences and phenotypic plasticity as causes of variation in host-finding behavior in the butterfly, Battus philenor: A test of the "environmental variability" hypothesis for the evolution of learning. D.R. Papaj.


Effects of protein and RNA synthesis inhibitors on long term memory in mutant and wild type Drosophila melanogaster. S.C. Boynton & T. Tully. (T)


Friday Morning, June 24 (continued)

11.00  PRESIDENTIAL ADDRESS (PL lecture room): "Behavior, Stress and Variability"

Peter A. Parsons
Sixteenth President of the Behavior Genetics Association

11.30  Poster Session (hallway near PL lecture room).


*The abstract for this poster paper was submitted too late for it to appear in alphabetical order; it is printed at the end of the "ABSTRACTS" section.


Cardiovascular function during gestation in hypertensive and normotensive rats: Preliminary findings. D.A. Blizard & D. Watts.


Popular and scientific views of alcohol sensitivity and tolerance: A brief history. L. Crowe.

Reactivity to methyl beta-carboline-3-carboxylate (beta-CCM): Genetic analysis. C. Desforges, P. Venault, R.H. Dodd, G. Chapouthier & P. Roubertoux.

Dopamine (DA) metabolism and substance-P levels within the nigro- striatal and meso-cortical projections of Roman high- and low-avoidance rats (RHA/Verh and RLA/Verh) following increased locomotor activity, footshock stress and two-way active avoidance acquisition. P. Driscoll, Y. Claustre, A. Oblin, J. Dedek, B. Zivkovic & B. Scatton.

Quantitative genetic analysis of adult mouse (Mus domesticus) ultrasonic vocalizing. K.S. Gannon & J.C. Maggio.

Friday Morning, June 24 (continued)

Poster Session (continued)


Aggressive behavior induced by early androgenization in female mice: Evidence for a strain-dependent sensitivity period. C. Michard-Vanhees.

Evolution of the sexual behaviour of Drosophila melanogaster in laboratory conditions. II. M.D. Ochando.

12.00  LUNCH BREAK

Friday Afternoon, June 24

1.15-3.15  Symposium (Room A.00.06, PL). Behavioral Genetic Analyses Using the Combined Twin/Adoption Design. CHAIR: Nancy L. Pedersen, Dept. of Environmental Hygiene, The Karolinska Institute, Stockholm and Institute for the Study of Human Development, The Pennsylvania State University, University Park, Pennsylvania.

"What Do We Really Mean by 'Shared Environment': Rearing Environment vs. Lifetime of Contact?"

Nancy L. Pedersen.

"The Nature of Nurture: Behavioral Genetic Analyses of Environmental Measures."

Robert Plomin, Institute for the Study of Human Development, The Pennsylvania State University, University Park, Pennsylvania

1.15-3.15  Symposium (Room A.00.25, PL). Neurobehavioral Genetics. CHAIR: Wim E. Crusio, Groupe Génétique, Neurogénétique et Comportement, Université René Descartes (Paris V), Paris, France.

"Genes, Brain, Behavior and Evolution: Translating Theories into Experimental Approaches."

Hans-Peter Lipp, Institut für Anatomie, Universität Zürich-Irchel, Zürich, Switzerland.

"Genetically Determined Variation in Hippocampal Morphology and Behavioral Correlates in Mice."

H. Schwegler, Institut für Humangenetik und Anthropologie, Universität Heidelberg, Heidelberg, FRG.
Symposium (continued).

"Means, Variances, and Scale Effects in Gerontological Genetics."
Gerald E. McClearn, Institute for the Study of Human Development, The Pennsylvania State University, University Park, Pennsylvania

"Estimating Age Differences and Age Changes in Behavioral Genetic Studies."
Jennifer Harris, Department of Dental Hygiene, The Karolinska Institute, Stockholm and Institute for the Study of Human Development, The Pennsylvania State University, University Park, Pennsylvania

"What is a Gerontologist Doing Here? Using Quantitative Genetic Methods to Estimate Environmental Influences for Psychological Attributes in Adults and Older Adults."
Margaret Gatz, Dept. of Psychology, University of Southern California, Los Angeles, California

3.15 COFFEE BREAK
3.45 Poster Session (hallway near PL lecture room). Continuing discussions with viewers of posters (see above).
4.30 Business Meeting. PL lecture room. CHAIR: Peter A. Parsons.

Friday Evening, June 24

7.00 Cocktail Hour (cash bar) and Annual Banquet (beginning at 8.00). On Board the M.P.S. Keizerstad.

Dobzhansky and Thompson Memorial Awards. Presented by Sandra Scarr.

Saturday Morning, June 25

8.00 Executive Committee Meeting. Psychological Laboratory B.02.05.

9.00-10.00 Paper Session (Room A.00.06, PL). Rodent Behavior: Topics in Pharmacological Genetics. CHAIR: G.A. van Oortmerssen.

Effects of the microphthalmic white (M\textsuperscript{wb}) gene on behavior in mice during periadolescence. D.J. Nash.


Resistance to DFP effects on spatial learning in C57BL X DBA hybrids. J.M. Wehner & M. Upchurch.

Opioid involvement in ethanol preference and acute tolerance in SHA and SLA rats. I. Hiroyuki & P.R. Bruah.

10.00 COFFEE BREAK

10.30-12.00 Paper Session (Room A.00.06, PL). Animal Behavior: Genetics of Behavioral Traits. CHAIR: N.D. Henderson.

Genetics and evolution of tailbiting by farmed mink. G. de Jonge.

Symposium (continued).

"Genetic Analysis of Hippocampal Dynorphinergic and Enkephalinergic Mechanisms Involved in the Regulation of Behavioral Responses to Novelty in Mice."
J.H.H.M. van Daal, Dept. of Zoology, University of Nijmegen, Nijmegen, The Netherlands

"Structural Brain Mutants of Drosophila melanogaster: Their Performance in Non-Associative and Associative Learning."
Gerard Vayssse, Centre de Recherche en Biologie du Comportement, Université Paul Sabatier, Toulouse, France


ABSTRACTS

J. H. F. van ABELEEN,1 J. M. H. M. van DAAL,1 and Y. J. M. de KOK.1 Genetically-Controlled Action of Hippocampal Dynorphin B in the Regulation of Mouse Exploration.

Immunohistochemical studies and RIA's, using our specific antisera against dynorphin B, demonstrated the presence of this opioid peptide in the hippocampus of mice. The peptide is confined to the mossy fibers. There is evidence that its release, induced by exposure of mice to novelty, disinhibits pyramidal neurons by blocking inhibitory interneurons. To study the participation of dynorphin B in the control of novelty-induced exploratory behavior, we used male mice from the inbred strains DBA/2 and C57BL/6. They received injections with diluted anti-dynorphin B antiserum into the hippocampal CA3 region, were tested for exploratory responses in a novel environment, and were compared to preimmune serum controls. Treatment caused opposite behavioral effects in the strains: the scores of exploratory acts such as rearing increased in DBA/2 and decreased in C57BL/6 so that the original strain differences between the controls were reversed or eliminated after antisera. These results show the important role of the genotype in the hippocampal dynorphinergic regulation of mouse exploration. They support the idea that DBA/2 animals exposed to novelty, as compared to C57BL/6 mice, are characterized by an overrelease of dynorphin B which can be attenuated by diluted antisera.

1. Department of Zoology, University of Nijmegen, Toernooiveld, 6525 ED Nijmegen, The Netherlands.

LAURA A. BAKER,1 MARGARET GATZ,1 CLAUDE MELLINS,1 and IAN L. CESAD.2 The transmission of subjective well-being in twins and three-generation families.

While genetic influences have been shown to contribute significantly to individual differences in personality traits, attention has not been paid to the more elusive but fundamental experience of human happiness. In the first study to investigate this issue, data were combined from 50 older twins (age 65-98) and 238 families with data available for two or more members of three generations (G1, G2, G3; age:15-98). All participants completed the Bradburn Affect-Balance Scale which yields orthogonal measures for frequencies of positive and negative well-being. Two times of measurement at a twelve-year interval were available for participants of the three-generation family study. Both positive and negative well-being were analyzed separately in biometrical models which allowed additive genetic effects, assortative mating, as well as separate effects of shared environmental influences for parents and offspring. For G1/G2 resemblance to increase across time of measurement, cultural effects otherwise appeared stable between measurements. Significant genetic influences were present for negative affect, however, with common environment for twins being the only significant cultural effect.

1. Psychology Department and Andrus Gerontology Center, USC, CA, 90089
2. Support by NIMH Grant #MH-38244 (V. Bengston and M. Gatz, co-P.I.'s)
Population differences in aggressiveness of sticklebacks (Gasterosteus aculeatus L.).

A detailed study of intra-population variation in aggressiveness of sticklebacks in different test situations (Th. C. M. Bakker, 1986, Behaviour 93, 69-81; Th. C. M. Bakker, 1986, Behaviour 93, 1-144) showed that a. under standardized conditions, much of the variability in aggressiveness is attributable to genotypic variation, but b. the genetic influence on this variation is not identical in the different test situations. The behaviour-genetic study was continued with two natural populations of sticklebacks, instead of artificial selection lines. We used laboratory-bred progeny of wild-caught parents from an anadromous population (Den Helder, Netherlands), a freshwater population (Vaassen, Netherlands), and their reciprocal crosses. Fish of the freshwater population were more aggressive than those of the anadromous population: They showed higher levels of juvenile aggression, dominance ability, and, though less pronounced, territorial aggression. The reciprocal crosses between the populations indicated no effect of the genetic factors involved in the higher aggression levels of fish of the freshwater population.

1. Ethology research-group, Zoological Laboratory, University of Leiden, P.O.Box 9516, 2300 RA Leiden, Netherlands.

JACQUES BEAUV. Genetic Correlates of Rhythm of Activity in Synchronized Mode in BALB/c and C57BL/6 Inbred Mice.

In mammals, aside from true genetic analyses of certain elementary features such as body temperature in mice and activity in birds, genetic correlates of differences in circadian rhythm have not been reported. Numerous studies have indicated strain differences for rhythm but proving a genetic origin requires more than the simple demonstration of differences between strains. Rhythm of activity in inbred strains of mice in synchronic LD 12:12 is shown to be characterized by six indices: amount of activity, circadian level, pulsatile activity, ratio of nocturnal/diurnal activity, and two temporal frequency descriptors. Genetic analysis of rhythm of activity in female mice was conducted using C57BL/6 by and BALB/c by as parental strains via their reciprocal F1s and seven recombinant inbred lines. No maternal effect for the reciprocal F1s was observed. The findings indicate dominance and heterosis effects for the F1s. Heterosis bends towards a better fit of rhythm to natural day/night synchrony. The RI findings eliminate the hypothesis of monogenic transmission for all six indices investigated and in conjunction with the RI analysis demonstrate a polygenic determination with at least one different locus for each of the measures of activity. Correlations between measures can neither be attributed to a mathematical nor a genetic origin, but rather indicate a functional physiological commonality for the indices used to characterize rhythms of activity.


JEAN-YVES BERTHOLET, M. CARLIER, CH. COHEN-SALMON. Early development in strains of laboratory mice: ultrasonic production.

In conditions of stress, newborn mice emit ultrasonic whistles. Differences between strains have been described previously for this trait. We analyzed the number of clicks and whistles emitted over a one-minute period by pups in eight inbred strains. Two different conditions of stress were tested: removal from the nest with exposure either to room temperature or to cold (4°C). Measurements were made for 10 consecutive days in the first condition and 5 in the second. In room temperature, significant strain differences were observed (NZB the lowest, C57BL/6 the highest emitters). However, no effect for day or interaction between strains and days were found. After cold exposure two strains always scored low (NZB, XLII) four scored high (BALB/c, A/J, DBA/2, CBA/H) and two scored high but their scores decreased with time (C57BL/6, C57Br). Genetic correlations between characteristics of whistles and clicks will be presented.


