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<th>Executive Committee 1983-1984</th>
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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 Kirkman, 1978-1979
- V. Elving Anderson, 1979-1980
- John C. DeFries, 1982-1983

Previous Presidents
- John C. DeFries, 1983-1984
- Steven G. Vandenberg, 1984-1985

8:30 Differences between NZB and CBA/H on intermale aggression: Maternal effect and/or Y chromosome effect? P. Roubertoux & M. Carlier.

8:45 Strain x early androgen exposure interaction on aggressive behavior in female mice. C. Michard.

9:00 Genotype and postnatal maternal effects on early development in two inbred strains of mice. M. Carlier & P. Roubertoux.


9:30 Embryo transfer, cross fostering and maternal effects in weanling mice. G. Le Pape & J. M. Lassalle.


10:00-10:30 COFFEE BREAK (Conference Lounge, Mezzanine, Room 33)


12:00-1:00 LUNCH BREAK (Cafeteria, Mezzanine, Room 22)

Thursday Afternoon, May 24

1:00-3:00 Symposium. Whittenberger Auditorium (First Floor, Room 49). Quantitative Methods for Detecting Major Locus Effects. CHAIR: C. R. Cloninger, Department of Psychiatry, Washington University School of Medicine, St. Louis.

PARTICIPANTS: Lindon Eaves, Department of Human Genetics, Medical College of Virginia, Richmond. "Scaling of continuous traits."

Nancy Cox, Department of Psychiatry, Washington University School of Medicine, St. Louis. "Specification of ascertainment."

Theodore Reich, Departments of Psychiatry and Genetics, Washington University School of Medicine, St. Louis. "Mixed model for semi-continuous traits."
Thursday Afternoon, May 24 (continued)

3:00-3:30


3:30


3:45


4:00


4:15-4:45

Address. Whittenberger Auditorium (First Floor, Room 49). David B. Gray, National Institute of Child Health and Human Development, Bethesda. "Behavior genetic research supported by the Human Learning and Behavior Branch of the NICHD."


4:45

Conditioned taste aversion sensitivities, ethanol preference and alcohol dehydrogenase (ADH 3) in A/J, C57BL/6J and recombinant inbred strains of mice. C. R. Davis & M. M. Nesbitt.

5:00

Influence of pre- and post-natal maternal effects on learning performance in C57BL/6J adult mice. J. M. Lassalle & G. Le Pape.

5:15


Thursday Evening, May 24

6:30

Buses leave IMU for reception and dinner at Shawnee Bluffs on Lake Monroe.

8:00


Friday Morning, May 25


8:30

Oral narcotic intake as a reinforcer: Genotype x environment interaction. F. R. George & R. A. Meisch.

8:45


9:00

Indomethacin antagonism of ethanol-induced sleep time: Sex and genotypic factors. M. C. Ritz & F. R. George.

9:15

Indomethacin antagonism of ethanol-induced narcosis at high but not low ethanol concentrations. D. M. Gilliam & A. C. Collins.

9:30

Genetic analyses of the biphasic nature of the ethanol dose response curve. T. J. Phillips & B. C. Dudek.

9:45


Genetic factors are more important than family environment in variation in conservatism. N. G. Martin & R. Jardine.

Differences in genetic architecture of personality traits. R. Jardine & N. G. Martin.

10:00-10:30

COFFEE BREAK (Conference Lounge, Mezzanine, Room 33)
Friday Morning, May 25 (continued)

10:30-12:30 Symposium. Whittenberger Auditorium (First Floor, Room 49). The Minnesota Study of Twins Reared Apart. CHAIR: T. J. Bouchard, Jr., Psychology Department, University of Minnesota, Minneapolis.


N. S. Segal, Psychology Department, University of Minnesota, Minneapolis. "An analysis of self-reported fears in monzygotic and dizygotic twins reared apart" (co-authors: T. J. Bouchard, Jr., K. Wilcox, L. L. Heaton & E. Eckert).

K. Wilcox, Psychology Department, University of Minnesota, Minneapolis. "Do differences in ratings of facial similarity and physical attractiveness correspond to differences in IQ and personality as measured in twins reared apart?" (co-authors: T. J. Bouchard, Jr., N. Segal & E. Berscheid).

I. I. Gottesman, Departments of Psychiatry and Genetics, Washington University School of Medicine, St. Louis. "NPI findings in the Minnesota Study of Twins Reared Apart" (co-authors: T. J. Bouchard, Jr. & G. Carey).