In this study we sought to determine the genetic basis for variations previously observed in cerebellar foliation patterns in inbred strains of mice. We used a diallel cross breeding design with the following strains: C57BL/10J, DBA/2J, A/J, and BALB/cJ as the parental strains. Five litters from each of the resultant 16 groups were culled to 5-7 pups and reared in a 12/12 hour light/dark cycle with food and water ad libitum. On day 282 animals were weighed and sacrificed. Their brains were removed, weighed and placed in 45 formalin. The fixed brains were cut in the mid-sagittal plane and stained with cresyl violet. The left half of the stained brains were analyzed under a dissecting microscope and categorized as either a Type I or Type II based on the presence or absence of a "mouth-like" arrangement of the third primary branch of the arbor vitae of the cerebellum. The resultant dichotomous data was analyzed with a method developed by one of us (JE2) and interpreted within the theory of biometrical genetics. Results of this study suggest that:

(1) Significant directional dominance, significant additive genetic effects and maternal effects are found for the cerebellar foliation pattern.

(2) An evolutionary history of directional selection exists for the determination of cerebellar foliation pattern in mice.

1. Dept. of Biology, William Paterson College, Wayne, New Jersey 07470
2. Dept. of Human Genetics, Med. Coll. of Virginia, Richmond, Virginia 23298
DORRIT I. BOOMSMA1, PETER C.M. MOLENAAR2 and J.F. ORLEBEKE1: Estimation of genetic and environmental factor scores: Statements about individuals Implicit in the application of the common-factor model as a method for decomposing trait covariance into a genetic and environmental part is the use of factor scores. For the communal part of the model it is possible to estimate these factor scores. Estimation of scores on the unobserved factors in terms of the individual observations within the context of a twin study thus amounts to estimation of individual genotypic and environmental scores. Such estimates may be both of theoretical and practical interest. The validity of the method will be illustrated with simulated twin data.

2. Department of Psychology, University of Amsterdam, Weesperplein 8, 1018 XA Amsterdam, The Netherlands.


The effects of the staggerer mutation on maternal behavior were extensively described, and it was found that they greatly surpass the effects of the ataxic gate. In the C57BL/6 strain this mutation leads to an almost lack of care by the mother, which is unable to build a nest, to gnaw the umbilical cord, to extract the pups from the amniotic membrane, to suckle, and to retrieve her pups.

These deficiencies are partly restored by adapting the environment. We intercrossed individuals which were the most able to care for their litters. This has been repeated for about 15 generations without taking into account the gait. In this new population, 30% of the mothers are able to tend their litters spontaneously allowing almost all the pups to survive. However, the staggerer mother reaches about the same goals through different strategies.

We underline that the influence of the staggerer gene on the maternal behavior is very dependent on the genetic context, and that abnormalities in the gait are not alone responsible for deficiencies in the maternal behavior. We show here another example of behavioral commutability.

1. Laboratoire d’Ethologie et Sociobiologie, Université Paris XIII, 93430, Villetaneuse, France.

Susan C. Boynton1, T. Tully1, Effects of Protein and RNA Synthesis Inhibitors on Long Term Memory in Mutant and Wild Type Drosophila melanogaster.

Classical conditioning of an olfactory avoidance response produces strong associative learning and long-lasting memory in wild-type Drosophila melanogaster [Tully & Quinn (1985) J. Comp. Physiol. 157: 263]. Traditional consolidation experiments have distinguished two memory phases—anesthesia-sensitive short-term phase and an anesthesia-resistant long-term phase. Behavioral analyses suggest that the anesiesar, rutabaga, turnip, and dance mutations affect acquisition and short-term memory, leaving long-term memory intact [Tully (1987) TINS 10: 330]. These observations indicate that short- and long-term memory may be genetically distinct processes. Results from dozens of experiments on several other vertebrate and invertebrate species also suggest that the formation of long-term memory (LTM) is dependent on normal protein synthesis [Mutlu et al (1986) Science 234: 1249, Mizumori et al (1985) Behav. Neurosci. 99: 220; Gibbs & Ng (1976) Neurosci. Lett. 2: 165]. We are investigating the effects of protein and RNA synthesis inhibitors on LTM formation in fruit flies. To date, we have found several drugs, which can inhibit protein synthesis in fly brains by more than 90% and which have no effect on anesthesia-resistant memory in wild-type flies. Thus, classical conditioning in fruit flies may produce an anesthesia-resistant, long-term phase of memory that is not protein synthesis dependent. These data will be presented along with additional work on mutant and wild-type flies using these and other drugs.

1 Department of Biology, Brandeis University, Waltham, Massachusetts 02254.
2 Supported by NIH Grant GM-32015 and the McKnight Foundation.
Confirmatory factor analyses of three PIAT reading measures (Recognition, Comprehension and Spelling) and full-scale WISC-R IQ were conducted on data from 128 pairs of twins of average or above average reading ability from the Colorado Reading Study. A full rank model was fitted to the genetic, common environmental and unique environmental covariance components. The model contained one reading factor, three specific variances, and a single set of IQ loadings for each subtest. The results are analyzed using the routines for covariances among the nine measures included in the analysis: IQ, Reading subtests, and reading ability scores. Genetic and environmental correlations were estimated and several hypotheses regarding the structure of the genetic, common environmental and unique environmental variance/covariance component matrices were tested. Genetic correlations between IQ and reading ability were varied across high, ranging from 0.64 to 0.71. The correlations were not as consistent for the common and unique environmental matrices, with correlations ranging from essentially zero to 0.98. The full model fit adequately ($X^2 = 40.37$, df = 30, $P = 0.1$), as did the reduced model which omitted the effects of common environment. However, the genetic covariance component could not be dropped from the model. Dropping the reading factor consecutively in all three components and then simultaneously also produced an adequate fit, the final $X^2$ being 30.72, df = 36, $P > 0.05$. Heritability estimates range from 0.57 for IQ to 0.17 for Spelling. Because a single-factor model for all three component matrices fit the data, individual differences in IQ seem to account for much of the variability in reading skills.

1. Institute for Behavioral Genetics, University of Colorado, Boulder, Colorado 80309
2. Supported by NICHD grants HD-07289 and HD-11681.

CHRISTIANE CAPRON, M. and N. DYNE.

How much can WISC-R subtest scores be boosted or reduced?

A full cross-fostering design (Capron and Dyne, 1986, Behav. Genet. 17, 618) was used to assess the increase in WISC-R IQ scores of children born to lower socioeconomic status (SES) families and adopted by high-SES families, and the drop in IQ of children born to high-SES families and adopted by low-SES families. In this cross-fostering study four groups were studied: (1) children born to low-SES families adopted by low-SES parents; (2) children born to low-SES parents adopted by low-SES parents; (3) children born to high-SES parents adopted by low-SES parents, and (4) children born to high-SES parents adopted by high-SES parents. It was hypothesized that group mean differences would reflect the influence of the foster parents. The results confirmed this hypothesis. Performance of children from low-SES biological parents on Information, Similarity, and Vocabulary increases when adopted by high-SES. In contrast, performance of children from high-SES biological parents on Object Assembly, Coding, and Block Design decreases when adopted by low-SES. In the high-SES environments, the biological offspring of high-SES parents exhibit significantly higher scores on 4 subtests (Block Design, Picture Completion, Arithmetic, and Similarity) than those of children born to low-SES, whereas in low-SES environments, scores for children born to high-SES parents are significantly higher than those of children born to low-SES on 3 other subtests (Picture Arrangement, Vocabulary, and Comprehension) and again Similarity. This difference in performance on different items as a function of SES of the biological parents and postnatal environment raises the issue of the role(s) of genetic and environmental factors. Genetic analyses of behavioral senescence in mice: what do "maternal effects" observed in aged mice mean?

SHIRLEY COLE-HARDING, ANN L. MORTAD, and JAMES R. WILSON.

Spatial Ability in Members of Opposite-Sex Twin Pairs.

Many studies have found a gender difference in spatial ability, but explanations for the development of this phenomenon vary. The Colorado Alcohol Research on Twins and Adoptees (CARTA) data set contains scores on the Vandenberg modification of the SHEFFER-MERIDEN Memory Rotation (MR) test, a widely used measure of spatial ability. These data are being analyzed to compare differences in spatial ability among female members of opposite-sex (OS) and same-sex (SS) DZ twin pairs. Gender differences in spatial ability have been noted in the CARTA data, especially on the MR test, with males doing significantly better than females. An attempt to examine the development of these differences led us to compare OS/DZ females with SS/DZ females to analyze the effect of having a male twin in utero on the female's later spatial ability, controlling for any twin in utero effects. The MR test was administered three times before alcohol was given. The OS/DZ females' baseline (mean of trials 2 and 3) scores were significantly higher than those of the SS/DZ females ($t = -2.42, P < 0.05$). The OS/DZ females also showed greater improvement over these trials compared to SS/DZ females; this interaction of relationship by trials was significant by repeated measures MANOVA ($P < 0.05$). By the third trial, the scores of the OS/DZ females were not significantly different from those of their twin brothers. The scores of these OS/DZ males were not significantly different from those of any other male group. These results suggest the possibility that exposure to testosterone in utero improves spatial ability in females, thus supporting the theory that differences in prenatal exposure to testosterone are at least partially responsible for the gender difference in spatial ability.

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HILARY COON\(^1\) and GREGORY CAREY.\(^1\) Systematic rating bias of childhood temperament: Effect on behavior genetic data.\(^2\)

When ratings are used to assess childhood temperament, results may be confounded by systematic rating bias. To investigate this issue, data from the Colorado Adoption Project (CAP) are analyzed. Two emotionality measures are used in biological, adoptive, and control parents; the analysis includes both self-ratings and ratings of the spouse on these two measures. In addition, two parental measures of the emotionality of the child are used. No statistically significant differences are found between the parental ratings of male versus female offspring. Further, the group of ratings done by fathers can be equated to the group of ratings done by mothers without a statistically significant loss of information. Evidence for a significant rating bias is found. The genetic aspects of this issue are also explored with the comparison of adoptive and control families.

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Jaap E. Couvée, Marianne B. M. van den Bree and Jacob F. Orlebeke
Genetic analysis of reaction time in twins and their parents

Data from a two-choice reaction time (RT) task and a mental arithmetic (MA) task from the members of 120 families were analyzed with LISREL to estimate contributions of genetic and environmental factors to variances and covariances. The families consisted of father, mother and their MZ and DZ twins (age 14-20). In the reaction time task subjects had to respond as quick as possible and perform a judgment whether a stimulus was presented or not. In the MA task subjects were asked to add 3 numbers. The MA task consisted of 10 levels of difficulty which reflect a non-verbal component of intelligence. Each task was presented twice within a single session. RT and MA reaction times and MA levels of difficulty were analyzed. Preliminary results indicate that genetic as well as common environmental factors are important in male performance. In females common and random environmental factors seem important. The possible influence of cultural transmission between parents and offspring will be studied.

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LAWSON CROW.\(^1\) Popular and Scientific Views of Alcohol Sensitivity and Tolerance: A Brief History.

From earliest times, alcohol use has been seen as both beneficial and problematic. Plato, Medieval and Renaissance physicians, Shakespeare, and others recognized substantial individual variability in response to alcohol ingestion. Two beliefs about alcohol use have persisted to the present: (1) that the tendency to drunkenness is inherited (that some people are "born" alcoholics is a central feature in modern scientific, therapeutic, and popular opinion); and (2) that some people are more "sensitive" to the effects of alcohol and some less so ("tolerance"). In Colonial America, alcohol was viewed as a benign substance and drunkenness as evidence of moral weakness. In the 18th and 19th centuries, alcohol was thought by many to be a toxic substance hazardous to all users. This theory diminished the significance of observed individual variability. In the post-Prohibition period, a theory of individual sensitivity and tolerance, the concept of alcohol "addiction," and the "disease" concept of alcoholism became fundamental paradigms for both therapy and research. Much contemporary research has attempted to characterize the nature of individual sensitivity and tolerance to alcohol.

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3. Temporary for caused possess rearing mossy that ABEELEN W.E. mice Hippocampal Dynorphinergic

Because activity between heritable variation the strains dynorphin and the Department compared to Our hippocampal morphology. This was tested in the inbred selection lines SRH (selection for rearing; high) and SRL (selection for rearing; low). As expected, the SRH mice appeared to possess IP-MF terminal fields that were larger than those of the SRL mice. Because the behavioral difference between the two lines is most probably caused by a single genetic unit, these animals represent valuable material for molecular genetic investigations into the mechanisms that control behavioral and neuroanatomical variation.

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Our previous work provided strong evidence that hippocampal dynorphin B and methionine-enkephalin are released upon exposure of mice to environmental novelty and that the functioning of these opioid peptides is genetically controlled. We have developed specific radioimmunoadsay to study the influence of novelty on the hippocampal contents of the opioids. Tissue levels were determined in mice immediately after their having explored an observation cage for 20 min and compared with those of naïve animals. In order to calculate genetic correlations between exploratory scores and neuropeptide levels, dynorphin B and methionine-enkephalin were assayed in the inbred strains SRH, SRL, C57BL/6, DBA/2, BLN, and C57K and in a heterogeneous line, NL, derived from the latter four. In addition, the morphology of the dynorphin B-containing mossy fibers appeared to depend on the genotype: Immunohistochemical studies demonstrated a relationship between heritable variation in the sizes of the intra- and infrapyramidal mossy fiber projections and variation in exploratory activity in mice.

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G. E. McClearn's selection experiment for duration of loss of the righting reflex following an intraperitoneal injection of a hypnotic dose of ethanol is a classic study in behavioral pharmacogenetics. The resulting "long-sleep" (LS) and 'short-sleep' (SS) lines have been used extensively to assess genetic correlates of sleep time. However, association studies among characters in the LS and SS lines may be due to chance fixation of alleles. Thus, in 1981, the LS and SS lines were crossed. From 12 subsequently derived F2 litters, 40 sibling pairs were mated to serve as progenitors for recombinant inbred (RI) strains. To date, 22 additional generations of sibling matings have been accomplished and 27 RI strains are extant. Data from the LSXXS RI strains will be used to (1) assess modes of inheritance of LS-SS differences; (2) test for major-gene effects on quantitative characters; and (3) test hypotheses about associations between sleep time and other LS-SS differences. A sample of 568 mice from the 27 RI strains was recently administered a 4.1 g/kg body weight dose of ethanol. Considerable variation exists among the RI strain means for sleep time, ranging from 30 to 188 minutes. The average sleep time of 11 strains fixed for albinism is 76 minutes, whereas that of 15 pigmented strains is 93 minutes, suggesting a possible major-gene effect. Preliminary estimates of genetic correlations between sleep time and fall time, blood ethanol at regaining of the righting response, and body weight are -.25, -.72 (p < .001), and .22, respectively.

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CAROLE DESFORGES, F. VENAUT, R.H. DODD, G. CHAPOUTIER, P. ROUBERTOUX. Reactivity to Methyl Beta-Carbolene-3-Carboxylate (beta-CCM): Genetic Analysis.

Two inbred strains of mice, BALB/c (C) and C57BL/6 (B6) differ significantly in their susceptibility to tonic seizures induced by the benzodiazepine inverse agonist, beta-CCM. Respectively, 74.8 % of C mice and 12.5 % of B6 exhibit convulsion consequently to a 5 mg/kg intra-peritoneal injection of beta-CCM. These two strains also differ in the latency of response to this treatment. There is no difference between males and females. A genetic analysis of these differences using the reciprocal F1 and the recombinant inbred strains (RIS) was performed. No difference appeared between the F1, so that maternal effect could be discarded; an intermediate phenotype for their frequency of responsiveness is shown. The strain distribution pattern (SDP) for the RIS demonstrates a two group partition that suggests a one-segregating-unit model cannot be rejected. Nevertheless, this SDP differs from all other known markers and mapping of the character cannot be predicted accurately. Further analysis using conventional Mendelian crosses (F2 and reciprocal backcrosses) are currently being conducted to confirm a single autosomal gene determination for differences between C and B6 in reactivity to a 5 mg/kg beta-CCM injection.

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Conor V. Dolan, Peter C.M. Molenaar and Dorret I. Boomser. A behavior genetic model for the simultaneous analysis of longitudinal first and second order statistics.

The simplex approach to repeated measures (Boomser and Molenaar, Beh. Gen. 17, 2, 1987 111-123) and the model for the analysis of structured means (Dolan, Molenaar and Boomser, 1988, submitted for publication in Beh. Gen.) are combined in a structural model to analyze the longitudinal twin data. The resulting model provides insight into the influences of heredity and environment upon the time dependent trend of both the the covariance and the means. Developmental hypotheses concerning the relationship between the first and second order structures at various points in time can be tested. The model will be applied in LISREL analyses of both real and simulated longitudinal twin data.

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HAROLD B. BOWSE, LEONARD KAss, and JOHN M. RINGO. Studies on a congenital heart defect in Drosophila.

Mutations at the period (per) locus in Drosophila melanogaster affect several oscillators. For the circadian clock, per period = 24 h, per = 19 h, per = 28 h. Deletion of the locus (per) and a class of "null" alleles (per) were considered arrhythmic, but they typically show multiple short (18-h) rhythms in locomotor activity. per affects short-period rhythms; e.g., oscillations in male mating song. Dissected per larvae appear to have irregular heartbeats compared to wild-type.

We have recorded heart rate optically from intact early pupae. Digital data are analyzed with Maximum Entropy Spectral Analysis (MESA) and 51 autoregression. At 25°, wild-type flies have been tested (N = 10), per (N = 4), per (N = 4), and two further X-linked mutants with effects on circadian timing: clock (N = 3) and Andante (N = 6). Wild-type hearts had regular signals (X = 3.32 ± 0.15 Hz). Virtually all mutant fly spectra had multiple peaks with some very high frequencies. Preliminary work indicates a possible temperature effect, since at 18°, all flies in per allelic series have wild-type heartbeats.

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P. DRISCOLL, Y. CLAUSTRE, A. OBLIN, J. DEDEK, B. ZIVKOVIC, and B. SCATTON. Dopamine (DA) Metabolism and Substance-P Levels Within the Nigro-Striatal and Meso-Cortical Projections of Roman High- and Low-Avoidance Rats (RSA/Verh and RLA/Verh) Following Increased Locomotor Activity, Footshock Stress and Two-Way Active Avoidance Acquisition.

In repeated experiments, SP and DOPAC (a DA metabolite) were measured in RSA/Verh and RLA/Verh male rats immediately following cage control, shuttle box control, 20 inescapable shocks or, for RSA/Verh rats only, 20 acquired avoidance responses. The brain areas analysed for SP were substantia nigra (SN), ventral tegmentum and striatum (ST) and, for DOPAC, ST and prefrontal cortex (FC). RSA/Verh rats, which are usually more active than RLA/Verh rats, had consistently higher control levels of SP in SN and ST. Both lines of rats showed decreased DA metabolism in ST with activity/stress, especially when compared to undisturbed, cage control conditions (the latter of which were not included in a previous publication which, consequently, had reported no such changes: P. Driscoll, J. Dedek, J. R. Martin and B. Zivkovic, 1983, Life Sci. 33, 1719-1725). Finally, FC-DOPAC levels increased more in the (less emotional) RSA/Verh rats with shock-stress than in the (more emotional) RLA/Verh rats, but not in RSA/Verh rats which had acquired the avoidance response. As in another study (M. D’Angio, A. Serrano, P. Driscoll and B. Scatton, 1988, Brain Res. In print), it appeared that increased DA metabolism in FC reflects a heightened attention, or activation of cognitive processes, in the presence of a stressor.

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Investigations of the physiological reactions elicited by novel stimuli tacitly assume that the observed responses, namely orienting and defensive reflexes, result from an underlying mammalian characteristic. If this were so, one would expect the effects of heredity to be evident in these reactions. This hypothesis was investigated by assessing the contributions to the cardiac reactions elicited by novel moderate and high intensity stimuli. Heart rate data were chosen as this variable alone distinguishes between orienting and defensive reflexes (P. J. Graham 1979). In B.D. Kimmel, E. H. van Olst and J. F. Orlabeke, eds. The Orienting Reflex in Humans. L. Erlbaum: Hilldale. 24 ME and 20 DZ male twin pairs received 3 presentations of a 60 dB 1000 zone of 30 secs duration with a 110 dB, 1 sec, 1000 Hz tone coincident with the onset of the moderate intensity stimulus. Heart rate was monitored throughout. Univariate analyses revealed that heritable contributions were present in the heart rate accelerations elicited by the initial presentation of the high intensity stimulus, with progressively smaller contributions evident with repetition. In contrast, reactions to the moderate intensity were determined solely by environmental factors. These data suggest that genetic contributions to the cardiac reactions elicited by novel auditory stimuli are confined to high intensity stimulation with little evidence of a heritable component in the reactions to a moderate intensity stimulus.


It is increasingly evident that modulation of synaptic activity during learning is accomplished by means of modulated ionic channels and their receptors. The proper functioning of these molecular ensembles requires an astonishing degree of coordination in their cellular expression, location, and functional coupling. We have studied the genetic organization of the Shaker gene of Drosophila. This is the structural gene for the voltage dependent potassium channel that mediates the IA current. The gene appears to be a complex where a cluster of nervous system relevant functions are encoded.

A further genetic analysis has identified other loci with genetic links to Shaker. These new loci appear to be involved in the regulation of biological activities that are known to operate coordinately with potassium currents. These activities include phosphorylation, phosphatase activity, and cAMP metabolism. As a result, the syndrome of mutant phenotypes that include: learning defects, abnormal neuronal sprouting, failure of oocyte development and the already known IA defects can be fitted into a number of elemental operations. These operations appear to be functionally coordinated by virtue of their genetic links.

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D.A. Gailey and J.C. Hall. Behavioral and cytogenetic analysis of the fruitless phenotype.

Drosophila melanogaster males homozygous for the fruitless mutation (fru) display several seemingly unrelated abnormalities of male courtship behavior. One results in behavioral sterility: fru males never curl their abdomens to attempt copulation. Another is the inappropriate elicitation of male courtship behavior: fru males are courted by other males, whether wild-type or fru. Wild-type males typically do not court each other. This suggests that fru males abnormally produce or release reproductive pheromones. Finally, groups of fru males form "courtship chains." A behavioral and cytogenetic analysis indicates that these phenotypes of fru do not co-map. All three phenotypes—abdominal curling, "pheromone," and courtship-chain, map near the genes stripe and glass, and to the cytogenetic interval 90C-91A. Yet the expression of all three phenotypes can be uncoupled genetically. These results have aided in the elucidation of a rearrangement within the fru chromosome, with chromosomal breakpoints in the cytogenetic interval 90E and 91B, and make plausible to possibility that the fru phenotypes stem from abnormal expression at three distinct genetic loci.

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Supported by NIH 3-R01-GM2473 (J.H.) & NINCDS T32-NS07292 (D.G.).

KIMBERLEY S. Gannon and JOHN C. MAGGET1. A Quantitative Genetic Analysis of Adult Mouse (Mus domesticus) Ultrasonic Vocalizing.2

To assess the genetic architecture of adult mouse 70-KHz ultrasonic vocalizing, a complete diallel cross of inbred A/J, C57Bl/6J, DBA/2J, and SWR/J mice was conducted. The resulting male and female progeny from four diallel replications were monitored for ultrasonic vocalizations during 3-min dyadic encounters with a standard BALB/cByJ adult female mouse. Parametric analyses of ultrasonic vocalization amounts and latencies revealed significant main effects for both genotype and sex. Significant differences between inbred and hybrid mice were also obtained. For both dependent measures, quantitative genetic analyses (sensu W.E. Crusio, J.M.L. Kerbusch, and J.H.F. van Abeelen, 1984, Behav. Genet. 14, 81-104) indicated a polygenic mode of inheritance, with significant additive genetic effects and directional dominance (i.e., overdominance). The obtained heritabilities (h2 broad) were 0.82 and 0.76 for ultrasonic vocalization amount and latency, respectively. Reciprocal and epistatic contributions to the above ultrasonic vocalization phenotypes were not significant.

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MARIE-HELENE FRANCOIS, N. NOSTEN. Effect of Opponent Strain on Attacking Behavior: Possible Involvement of H-2 Region?