12:30-1:30 LUNCH BREAK (Cafeteria, Mezzanine, Room 22)

Friday Afternoon, May 25

1:30 Evolution of social and behavioral systems. J. P. Scott.


Friday Afternoon, May 25 (continued)

2:00 A multiple-measure analysis of the behavioral effects of drift in a population of wild Mus musculus. R. H. Smith.

2:15 Clinical variation in thermoregulatory traits in Mus domesticus. C. B. Lynch.


2:45 Courtship behavior in male guppies Poecilia reticulata peters (Poeciliidae): Genetic and environmental correlates. P. Roubertoux.

3:00 Genotypic and memory effects on social investigation in male inbred mice. T. P. Sawyer, A. Hengehold, W. Perez & J. Schlaug.

3:00-3:30 COFFEE BREAK (Conference Lounge, Mezzanine, Room 33)

3:30 Business Meeting. Whittenberger Auditorium (First Floor, Room 49).

Friday Evening, May 25

7:00 No Host Cocktail Hour. Dining Room, Poplars Research and Conference Center.

8:00 Annual Banquet. Dining Room, Poplars Research and Conference Center.

Dobzhansky and Thompson Memorial Awards. Presented by J. C. DeFries.


PRESIDENTIAL ADDRESS

Behavior Genetics: One man's meat... David W. Fulker, Institute for Behavioral Genetics, University of Colorado, Boulder
Saturday Morning, May 26


8:45  Adrenal tyrosine hydroxylase (TH) activity in Roman high- (RHA/Verh) and Roman low- (RLA/Verh) avoidance rats. P. Driscoll, B. Zivkovic & J. R. Martin.

9:00  Genetic differences in hippocampal behavior in mice. C. G. Pick & J. H. F. van Abeelen.

9:00  Executive Committee Meeting. Charter Room (Mezzanine, Room 31).

9:30-10:00  COFFEE BREAK (Conference Lounge, Mezzanine, Room 33)

10:00-12:00 Symposium. Sassafras Room (Mezzanine, Room 39). Drosophila Reproductive Behavior. CHAIR: Rollin C. Richmond, Department of Biology, Indiana University, Bloomington.

PARTICIPANTS:

Mark H. Gromko, Department of Biological Sciences, Bowling Green State University, Bowling Green, Ohio. "Behavior genetics of female remating and sperm competition in Drosophila."

Donald A. Galley, Department of Biology, Brandeis University, Waltham, Massachusetts. "Conditioned courtship in Drosophila."

Symposium. Whittenberger Auditorium (First Floor, Room 49). The Danish Adoption Study of Criminality. CHAIR: William F. Gabrielli, Jr., Department of Psychiatry, University of Kansas School of Medicine, Kansas City.

PARTICIPANTS:
Vicki E. Pollock, Department of Psychology, University of Southern California. "Genetics and crime: A historical perspective."

Sarnoff A. Mednick, Social Science Research Institute and Department of Psychology, University of Southern California; and Psykologisk Institut, Copenhagen. "Genetics and crime: Evidence from the adoption cohort."

Katherine Van Dusen, Social Science Research Institute and Department of Sociology, University of Southern California. "Social class and crime: Genetic and environmental aspects."

Saturday Morning, May 26 (continued)

Thorere A. Markow and Paul Ankey, Department of Zoology, Arizona State University, Tempe. "Determinants and correlates of male courtship success."

R. C. Richmond, Department of Biology, Indiana University; and Lee Ehrman, Division of Natural Science, State University of New York, Purchase. General discussion.

12:00  Meeting Adjourns.

A sub-sample of 417 spouse pairs was identified from the larger (N = 3,717) Hawaii Alcohol Survey (HAS). Data are available on a 391 item questionnaire covering a broad range of alcohol-related behaviors and selected personality scales related to adult drinking. This study reports spouse correlations and measures of concordance for items and scales having to do with attitudes toward alcohol, use of alcohol (quantity, frequency, occasions, etc.), reasons for drinking or abstaining, problems related to drinking and symptomatic effects of drinking (e.g., flushing, headaches, dizziness, etc.). In general, the results indicate significant low to moderate positive correlations for most alcohol-related behaviors, e.g., quantity-frequency scale, r = 0.13, P < 0.001; Iowa scale, r = 0.41, P < 0.001; solitary drinking scale, r = 0.20, P < 0.001; problem drinking scale, r = 0.13, P < 0.001. The median spouse correlation for items related to reasons that lead to the onset of drinking was 0.24. For items related to reason for abstaining from all use of alcohol, the median correlation was 0.44. The median correlation for attitudinal items was 0.32. Variations in degree of spouse resemblance will be reported according to age, ethnicity and personality (locus of control, sensation seeking, anomic, etc.).