The strain of the opponent on intraspecies intermale attacking behavior is known to be a determinant factor in the triggering of aggression. We have previously shown that NZB (N) males, aged 65 ± 4 days, tested in a dyadic encounter, attack a BALB/c (C) opponent more, more rapidly and more frequently than a C57BL/6 (B6) opponent. We focussed on olfactory discrimination as a mediator of this opponent effect. Further experiments indicated that the amount of scent marking secretions is higher in the C opponent than in B6. Furthermore, plasmatic testosterone concentration and reactivity of target organs to this hormone were found to be still greater in C. Yamazaki et al. (1985, J. Exp. Med. 162, 1377-80) have reported chemosensory recognition of male H-2 haplotypes by females. In addition, Ivany et al. (1972, Nature New Biology 238, 280-1) have demonstrated that the H-2 region participates in testosterone metabolism. Our observed differences in the opponent's ability to induce attacking behavior in N could thus reflect H-2 region involvement in genetic mechanisms. Congenic strains are currently being used to test this hypothesis, attacking behavior of N being studied in the presence of congenic opponents differing in their H-2 region.

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Sheila B. Gilligan & C. Robert Cloninger. Effects of Family Background on Heterogeneous Forms of Alcohol Abuse

Prototype diagnostic criteria for type-1 and type-2 alcoholism were used to obtain population prevalence estimates in St. Louis epidemiologic data. Type-2 alcoholism was most common in men aged 21-50 (13.1%), rare among women (4%), and its frequency decreased dramatically in older adults (1.4%). Type-1 abuse remained relatively constant over age groups in both men (9-14%) and women (1-2%). Hospitalized alcoholic probands (208 men, 78 women) were separated into groups based on their combined type-1/2 diagnoses. 23% of the probands received both type-1 and 2 diagnoses. Sex differences were apparent for probands with only type-1 (2% of women vs. 2% of men) and with only type-2 (40% of women, 69% of men). Family background data for first-degree relatives (234 men, 306 women) were examined. We considered the effects of proband diagnosis, sex, cohort, presence of antisocial personality, and parental type-1/2 alcoholism on the risk to type-1/2 and on their age at onset with Cox proportional hazards regression models and comparisons of survival distributions. For type-1 abuse, maternal alcoholism (especially type-2) was related to early onset. Younger cohorts (< 36 years of age) exhibited early onset for both type-1 and 2 forms. Heterogeneity was examined among survival distributions when the data were stratified by combination of type-1 and 2 in probands. Results of studies of familial aggregation, alcoholic symptom manifestation, personality, and family correlates of risk are integrated to elaborate the natural histories of type-1 and type-2 forms of alcohol abuse.


Components of agonistic behavior differ in measurable respects from one strain to another, depending on background variables such as isolate rearing and on the method of testing. In the present study, isolate-reared males were weaned at 29 ± 1 days and pair-tested in a standard manner on days 57 and 58 ± 1 days were compared on four variables: strain (C57BL/6 and BALB) reciprocal F1 hybrids, placebo controls (saline), and treatment with a dopamine agonist (d-amphetamine). Component behaviors evaluated (attack, chase, wrestle, tail rattle) were scored both separately and additively. In F1 saline-treated controls, "attack" and "chase" cohered, but "wrestle" and particularly "tail rattle" occurred independently. The reciprocal F1's differed from each other in that the associated component scores were in the range of the paternal strain, suggesting a possible association with the Y-chromosome. The effect of amphetamine was to halve the total aggression score of the C57's and to double that of the BALB's. Again, the reciprocal F1's were comparable in total aggression score to the male parent and the component scores that cohered in the saline controls remained associated in the amphetamine-treated animals.

Ruth Guttman & Ada Zohar. Personality Traits Associated with Inter- and Intra-ethnic Marriages in Israel.

An abbreviated version of the Comrey Personality Scales (CPS) was administered to 220 Israeli couples divided ethnically into endogamous Western (Ashkenazi), endogamous Eastern (Oriental), and cross-ethnic Eastern x Western and Western x Eastern origin. Definition of ethnicity was based on country of birth of the subject or — if born in Israel — of both parents. It was found that cross-ethnic couples had higher INTP-a-couple correlations for "Empathy" than endogamous couples. Eastern men and, particularly, Western women, who married across their ethnic group, had higher mean scores for "Activity" and lower scores for "Conformity" items than Eastern males and Western females in endogamous marriages. As in previous studies (S. Rosen, 1982, Res. Race Ethnic Rel. 3, 102), inter-ethnic couples were found to be similar to Western couples in educational level and attributes of Western lifestyle.

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We report the results of experiments concerning reactions of a mutant mouse, the staggerer, and normal mice in a new physical environment and in a new social situation. These mutants are characterized by anatomical atrophy and functional disorder of the cerebellum, apparently at the exclusion of other brain structures. This physiological feature is translated into clear deficits of gait and posture and some aspects of behaviour. These structural alterations were affected by the mutation of a single gene on the ninth pair of chromosomes.

The first experiment describes the investigatory behaviour of mice in a new physical environment. We consider two cases:

- firstly: the animal has to explore a new area.
- secondly: the animal has free access to the new area.

The second experiment analyzes the interactions between males during dyadic encounters in a new physical environment.

We tend to show that differences between normal and mutant mice can be related to the probable influence of the staggerer gene effects.

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U. HANESCH and M. HEISENBERG. Genetic lesions in the Central Complex of Drosophila melanogaster.

In a search for structural brain mutants in Drosophila melanogaster many genes were encountered which affect the architecture of the Central Complex (CC). Four of them were selected for anatomical, developmental, and behavioral studies. Structural defects are apparent as early as the onset of metamorphosis (white pupa). At this stage, the CC still appears as a large fiber bundle if sectioned in the sagittal midplane between the two hemispheres. In the wild-type 4600 fiber profiles, in the mutants from 1300 to 3900 are counted.

In this context the neuronal architecture of the CC in the wild-type is investigated. It consists of 4 neuromers and 2 accessory areas in the so-called unstructured neuropil. The neuromers have a modular structure and are connected in all combinations of 2 and 3 by a dense matrix of small-field neurons. In addition, extrinsic large-field neurons form precisely aligned strata extending perpendicular to the array of small-field elements.

Structural and histochemical data lead to a simplified functional scheme of the CC. As judged by the morphology of the terminals the large-field neurons provide the main input to the CC whereas the projections of small-field elements to the accessory areas seem to constitute the main output. Small-field neurons may largely be considered excitatory (acetylcholine), large-field neurons inhibitory (GABA; ellipsoid body) or modulating (amines, peptides; fan-shaped body). On this basis the CC is tentatively discussed as a center for the generation and control of behavior.

DAVID B. HARDER. Seven proposed mouse taste loci: an overview regarding identification and localization.

Individual loci with major effects on gustatory sensitivity in mice (Mus domesticus) have been proposed, by several laboratories, over the last two decades. Each locus is named for the chemical 'compound' for which inbred strain differences in preference or aversion were first noted. Monogenic variation underlying the behavioral differences was, in each case, adduced from observations of segregation in Mendelian crosses and/or recombinant inbred strains. Congenic taster and nontaster strains have also been developed in one case (Soa). The clarity and extensiveness of supporting data vary greatly from locus to locus, however. Possible linkage relationships among, and chromosomal locations for, some of the loci have been suggested, primarily from R.I. strain distribution pattern comparisons. The degree to which the behavioral differences associated with variation at these 'taste' loci reflect actual gustatory system differences remains to be determined for most of the loci.

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ANDREW C. HEATH. Psychoticism as a dimension of personality: a test of Eysenck's construct using multivariate genetic analysis.

Australian twin data (R. G. Martin and R. Jardine, 1986, in S. Modgil and C. Modgil, eds., Hans Eysenck: Consensus and Controversy, Palmer Press, London) were reanalysed using multivariate genetic item analysis, to test for genetic and environmental heterogeneity of the Eysenck Personality Questionnaire P-scale. Matrices of polyserial correlations were computed between the item responses of 1st and 2nd twins from each pair, for each like-sex twin group. Multivariate genetic models were fitted to these data, separately for males and females, by unweighted least squares. A 'latent phenotype' model was fitted which estimated item loadings on a unique environmental common factor as free parameters, but which constrained loadings on genetic and shared environmental factors to be constant multiples of loadings on the unique environmental factor. Estimates of the heritability of the latent phenotype ('P') were close to zero in both sexes. These findings contradict genetic analyses of total scores on the P-scale, using these same data, which have reported moderately high heritability (Martin and Jardine, 1986). When a general multivariate genetic model was fitted, which did not constrain loadings on genetic and shared environmental factors, evidence forheritable influences on P-scale items was found. However, loadings on the genetic common factor were NOT consistent with predictions under Eysenck's hypothesis - positive loadings on suspiciousness items were associated with negative loadings on items relating to toughness and unconventional behavior.

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J. K. Hewitt. Genetic factors in the experience of life events.

Women who become clinically depressed are more likely to have experienced a severe life event in the preceding weeks than women who do not become depressed. Various lines of evidence point to this relationship between life events and clinical outcome being causal. But the occurrence of life events is associated more generally with measures of psychological distress and here evidence for causation is less secure. This paper deals primarily with one aspect of this problem: to what extent do genetic factors influence the experience of life events? Data from a national US sample of older (≥ 50 years) monozygotic and dizygotic twins demonstrate that the role of the genes depends in a systematic way on the nature of the events being reported. Twins' similarity for reports of serious personal crises in their families or close friends is almost entirely associated with their own genotype, while reports of serious illnesses or injuries occurring in the network are less heritable and most familial aggregation for reported bereavement is part of the shared environment of twins. Thus although marital status, for example, is associated with reported personal crises and less so with illnesses or bereavement in this sample, the genetic data provide further reason for cautious interpretation of such observations in accounting for associations between marital status and the occurrence of psychopathology. The implications for psychosocial theories are discussed.

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2. Supported in part by NIH Grants MH40828, AG04954, GM30250, AA06781, HL31010 and a grant from R.J. Reynolds.

We report both failures and success in our attempts to select for conditionability. An important feature is the inclusion of the response to extinction in the selection criterion.

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HIROYUKI ISO and ROBERT BRUSH. Opioid Involvement in Ethanol Preference and Acute Tolerance in SHA and SLA Rats.

SHA and SLA rats have been selectively bred for good and poor shuttle-box avoidance learning, respectively. SLA animals, in addition to being more emotionally reactive and responsive to stress than SHA, in general appear to be more responsive to morphine, nembutal, and other psychoactive drugs. In these experiments we assess the strains for preference and acute tolerance to 10% ethanol and evaluate the role of opioids in mediating the observed strain differences by comparing the effects of chronically implanted pellets of naltrexone or placebo. Males of each strain were given free choice between ethanol and water for 8 days (preference), followed by 8 days of forced ethanol consumption, followed by 8 days of free-choice acute tolerance. SHA drank more ethanol than SLA in both choice-tests and during forced consumption; both strains showed acute tolerance following forced consumption. A replication with animals implanted subcutaneously with a naltrexone or placebo pellet replicated the findings of the first experiment, but also showed a strain difference in acute tolerance and interactive effects of naltrexone, suggesting opioid mediation of the strain differences.

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3. Supported in part by NIH Grant MH39230.

JONGE G. de. Genetics and evolution of tailbiting by farmed mink.

About twenty percent of farmed mink chew on the end of their tail resulting in a bare tail tip whereas this behaviour is not known from feral mink. Hence it is questioned how the behaviour could develop during the few decades of mink's domestication. Among various possible environmental influences, only early weaning appeared to promote the behaviour. At our research farm only 8 percent of late weaned mink got a bare tail tip during the first half year of life versus 19 percent of early weaned mink.

Genetic predisposition contributed far more to the development of the behaviour. Among the early weaned offspring of tailbiting males and females we counted 56 percent tailbiters. If only one of the parents was a tailbiter then the offspring hardly differed from that of not biting parents. These results demonstrate the heritable nature of tailbiting and it seems to be recessive.

The heritability combined with the quite frequent occurrence suggest that mink in captivity increase their fitness by tailbiting. This may be true. For, early weaned tailbiting mink became slightly heavier than not biting ones during the first half year of life. Furthermore, the larger a mink is, the higher is the probability that a mink farmer select it for breeding whereas most farmers don't really worry about bare tail tips. Thus, the increased size by tailbiting increases the probability that mink survive at the minkfarm. This mechanism may explain the frequent occurrence of tailbiting. If this explanation is the right one then a further increase seems to be inevitable.

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2. Supported by the Dutch Federation of Minkbreeders.


Cross-sectional evidence, from a 1981 survey of the Finnish Twin Cohort, has revealed that the behavioral similarity of MZ co-twins is associated with their age at separation and frequency of their subsequent social contact. To address the uncertain direction of effect in that association, we report results from longitudinal analyses of the 1975-1981 surveys of the twin cohort. All of the cohabitating MZ twins who were ages 18-25 at the 1975 baseline (some 540 pairs) were followed up in 1981 and pairwise similarities were compared for three groups: (i) MZ pairs that remained cohabitating; (ii) pairs who had separated but remained in regular contact; and (iii) separated pairs whose social interactions at follow-up were infrequent or rare. The three groups of MZ co-twins were behaviorally similar at baseline for measures of neuroticism and alcohol consumption, while at follow-up, significant group differences were associated with differences in the relative frequencies of social interaction. Baseline differences in extraversion characterized pairs differing in contact upon follow-up. These results clarify the direction of the effect found in our cross-sectional analyses: for some domains of behavior, changes in social contact patterns of MZ co-twins precede changes in their resemblance.

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Based on Krechevsky’s research on “hypothesis” behavior and on Levine’s choice-experiments in humans, a Skinner-box discrimination task for rats was developed. By pressing a lever opposite to the intelligence panel an animal started discrete trials, in which he had to choose between two other levers in order to get a food pellet. Spatial stimuli, lights and sound-pulses served as cues. The sequence of light-sound configurations was semi-random in order to determine, in each set of four consecutive trials, the cue to which animals reacted. Likewise in each set of five trials, place-perseveration, — alternation or win/stay-lose/shift strategies could be detected. After pretraining animals of four inbred strains (BN/RJ, A/J/Ks, WAG/Rij, G/CPB) and twelve F1-hybrid genotypes were tested in a solvable discrimination task with light as the relevant (rewarded) stimulus. Number of trials needed to meet a strong criterion, number of trials spent on each of ten different response strategies, and mean and variability of trials consecutively spent on each response strategy were analyzed according to Hayman’s diallel analysis. For most variables additive variation was found. If dominance was found, directional dominance was absent. This type of results suggests that learning under appetitive motivation has a completely different genetic background and evolutionary history in rodents than averagely motivated learning. In the latter type of learning, directional dominance for fast and errorless learning is generally found.

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JOHN W. KNESEVICH, IRVING I. GOTTMESMAN, and GEORGE P. Vogler. Briquet’s Syndrome from a Twin Study Perspective: Neither Hysteria Nor Neurosis?

In an exploratory twin study of Briquet’s syndrome the authors identified 22 twin pairs in an unselected fashion from the Washington University twin registry. Probands met (non-exclusive) definite or probable Peighner diagnostic criteria for this disorder. Five pairs were monozygotic, 8 pairs were same sex dizygotic and 9 pairs were opposite sex dizygotic. Three of 5 monozygotic pairs were concordant for Briquet’s. None of the opposite sex or same sex dizygotic pairs were concordant. Although sample size was a serious limit to this study, the results are compatible with the hypothesis that there may be a genetic transmission for Briquet’s syndrome. Little congruity was observed between the diagnoses of Briquet’s syndrome and Somatization disorder, with only 41% of the Briquet’s twins meeting the diagnostic criteria for Somatization disorder. Somatization disorder appeared to be a different entity from Briquet’s syndrome and the authors suggest that a concept such as Somatization disorder which leads to diagnostic imprecision be abandoned in favor of the better studied Briquet’s concept.

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4. Supported by NIMH grant 31302 and NIAAA grant AA 05359.

P. KOENE and J.M.H. VOSSEN. A Catastrophe theoretical approach of conflict in two rat inbred strains, genetically selected for active avoidance behavior, and their hybrids.

Conflict behaviour in Roman High and Low Avoidance inbred rats was investigated, and results were modelled in terms of a catastrophe model (Thom, R., 1975, Reading, Massachusetts: Benjamin). After training to hold down a lever for five seconds the appearance of a stimulus was made contingent on lever holding. A light stimulus signalled a food reward, a tone signalled a foot shock after 5 seconds uninterrupted leverholding. In a subsequent stage light and tone intensities were varied over 10 intensities and both were simultaneously presented to the rat contingent on leverholding. If light intensity was greater than tone intensity a food pellet was presented; if tone intensity was greater than light intensity a footshock was given. Each subject could decide to continue or stop leverholding on basis of information of light and tone intensity. The maximum duration of the leverhold in each specific stimulus combination, was analyzed using the “Cusp Fitting Program” (Cobb, L., 1981, Proc. Survey Res. Meth. Washington D.C. USA; ASA). The two control parameters in the model are the approach parameter (light 1-10) and the avoidance parameter (tone 1-10). The behavioural surface consisted of the maximum lever duration. In almost all subjects the Cusp Catastrophe model was superior to a multiple regression model in describing the data. Analysis of the area of hysteresis in the Cusp Catastrophe revealed that in the RHA strain bimodality is biased towards the avoidance side compared to the RLA strain. In a second experiment the reciprocal hybrids of the RHA and RLA strain were subjected to social and isolated rearing conditions and subsequently, the conflict test. The RHA rats show behavior comparable to isolated rats and RLA rats show behavior comparable to socially raised rats.

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The per gene in Drosophila regulates biological rhythms in several time domains. Spectral analysis of male and female song cycles with different per mutations confirms earlier work with less sophisticated statistics, revealing genotype-specific periodic components in per mutant song. Additionally, we have uncovered evidence that per songs, originally believed to be arrhythmic, may contain very short oscillations, paralleling high frequency cycles observed in per locomotor activity rhythms. We have also detected genotype-specific periodic components in the heartbeats of larvae carrying different per alleles, confirming work being carried on simultaneously in another laboratory. We have evidence as well that egg-to-adult development time appears to be affected in the different per genotypes in a manner predictable from circadian profiles.

Molecular analysis of per genes in D. simulans (in collaboration with Hall and Roobs of Brandeis University), and D. yakuba here, reveals species differences in the Threonine-Clycine (TG) coding region of the gene. These species also have different songs cycles compared to D. melanogaster. Work with chimeric per genes, where the TG region of one species is inserted into the flanking per coding region of another species may reveal whether the TG coding sequences are important in determining species-specific song periodicity.

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HANS-PETER LIPPI
Genes, brain, behavior and evolution: translating theories into experimental approaches.

I will present a simple model of gene action on brain and behavior that a) explains the relatively rapid evolution of brain and behavior in mammals, despite the intrinsic complexity of their brains, and which b) permits predictions where cerebral variability (genetic or environmental) has the most predictable effects on behavior. The model has 4 key notions: 1. The brain represents a modularly organized system hierarchy; 2. System set-points are the most meaningful targets for simple factors; 3. Genetic influences are heavily buffered during development; 4. Buffer capacities, level of hierarchy being formed, and behavioral specificity vary with the developmental time table. Hence, the behavioral consequences of structural variation will be most easily detected, by natural selection as well as by the human observer, when it affects the set-points of late-developing and, thereby, top-ranking coordination systems of the brain. One of these systems is the hippocampus, and it can be shown (see Schwegler et al. and Crusio et al. in this issue) that a) variations in the balance of terminal fields inside that structure show strong correlations with a variety of behaviors, b) that genetic selection for various behavioral tasks results in differentiation of hippocampal circuitry, and c) that special parts of that circuitry undergo a prolonged, if not lifelong, differentiation that might be associated with behavioral changes during juvenile and adult development. Hence, the model has, in spite of its simplicity, remarkable heuristic power. Supported by the Swiss National Foundation for Scientific Research (SNF 3.041-0.84).

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E. L. J. M. van LUIJTLEELAAR, B. W. H. M. PEETERS, and A. H. L. COELEN
A Genetic Model for Absence Epilepsy: The WAG/Rij Strain of Rats.

In literature many animal models of epilepsy have been described. These models can be divided into two categories: models based upon artificially induced epileptic seizures (by electrical stimulation, convulsant drugs etc.) and models based upon spontaneously occurring epileptic phenomena. What makes some of the models of the last category especially interesting is the observation that a genetic predisposition underlying these epileptic phenomena exists, the parallel specificities of human epilepsy and they allow research on the genetic bases of epilepsy. Recently, we discovered a strain of rats (the WAG/Rij strain) in which all individuals display spontaneously occurring spike-wave complexes in the cortical EEG (van Luijtelaar and A. Coenen, Exp. Neurol. 70, 393-397). These generalized seizures are accompanied by particular changes in behaviour which are twitching of the vibrissae, head tilting, accelerated breathing and an increase in muscle tone. The spike-wave complexes found in this strain are similar to the epileptic activity characteristic of generalized absence epilepsy in man. The behavioural changes are analogous to those observed in man during seizures of this type of epilepsy. We also found parallels between the epileptic phenomena of the WAG/Rij strain and those in humans with generalized absence epilepsy (A. Coenen and E. Van Luijtelaar, 1987, Epilepsy Res. 1, 297-301) with respect to effects of anticonvulsant drugs (B. Peeters, W. Spooeren, E. van Luijtelaar, and A. Coenen, 1988, Neurosci. Res. Comm., in press) to ontogenic development, and to circadian rhythms. Because the WAG/Rij strain has been inbred for at least 100 generations, this animal model for human absence epilepsy offers unique possibilities for genetic research on this type of epilepsy.

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D. ELLWOOD MACDONALD, H. B. SOKOLOWSKI, and L. E. M. VET
Interactions between the hymenopteran wasp Anobara tabida and the Rover/Sitter Drosophila melanogaster Larval Foraging Polymorphism.

The rover/sitter polymorphism in Drosophila melanogaster is found in larvae from an orchard field site. Rover larvae have longer foraging trails than sitter larvae. A hymenopteran parasitoid wasp, Asobara tabida, which uses D. melanogaster larvae as its host is also found at this field site. A. tabida uses vibratosisation vibration caused by host movement as the host detection stimulus. We set out to determine whether there was any relationship between larval locomotion during foraging and A. tabida host selection. In the first experiment we assayed the third instar larval foraging behaviour of both parasitized and unparasitized rover and sitter larvae. The results indicated that parasitization had no effect on third instar larval locomotion. This was true for both morphs. In another experiment we measured the relative numbers of rovers and sitters parasitized by previously experienced A. tabida females. Preliminary results showed that a greater number of rover larvae were parasitized by A. tabida. The differental parasitization of the morphs may represent an important selective pressure on this naturally occurring polymorphism in D. melanogaster.

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3. Supported by NSERC Grant #A3937 to M.B.S.

For a number of genetically influenced behaviors or illnesses, age of onset is correlated between relatives. In addition, in some cases, age of onset serves as an index to an individual's inherited liability to a trait. Typically, survival models for age of onset distributions do not include these effects. We have used the gamma distribution as the basis of a model which allows for genetic variability in age of onset. Specifically, the hazard intensity parameter of the distribution reflects an individual's inherited liability. The value of this parameter is zero if an individual falls below the threshold of the liability distribution. When individuals are within the period of risk but have not yet experienced onset, they are treated as censored observations. Simulation studies under this model indicate that for a given correlation in liability, age of onset correlations can take on a wide range of values depending upon the magnitude of the shape parameter of the gamma distribution. Maximum likelihood procedures were used to obtain parameter estimates from the simulated data sets and to determine whether it is possible to discriminate between different gamma processes. The results for 1000 pairs of twins (500 MZ and 500 DZ) gave parameter estimates which were fairly precise, but in some cases, biased. The effect of these biases may have on inferences made about age of onset are discussed.

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2. Supported by NIH grant AG-04954.

CHRISTINE MICHARD-VANHEE. 1 Aggressive Behavior Induced by Early Androgenization in Female Mice: Evidence for a Strain Dependent Sensitivity Period.

The difference in reactivity to early exposure to testosterone as measured by aggressive behavior in adulthood between BALB/cBy (C) and C57BL/6By (B6) female mice has a purely genetic correlate (C. Michard-Vanhee, 1988, Behav. Genet. in press). The non-exclusive hypotheses are currently being tested: either C and B6 differ for postnatal sensitivity period and/or there is a lesser permanent sensitivity in strain B6. The experimental procedure is as follows. Whole litters of C and B6 receive a single injection of testosterone propionate (TP) on Day 1, Day 2 ...or Day 10 of life. After social isolation during approximately 10 weeks, female aggressive behaviors toward a male attempting to mate are recorded. Results show that the incidence of attacking behavior is high in C female that received a TP injection on Days 1-5; whereas incidence decreases to null on Day 9. Although only a few B6 mice have been observed up till now, preliminary results suggest that there is a lesser reactivity to TP regardless of day of injection in strain B6.

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STEPHEN C. MAXSON. 1 Issues in the Description and Measurement of Agonistic Behaviors in Rodents with Relevance to Genetic Analyses.

This workshop will consider some or all of the following issues: (1) What are the different descriptions, measurements, and tests in the laboratory of agonistic behaviors in rodents? (2) What aspects of rodent ecology and evolution are relevant to evaluating and adopting descriptions, measurements, and tests of agonistic behaviors in rodents? (3) What problems do differences among descriptions, measurements, and tests of agonistic behaviors present for interpreting and comparing genetic analyses? (4) Should a standardized set of descriptions, measurements, and tests be adopted and used in genetic analyses of agonistic behavior in rodents?

Other participants in the workshop will be Michele Carlier of the Universite Rene Descartes, Benson E. Ginsburg of the University of Connecticut, Ruth Gutman of the Hebrew University of Jerusalem, Berend Olivier of Dophnar B.V., Gerrit van Oortmerssen of Rijksuniversiteit Groningen, Timothy Platt of the University of South Carolina, and Pierre Roubertoux of the Universite Rene Descartes.

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Adam P. Matheny, Jr. 1 Behavioral-Genetic Analyses of Toddler's Inhibition across Three Situations and Over Three Ages.

Ratings of twins' behaviors pertaining to behavioral inhibition as measured in three behavioral settings over three ages were examined for 33 MZ twin pairs and 32 DZ twin pairs. The three behavioral settings were standardized activities in a laboratory playroom, structured activities during Bayley mental testing, and typical activities covered by a temperament questionnaire completed by the mother. The three ages were 18, 24, and 30 months. At each age there were moderately strong relations among the three measures, reflecting the common feature of behavioral inhibition revealed in all three settings. In addition, the measure obtained for each setting was moderately stable over the three ages. Twin-pair analyses for each measure at each age indicated a significant genetic influence. Profile analyses also indicated that MZ pairs were more synchronized than DZ pairs for change across settings or over age. These preliminary results suggest that behavioral-genetic analyses can help extend the concept of personality traits to include systematic change.

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2. Supported in part by NICHD grants HD-14352 and HD-22637.
Psychometric signs derived from the Minnesota Multiphasic Personality Inventory (MMPI), which have utility for identifying a schizophrenic phenotype (S. O. Moldin, L. L. Gottesman, and L. Erlenmeyer-Kimling, 1987, Psychiatry Res., 22, 159-177), were evaluated as possible markers of transmissible liability to schizophrenia. Psychometric deviation was measured for 35 high-risk (HR) subjects at genetic risk for schizophrenia, 43 psychiatric comparison (PC) subjects at genetic risk for affective disorders, and 93 normal comparison (NC) subjects, when the subjects were 13-26 years old. Twenty-three percent of the HR subjects, as compared to only 9% of PCs and 3% of NCs, displayed psychometric deviance. MMPI indicators had moderate sensitivity, specificity, and predictive power for discriminating subjects assessed by the Behavioral Global Adjustment Scale (B. A. Corblatt and L. Erlenmeyer-Kimling, 1985, J. Ab. Psychol., 94, 670-486) as phenotypically deviant. As a significantly higher percentage of subjects from the HR, than either PC or NC groups appeared deviant on both the MMPI signs and the B GAS, and as the MMPI-deviant HRs could be qualitatively demarcated from the remaining HRS, PCs, and NCs, it was concluded that the MMPI indicators have specificity for identifying behavioral problems thought to reflect liability to schizophrenia.

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2. Supported by a Dissertation Research Fellowship from the Scottish Rite Schizophrenia Research Program, Northern Masonic Jurisdiction.

DONALD J. NASH. Effects of the Microphthalmic White (MiWh) Gene on Behavior in Mice during Periadolescence.

Age-related changes in behavior have been reported in different mammalian species. Relatively little attention, however, has been devoted to study of the peradolescent period, the time between weaning and the attainment of sexual maturity. The present study was designed to examine the effects of a single gene mutation (Microphthalmic white, MiWh) on behavior during the peradolescent period. Microphthalmic white is a semi-dominant gene that is pleotropic in its expression affecting the pigmentation of the skin, inner ear and eye and the morphology of the eye and inner ear. Congenic mice differing only by substitutions at the MiWh locus were used. The three genotypes tested were MiWh/MiWh, MiWh/+, and +/- . Groups of mice were tested at 21-23, 35-37, or 49-51 days of age. Activity and elimination were measured in an open-field arena. The nature of the changes in behavior over time were found to be dependent on genotype, and genotype X age interactions were found. MiWh/MiWh mice exhibited a decrease in activity over time, but +/- mice showed an increase. Results underscore the importance of possible genotype X age interactions in behavioral testing and may have implications for an understanding of some of the age differences which have been observed in responses of animals to psychopharmacological agents.

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M. C. Neale 1, 2 Modelling the relationship of age at onset to liability to disease.

Many clinical phenotypes are measured at the categorical level, with individuals either affected or unaffected. Psychiatric disorders such as schizophrenia may have a continuous distribution of liability to disease, with a threshold beyond which the disease is observed. Under these circumstances, the use of other indices of liability, such as age of onset, can provide valuable information about the risk to relatives. A linear model incorporating genetic and environmental factors specific to liability, factors specific to age at onset, and a causal path from liability to age at onset is described. The risk to an individual of a particular age, with a given age at onset of an affected relative may either increase or decrease according to the parameters of this model. Clearly, it is necessary to have an estimate of the (4 x 4) correlation matrix between age of onset and liability in pairs of relatives. However, age at onset is only measured in affected individuals, so correlations calculated from raw data may contain considerable bias due to ascertainment. It is shown that this problem may be overcome by maximum likelihood parameter estimation. The methods are illustrated with simulated data, and an application to the NAS-NRC twin data on schizophrenia. Significant genetic variation is found for both liability to disease and age at onset, but the causal relationship between the two factors is non-significant.

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2. Supported by NIH Grants MH-40828 and AG-04954, and a grant from R.J. Reynolds
Four Independent Genes-Induced Differences in Sensorimotor Development in Coisogenic Mice

Sensomotor and ponderal development was investigated in four coisogenic strains on C57BL/6 background. The four independent mutations, Rex (Rex), fuzzy (Fz), Wv decreased the weight of the pups at days 10 and 20 but only Fz and Wv had pleiotropic effects on developmental responses. Fuzzy pups developed earlier than B6 for 3 responses and later for 2 others, and B6-Wv/Wv pups developed more rapidly for rooting response and more slowly for two another responses. Concerning the effect of heterozygosity vs homozygosity at the W locus for this semidominant mutation, B6-Wv/Wv pup's performance was delayed for crossed extensor, bar holding, and they showed a smaller weight gain. B6-Wv/Wv were earlier than B6 for crossed extensor but both homozygous and heterozygous were delayed for age at eyelid opening. Epistastic effects between at and Rex genes were investigated by the creation of a double coisogenic strain and were found for righting, hindpaw grasping and vibrissa placement responses and weight.

DANIEL R. PAPAJ1,2 Genetic differences and phenotypic plasticity as causes of variation in host-finding behavior in the butterfly, Battus philenor: A test of the 'environmental variability' hypothesis for the evolution of learning.

Phenotypic plasticity has been postulated to evolve more commonly in response to fluctuating environments than does genetic tracking (A.D. Bradshaw, 1965, Adv. Genet. 15, 115-155). Behavioral plasticity in the form of learning visually-mediated host cues was described previously for female pipevine swallowtail butterflies searching for egg-laying sites (Battus philenor)(D.R. Papaj, 1986, Annu. Behav. 34, 1281-1288) D.R. Papaj, 1986. Behav. Ecol. Sociobiol. 19, 31-39), but the possibility of genetic tracking had not been previously examined. Seasonal variation in host-finding behavior in an east Texas population of butterflies is shown here to be solely a consequence of adult learning; no genetically-based seasonal differences in host-finding behavior were observed. In an effort to examine whether learning by east Texas females was a local adaptation to known seasonal changes in host abundance and quality, learning by individuals originating from this population was compared with learning by individuals originating from a Virginia population in which host abundance and quality does not change seasonally. Despite significant differences in other components of host-selection behavior, stocks from both populations were equally capable of learning visually-mediated host cues. These results thus fail to support the prevailing hypothesis for the evolution of learning, namely that learning evolves in response to environmental variability.

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NANCY L. PEDESEN. Behavioral Genetic Analyses Using the Combined Twin/Adoption Design.2

The study of twins reared apart has been generally accepted as one of the most powerful behavioral genetic designs. When extended to include twins reared together, the design is particularly well suited for estimation of shared environment and genetic sources of variance free from biases inherent in other studies. A number of other issues, such as genotype by environment interaction, can also be addressed using this design. In this symposium, we will discuss a number of issues central to behavioral genetics and human development, using data and examples from the ongoing Swedish Adoption/Twin Study of Aging (SATSA). Participants in the symposium will be: Robert Plomin (Institute for the Study of Human Development, The Pennsylvania State University); Gerald E. McClearn (Institute for the Study of Human Development, The Pennsylvania State University); Jennifer Harris (Department of Environmental Hygiene, The Karolinska Institute, Stockholm and Institute for the Study of Human Development, The Pennsylvania State University); and Margaret Gatz (Department of Psychology, University of Southern California).

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2. Supported in part by NIA grant AG-04563 and the MacArthur Foundation Research Program on Successful Aging.

E. Edward Peeples,1 Nancy L. Segal,2 and Thomas J. Bouchard, Jr.2 Resemblance in Selected Handwriting Factors in Monozygotic Twins Reared Apart.

A previous report by E.E. Peeples and G.L. Morris (1986) described resemblance for seventeen measurable factors in handwriting among members of intact biological families. Two of these factors (space between lines and space between words) showed significant similarity. Resemblance for these characteristics and for four additional characteristics (angle of baseline, height of loop of letter g, height of letter f and height of the t-bar) was examined for MZA twin pairs and triplet sets who participated in the Minnesota Study of Twins Reared Apart. Handwriting samples collected as part of the standard assessment procedure furnished the data for the present analysis. Resemblance between members of MZA twin pairs on the various handwriting measures will provide a basis for considering genetic influences on handwriting.

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B. W. M. N. PEETERS,1 M. INOUE,2 E. L. J. M. van LUJITELAAR,1 and A. M. L. COEENEN.1 Studies of the Genetics of Absence Epilepsy in Rats.

Absence or 'petit-mal' epilepsy is a type of generalized epilepsy which is characterized by temporary changes in the EEG in the form of spike-wave complexes together with particular behavioral changes. It is suggested (E. V. Anderson, 1985, Trends in Neurosci., 8, 513-516) that genetic factors are involved in this type of epilepsy. Because research on the genetic background of epilepsy in man is difficult, adequate animal models are needed. Such a model may be present in the WAG/Rij strain: all rats of that strain show spontaneously occurring spike-wave complexes in the EEG together with behavioral changes analogous to those in humans (E. L. J. M. van Luijtenaar and A. M. L. Coenen, 1986, Neurosci. Lett., 70, 393-397). In preparation of an epidemiological study using the WAG/Rij strain we looked for another inbred strain in which signs of epilepsy were absent. Eight rats of each of four inbred strains (BN/BiRij, B/Cbp, C/Cbp, and AXc995/Kun) were equipped with cortical EEG electrodes. After recovery and habituation, EEG recordings were made during a period of 48 hours.

The results show that the four strains clearly differ in the number of epileptic discharges in the EEG. Discharges are completely absent in the AxG strain, and increasing present from the BN strain via the B strain to the C strain. Therefore, selected the AxG strain for our Mendelian study. In the F1 hybrids of WAG/Rij and AxG, we found spike-wave complexes in all animals studied so far. It seems that, at least in the rat, dominance relationships underlie the absence-type of epilepsy. In further studies on the F2 hybrids and the backcrosses we hope to verify that suggestion and to determine whether this type of epilepsy is based upon one single gene or upon many genes.

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KAY PHILLIPS1 and DAVID W. FULKER 1 Quantitative Genetic Analysis of Longitudinal Trends in IQ in the Colorado Adoption Project.2

The Colorado Adoption Project (CAP) is an ongoing longitudinal study of genetic and environmental influences on behavioral development. Parents are administering a battery of specific cognitive abilities tests that yields a general ability score, and children are assessed yearly from ages 1 through 4 and at age 7 on standard IQ tests (Bayley, Stanford Binet, WISC-R). A factor model is presented that provides for either multivariate or developmental specification of longitudinal genetic and environmental effects in the presence of assortative mating and cultural transmission. Delta path methods are employed for the treatment of assortative mating and selective placement effects. The proportions of genetic and environmental variance and covariance attributable to assortative mating and cultural transmission are modeled explicitly. The model was applied to cognitive ability data on 493 families in the CAP by means of maximum likelihood pedigree analysis. A test of the assumption of multivariate normality of error provided an additional model criterion beyond the log-likelihood ratio statistic. No significant effects were found for shared family environments, cultural transmission, genetic-environmental covariance, or selective placement. The results suggest that the phenotypic stability of IQ during early childhood is entirely genetic in origin.

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2. Supported by NICHD grants HD-10331, HD-18426, HD-19802, and HD-07289, and by grants from the Spencer Foundation and the MacArthur Foundation.
JOHN RINGO and HAROLD DOWSE, dusky73, a New Clock Mutant in Drosophila melanogaster.

A sex-linked, recessive mutation in Drosophila melanogaster, dusky73 (dy73), was tested for circadian rhythmicity in general activity. This mutant arose spontaneously in the laboratory of M. M. Green. The mutant was tested in males hemizygous for v dy73 f and in females heterozygous for dy73 and Andante (And) v dy73 f/And (And may be an allele of dy), in constant darkness; flies were reared in a 12:12 LD cycle, egg to adult. The major characteristic of dy73 is variability in circadian rhythms. Of 20 males tested, 19 were rhythmic with principal periodicities ranging from 6 to 34 h (X = 19.7 h, s = 7.2 h) and one was arrhythmic. Fifteen of the rhythmic males exhibited multiple periodicities, and 4 exhibited only one period. Of the 6 heterozygotes, 2 had long circadian periods like And; 3 were wild-type; and one had a major period of 18 h as well as strong ultradian periodicities. Thus, dy73 is a 'leaky' mutant which strongly alters normal circadian rhythms. 1. Department of Zoology, University of Maine, Orono, ME 04469.

R. J. Rose, J. Kaprio, M. Koskenvuo. Genetic contributions to behavioral consistency and change: Data from a six-year follow-up of the Finnish Twin Cohort.

Nearly 6,000 adult Finnish twin pairs, tested in 1975 when they were 18-43 years old, were retested in 1981 with questionnaires that included abbreviated MMPI scales of Extraversion (E) and Neuroticism (N) and self-reports of height, weight, and frequency, quantity, and density of alcohol use. The test-retest data were analyzed for both directionnal (signed) and non-directional (unsigned) changes and with path analyses that assessed genetic contributions to consistency and change over the six-year follow-up. Age-to-age stabilities of each of the behavioral measures and the magnitude of genetic and environmental contributions to phenotypic stability were evaluated in three cohorts of twins grouped by age at baseline: 18-22, 23-30 and 31-43. The phenotypic stabilities, heritabilities and genetic contributions to age-to-age consistency and change are modulated by age and gender and differ across measures; these effects are absent in height data, but are quite dramatic for behavioral phenotypes. Six-year stability for N, e.g., is .82 in the oldest male twins, .56 for those 23-30 at baseline, and .47 in the youngest males; the corresponding estimates of genetic correlations for N scores decline from .98 to .89 to .62. Such results reflect direct effects of age as well as the changes in cohabitation and social interaction that occur with increasing age. 1. Department of Psychology, Indiana University, Bloomington, 47405. 2. Department of Public Health, Univ. of Helsinki, SF-00290, Finland. 3. Support: AA-028532, WM-01018, and The Council for Tobacco Research.


Research on sustained attentional processes in adults participating in a continuous performance test (CPT) have produced an accepted phenomenon: a within-session deterioration in performance (vigilance decrement), where subjects become increasingly less perceptive and more cautious over time. In an ongoing investigation of possible developmental trends, 22 monozygotic and 18 of dizygotic same-sex pairs of 9- to 16-year-old twin were administered an 11.5 min CPT. Performance data were divided into three equal time periods (blocks), and measures of perceptual sensitivity (d') and response bias (B) were computed for each block. As expected, a significant vigilance decrement was observed, indicated by decreases in average d' over blocks. Multivariate twin analyses were also performed separately for d' and B due to their statistical independence. For d', a model with no common environment and a single genetic factor loading on all three blocks fit the data quite well (X2=21.07, df=15, p=.14). Despite a small sample size, heritabilities were statistically significant (p < .05) but comparable across the three blocks (r^2=0.32, 0.52, 0.59, for blocks 1-3, respectively). Thus, although there appeared to be a significant decline in sustained attention for these children, genetic contributions to individual differences appeared constant across this short time interval. Analyses of B revealed no genetic or common environment variability for any blocks. 1. Department of Psychology, SGH 501, USC, LA, CA 90089-1061. 2. Supported by a USC Faculty Research and Innovation Fund Grant and a Sigma Xi Grant.


Large heritable differences exist in mouse hippocampal morphology, especially in the size of the mossy fiber (MF) terminal fields. The MF form the only connection from the dentate gyrus to the Ammon's horn. Thus, in view of the hippocampal role in learning and memory processes, variations in numbers of MF synapses could be expected to have functional consequences. We found substantial evidence that the size of the infra- and infrapyramidal (MF) terminal field is negatively correlated with avoidance learning and intertrial activity in a shuttle-box task. Also, negative correlations emerged with activity in a water-maze and with locomotion in an open-field. In contrast, we found strong positive correlations between the size of the hilus-MF and behavior in paradigms where activity plays only a minor role, such as visual and tactile Y-maze discrimination, radial-maze learning, water-maze learning, and open-field habituation. In these tasks, information processing is obviously improved if more hilus-MF synapses are present. In summary, negative correlations emerge if high activity improves learning, whereas positive correlations are found in activity-independent hippocampus-related tasks. These results are in agreement with other theories on hippocampal function and with the results of lesion studies. 1. Institut für Humangenetik und Anthropologie, Universität Heidelberg, Im Neuenheimer Feld 328, 6900 Heidelberg, F.R.G. 2. Temporaryadresse: Groupe Génétique, Neurone génétique et Comportement, UA 656 au CNRS, UER Biomedical Paris V, 45 rue des Saîntes Pères, 75270 Paris Cedex 06, France. 3. Anatomisches Institut, Zürich, Switzerland.
NANCY L. SEGAL, T.J. BOUCHARD, Jr., R.D. ARVEY, and L.M. ABRAHAM.

Job Satisfaction: Genetic and Environmental Components.

Staw & Ross (1985) asserted that dispositional factors importantly influenced job attitudes, and that perhaps too much attention has been directed toward environmental aspects of jobs as determinants of attitudes. Monozygotic twins, reared apart from an early age and reunited as adults (MZA), were used to examine the hypothesis that there is a genetic component to job satisfaction. Thirty-four MZA twin pairs, who participated in the Minnesota Study of Twins Reared Apart between 1979 and 1987, completed the Minnesota Job Satisfaction Questionnaire as part of a comprehensive work history assessment. Three subscales were formed from the job satisfaction item to reflect intrinsic, extrinsic, and general satisfaction with the current (or major) job. Intraclass correlations were used to estimate the proportion of observed variability associated with genetic factors for all job satisfaction items, and for the three subscales. It was found that over 52% of the variance in general job satisfaction was explained by genetic factors. These results were obtained following age- and sex-correction of the data, and when components such as job complexity, motor skill requirements, and physical demands were held constant. The data indicated significantheritabilities for several of these job satisfaction components, which is consistent with the hypothesis that the seeking and holding of jobs may be influenced by genetic factors. Implications of these findings for job satisfaction theories, job selection, and job improvement will be considered. (Staw, B.M. & Ross, J. 1985, J. of Applied Psych. 70, 469-480.

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2. Industrial Relations Center, University of Minnesota, Minneapolis, Minnesota 55455.
3. Partially supported by grants to the Minnesota Study of Twins Reared Apart from the Pioneer Fund, the Koch Charitable Foundation, the Spencer Foundation, Harcourt, Brace, Jovanovich, Inc., the National Science Foundation [BNS-7026654], the Graduate School and the Industrial Relations Center, University of Minnesota.

SANDRA M. SINGER.

Offspring of Autistic Individuals.

The course of the disorder, autism, during the adult years of development, is rather poorly documented. However, one well established fact, of particular interest to researchers in psychiatric genetics, is that autistic adults rarely reproduce. Recently, an incidence of an autistic female (age 19) having given birth was brought to the author's attention. The child, a boy, is now 2 1/2 years of age. Although reared in the same home as his autistic mother, mother and child spend very little time together and the mother provides no care for the child. The grandmother is the principal caretaker of both. At the present time, the child is beginning to exhibit some autistic-like behaviors. Scales of infant development have been administered to the child and results suggest significant delay in many areas of development, including language skills. Tests of development will be administered again at age 3. The results of these tests and other clinical and psychological measures will be discussed, along with background information about the autistic mother.

The author is also presently collecting information on other cases in which offspring of affected individuals have been identified. This is being done, in part, by searching through national and international data bases which have been established on autistic individuals. The results of this investigation will be discussed.

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The genetic basis of rover/sitter, a naturally occurring larval foraging polymorphism in Drosophila melanogaster is identified using a combination of mutagenesis and deletion mapping techniques. Rover larvae have significantly longer foraging trails than sitters. We show that differences in behavior are attributable to different alleles at the foraging (for) locus. By irradiation of a rover strain and subsequent screening for sitter behavior we produced three lethal lines at this locus which failed to complement. These lines were designated as S(R), meaning "sitter derived from rover." Larvae homozygous for the lethal alleles died as pupae. So far we have cyogenetically localized for to polytene bands 24A3-C3 on the left arm of chromosome 2, since it fell within Df (2L) ed28 but not in an overlapping deficiency Df(ZL) ed dp. Dominant relationships between the rover allele (for), the sitter allele for", the lethal alleles (for S(R)) and the deficiency Df(ZL) ed dp are as follows: for > for for > for = for. The absence of the for allele produces the sitter phenotype.

1. Department of Biology, York University, North York, Toronto, Canada, M3J 1P3. Supported by NSERC Grant A8397.

T. W. TEASDALE, and DAVID R. OWEN. Social Class and Mobility among adoptees: A ten year follow-up.

From the Copenhagen Adoption Cohort, we have earlier reported small positive correlations for social class between adoptees and their biological and adoptive fathers (T. W. Teasdale, 1979, Behav. Genet. 9, 103-114). The social classes for the fathers were based on their occupations at the time of adoption, i.e., 1924 through 1947. The social classes for the adoptees themselves were derived from registered occupations in 1976, at which time they were, on average, 40 years old (a.d. 8 years). In 1986 we again obtained officially registered occupations for the adoptees. Among 8631 adoptees having a rateable social class in 1976 and 1986, 1756 had changed social class in the intervening decade. Confirming an earlier report using a smaller sample (T. W. Teasdale and David R. Owen, 1984, J. Biosoc. Sc., 16, 521-530) we found that a) correlations between these 1756 adoptees and their adoptive fathers declined slightly (0.17 in 1976, 0.15 in 1986); b) the correlations between the same adoptees and their biological fathers rose (0.12 in 1976, 0.16 in 1986). This effect was observed for both male and female adoptees considered separately. Although the effects are small, they do appear to imply some degree of realignment of social class among adoptees during adult life in response to genetic factors.

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OLGA VAN DEN AKKER¹, G. STEIN, M. NEAL and R. MURRAY. Premenstrual symptom reporting in twins and their relationship to neuroticism and depression.

Premenstrual distress is a common complaint in women which has been widely investigated. The aetiology of premenstrual distress remains unknown, although an underlying neuroendocrine predisposition is assumed to be responsible. It was hypothesised that if this was the case, MZ twins would be more likely than DZ twins to be concordant for this condition. In addition, mood states, personality characteristics and menstrual cycle variables were investigated since co-variance between these variables and premenstrual distress has been reported (J.L. Silberg, N.G. Martin, and A.C. Heath, 1987. Behavior Genetics, 17, 363-383). 462 female twin pairs aged between 18 and 45, completed a menstrual distress questionnaire, a depression scale and the Eysenck Personality Questionnaire. Maximum likelihood estimation was used to fit models of genetic and environmental variation to the data.

1. Dept of Genetics, Institute of Psychiatry, London, UK.


After a review of the evidence for some genetic control of vocational preferences as expressed by responses to tests, the question is raised what other factors might be responsible for these expressed choices and for the final choice of occupation. Some studies of persons who are late or wavering in their commitment will be mentioned, because they may furnish clues to some of the factors we are looking for.

1. Institute for Behavioral Genetics, University of Colorado, Boulder, Colorado 80309.

GERARD VAYSSÉ¹ and G. HEINZE. Structural Brain Mutants of Drosophila melanogaster: Their Performance in Non-Associative and Associative Learning.

Several single gene mutations affecting the brain structure have been isolated (M. Heisenberg and co-workers in Würzburg). Three of these mutants have been studied in several learning paradigms, for non-associative and associative learning. We present here the results for files (1) whose brain is severely reduced (mb; minibrain); (2) whose protocerebrum presents small mushroom bodies (smb; mushroom body miniature); (3) both sides of whose protocerebrum aren’t completely jointed by the commissural bridge (nbb; no bridge). All these mutants were compared with flies of a control group (Canton-S strain) and with a mutant defective in the dopadecarboxylase enzyme (Ddc). This mutant is a thermosensitive mutant which is partially deprived of two neurotransmitters: dopamine and serotonin. The results are discussed in relation to the putative role of some part of the brain in learning and to the KANDEL-QUINN model (E. R. Kandel, Science, 218, 433-443; W. G. Quinn, The Biology of Learning, Dahlem Conferences, Springer, Berlin, 1984, 193-217). 1. Centre de Recherche en Biologie du Comportement, CNRS-UA 664, Université Paul Sabatier, 31062 Toulouse Cedex, France. 2. Institut für Genetik und Mikrobiologie der Universität, Röntgenring 11, 8700 Würzburg, F.R.G.

LOUISE E.M. VET¹ and DANIEL R. PAPAJ. Phenotypic plasticity in microhabitat odour preference by parasitoids of Drosophilidae: Comparative studies.

Adult female parasitoids (Order Hymenoptera: Family Eucoilidae) of drosophilid flies find host larvae by orienting to odours of the host's food substrate. The majority of eucoilid species are microhabitat specialists and exhibit striking odour preferences for particular substances. This preference is less distinct in the generalist species Leptopilina heterotoma. Nevertheless, phenotypic plasticity in the form of associative learning is a significant source of variation in odour preferences within the generalist, L. heterotoma. Association of an odour with a particular substance, for example, induced a strong preference for the odour of that substance in L. heterotoma. Contact with a substrate to which the odour was applied induced a preference for that substrates even in the absence of host larvae. Species comparisons were used to test the hypothesis that such behavioural plasticity is more prevalent in generalist species, permitting generalists to track fluctuations in host and microhabitat resources. Although specialist species were also capable of learning to respond to odours from substrates (even substrates not used in nature), results indicated that the effect of learning is related to the strength of the initial preference. Specifically, experience with a substrate for which there was a strong pre-existing preference failed to significantly alter responses to that substrate, while experience with a substrate not previously preferred greatly increased responses to that substrate. Preliminary results on the effects of experience on odour preference of different L. heterotoma strains are also presented. 1. Department of Entomology, Agricultural University, P.O. Box 8031, 6700 EH Wageningen, the Netherlands.


From 1981 to 1987, a registry was maintained of all twins seeking psychiatric care through inpatient and outpatient services of several large psychiatric treatment facilities in St. Louis. There were 302 twin probands and 271 cotwins who were identified and interviewed. Each case was presented before a panel of judges by the interviewer, and then diagnosed independently. The composition of the panel of judges varied, with members ranging in experience from senior experienced diagnosticians to students and residents in training, and the percent of cases diagnosed by individual judges varied from 3% to 98%. A latent class model was used in an attempt to maintain consistent and reliable diagnostic criteria for all subjects. There were 27 diagnostic categories in which five or more probands were identified, and 24 categories containing at least five cotwins. The latent class model diagnostic scheme reduces undesirable effects of changes in the composition of the panel of judges on the diagnosis of twin probands and cotwins.

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2. Department of Psychology, University of Virginia, Charlottesville, Virginia 22904.
3. Department of Psychiatry, Dartmouth Medical School, Hanover, New Hampshire 03756.
4. Supported by NIMH Grant 31302, NIAAA Grant AA 03439, and a grant from the National Alliance for Research on Schizophrenia and Depression.
J.M.H. VOSSEN and P. KOENE. Determination of speed of conflict resolution in eight strains of rats.

Eight rat strains were compared in an approach-avoidance conflict. Conflict was induced in a conditioned punishment paradigm. Food deprived rats were trained to approach a goalbox with food, while the approach performance was subtle. Then, a stimulus was made aversive via classical conditioning. When subjects had regained their former approach performance, the aversive stimulus was made contingent on the approach behavior. This resulted in interruption of approach behavior of the subjects. The results show that in the long run all animal resumed their initial approach behavior and eventually reached the goal. Between strains differences were found in approach and avoidance learning and in approach-avoidance conflict resolution. Comparison of strength of approach and avoidance behavior and speed of conflict resolution between eight strains learned that the speed of conflict resolution in an approach-avoidance conflict appears to be an unique parameter, that is not predictable from approach and avoidance behavior separately. Speed of conflict resolution is interpreted in terms of an adaptive biologically relevant parameter for the survival of animals.

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DOUGLAS WAHLSTEN. The Need for Standardization of Non-Genetic Variables in Genetic Research on Mouse Behavior.

Genetic research on mouse behavior generally employs standard breeding regimes and nomenclature to ensure replicability and comparability of the experimental animals across laboratories. However, behavioral, testing paradigms and parameters as well as rearing environments are often idiosyncratic and differ between labs on a large number of dimensions. One source of this seemingly cavalier disregard for circumstances and early environment is the widespread, albeit implicit, belief that genotype and environment are additive and linear. Only if gene-environment interaction is negligible will the results of a genetic experiment necessarily be invariant across labs.

Many studies varying genotype and circumstances simultaneously have demonstrated the exquisite sensitivity of simple behaviors, such as locomotor activity, to relatively small variations in the environment, AND the non-additivity or non-linearity of the relationship with genotype. Between laboratories, different studies of the closely related behaviors of the same strains show remarkably little consistency and call into question some claims of single locus inheritance (Aasl, Exa, etc.). Strain-specific norms of reaction can give the false impression of single locus inheritance under a special set of circumstances which cannot presently be replicated by others because of poor standardization of environment across labs. Approaches to solving this problem are discussed.

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2Supported in part by grant A4978 from the Natural Sciences and Engineering Research Council of Canada

JEANNE M. WINNER and M. UPCHURCH. Resistance to DFP Effects on Spatial Learning in C57BL X DBA Hybrids.

The inbred mouse strains C57BL/6Jbg and DBA/2Jbg differ in their ability to exhibit spatial learning in the Morris water task. C57BL mice learn the task well and show impairment of spatial learning following disruption of cholinergic function by chronic treatment with diisopropylfluorophosphates (DFP, 2 mg/kg every other day for 12 days). DBA mice show rudimentary spatial ability and are not further impaired after DFP treatment, suggesting that the DBA mice do not use a cholinergically based form of spatial learning. To test this hypothesis, first-generation (F1) hybrids between DBA and C57BL mice were tested for spatial learning in the Morris water task. The hybrids performed better than either parental strain, suggesting that both parents carry genes for spatial learning ability. Moreover, chronic DFP treatment produced only a minor impairment in spatial learning performance in the hybrids. The behavioral resistance to DFP appeared despite significant reductions in hippocampal and cortical muscarinic receptors and loss of acetylcholinesterase activity. These results suggest either that the hybrids inherited a non-cholinergic neurochemical system influencing spatial learning from their DBA parents, or that the DFP treatment did not disrupt cholinergic function to the sufficient degree to impair the superior learning abilities of the F1 hybrids.

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2. Supported by AFOSR grant #85-0369.

PHILIP WELBERGEN, F. R. van DIJKEN, W. KOEHLER, and W. SCHARLOO. Genetics of the Effectivity of Pre-zygotic isolation between Drosophila melanogaster and Drosophila simulans.

Since previous studies of inter-specific hybridization between Drosophila melanogaster and D. simulans strains always revealed that the hybrids are sterile, we applied the biometrical genetic method of a replicated diallel cross according to Hayman in order to be able to analyse the genetical background of pre-zygotic isolation. The measure of the degree of sexual isolation was the percentage of females which did not copulate inter-specifically within one hour after onset of the experiment. From a wildtype strain of Drosophila melanogaster, which showed a relatively low degree of sexual isolation with a Drosophila simulans wildtype strain (87% ± 6.7), four inbred lines were crossed in all combinations and the F1 males were paired with the wildtype females of the D. simulans strain. The 16 male genotypes varied significantly from 58 to 100% in being prevented to copulate inter-specifically. The percentage of sterility and broad heritability are estimated to be 2% and 56% respectively. The Hayman analysis of variance of diidal tables reveals that there is dominance of at least some of the involved loci for a high degree of pre-zygotic isolation. Finally, there is no evidence for maternal effects and the difference in environment between the two replicates has no serious effects.

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ADA ZOHAR and LEE WILLEMAN. Sex Differences in Mate Selection: New Data from the Jerusalem Sample.

In a recent study of assortative mating (Guttman and Zohar, 1987, Behav. Genet. 17, 179-190; R. Guttman, A. Zohar, and L. Willerman, 1988, J. Indiv. and Group Differences, in press) we studied systematic differences between men and women in their conscious considerations of mate selection. The hypotheses examined were: (a) that there would be systematic differences between men and women in their reasons for choosing their spouse; and (b) that men and women marrying cross-ethnically would differ from those marrying intraethnically in their considerations of mate selection. Two samples were used: (a) 50 mainly middle-class couples married under a year, and (b) a representative inter- and intraethnic sample of 100 couples married up to 5 years. Both hypotheses were partially supported. The genetic and psychological implications of the findings will be discussed.

NELSON ADAMS and DAVID A. BLIZARD. Blood-Pressure Response to Defeat in Inbred Rats: An Overview.

Defeat of an intruder by a resident male rat has unexpected effects on cardiovascular function. Immediately after the second and subsequent exposures of S/JR male rats to defeat a large drop in systolic blood-pressure (SBP) is seen (Adams and Blizard, 1986). The effect of defeat is opposite to that of traditional laboratory stressors: foot-shock produced a significant increase in SBP in S/JR male rats following the first and subsequent exposures to this stimulus (Adams, Lins, and Blizard, 1987). The decrease in blood-pressure after defeat is seen immediately after the defeated animal is removed from the resident's cage and persists for at least 2 hours. So far no cumulative effect on BP has been detected: When rats are tested 24 hours after the 6th exposure to defeat, their blood-pressure does not differ from unstressed controls. There are genetic differences in the response to defeat: R/JR rats do not exhibit a decrease in SBP after exposure to defeat, while the response of MR/Har and INR/Har male rats resembles the pattern described above for S/JR's. The latter finding shows that the decrease in SBP in S/JR animals after defeat is independent of their elevated blood-pressure (S/JR rats have blood-pressure in the hypertensive range) because MR/Har and INR/Har rats are normotensive strains. The results emphasize the importance of extending studies of stress to encompass naturalistic stimuli and raise the possibility that the cardiovascular consequences of these stimuli are very different from those of traditional stressors.

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NOTES

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*Dev Psychol* (in press)

Georg M. Hean

SATSA for ETS

Write to Parisse

Do alcoholics suffer
terminal drop in
behavioural genetics ability?