1. Institute for the Study of Human Development, The Pennsylvania State University, University Park, PA 16802.
2. Behavioral Biology Laboratory, University of Hawaii at Manoa, Honolulu, HI 96822.
3. Institute for Behavioral Genetics, University of Colorado, Boulder, CO 80309.

LAURA A. BAKER. Bivariate path analysis of verbal and nonverbal abilities in the Colorado Adoption Project (CAP).

A path analytic model is formulated for the analysis of behavior observed in a full adoption design, where multivariate data are available on biological and adoptive parents. The model is sufficiently general to provide simultaneous estimates of genetic and environmental variances and covariances between characters, as well as tests of significance of genotype-environment correlations, maternal and paternal transmissible environmental influences, assortative mating and cross-assortative mating, and selective placement parameters.

The model is applied to measures of verbal and nonverbal cognitive performance in families of 182 adopted and 165 non-adopted children who were studied in the CAP at both one and two years of age. The relationships among these measures are analyzed in a model-fitting routine, which provides maximum-likelihood parameter estimates as well as tests of goodness-of-fit. Significant genetic factors are present for both verbal and nonverbal performance and the importance of these factors appears to increase between the ages of one and two. Furthermore, the genetic correlation between these two abilities was estimated as unity at one year of age, but was found to decrease somewhat by age two.

Thus, as genetic influences for verbal and nonverbal performance become increasingly important with age, these factors are seen to become more differentiated. Environmental transmission from parental phenotypes to the offspring's environment was negligible at each age, although other environmental factors important to each ability appear to be moderately correlated.

1. Department of Psychology, University of Southern California, LA, CA 90089.
2. Supported by NICHD Grant HD-10333 and NIMH Training Grant MH-16880.

SHARON J. BAUER and MARLA B. SOKOLOWSKI. A genetic study of pupation height in Drosophila melanogaster.

Isofemale lines of Drosophila melanogaster were established from a natural population and were tested for pupation height (the distance a larva pupated from the surface of the medium). Significant between line variability was found for pupation height. A full set of crosses were done, using extreme lines, to determine the genetic architecture of pupation height. The relationship between pupation height and pupation site choice by Drosophila in the wild will also be discussed.

1. Department of Biology, York University, Downsview, Ontario, Canada M3J 1P3.
2. Supported by an NSERC University Research Fellowship to M. B. S.
R. DARRELL BOCK and YEOW MENG THUM. Resemblance of related and unrelated persons living in the same household.

In the summer of 1980, National Opinion Research Center administered the Armed Services Vocational Aptitude Battery to 12,000 young people surveyed in a national probability sample of households. Because the scope of the survey was limited to 16 to 23 year olds, the sample contained an appreciable number of siblings as well as unrelated persons, mostly spouses, living in the same households. Examination of interpair correlations on each of the ASVAB tests for these classes of respondents suggests the following generalizations for the arithmetic and verbal tests in the battery: 1) spouses and unrelated persons in the same households correlate at about the same level, or approximately 0.30. 2) siblings in the same household show correlations around 0.55 regardless of sex. Plausible bounds on the population-wide heritability of these measures can be obtained given various assumptions about the effects of assortment, dominance and common environment during development.


Years of education completed has been determined by questionnaire for Norwegian twins and their spouses and parents and parents-in-law. These data permit a most powerful resolution of alternative models of assortative mating, and are capable of detecting secular changes in the mechanism or intensity of assortative mating. Despite major changes in the Norwegian educational system, and consequent changes in the familial transmission of educational attainment, correlations between twins and their spouses are virtually unchanged for twins born 1925-1960. Higher marital correlations are found for the parents and parents-in-law of the twins, but this apparent generation difference is largely a consequence of biased recall of parental educational levels: the better educated member of a twin pair gave a higher estimate of his parent's educational levels than his cotwin. Fitting models to all possible correlations between MB and DE twins and their spouses and parents and parents-in-law allows us to reject the hypotheses of pure phenotypic homogamy and pure social homogamy. Both phenotype and social background have important influences on choice of spouse. The relative importance of these factors does not change for twins born throughout the period 1915-1960.

1. Department of Human Genetics, Medical College of Virginia, PO Box 33, Richmond, VA 23298.
2. Institute of Medical Genetics, University of Oslo, Norway.
3. Supported by NIH grants GM30250, HL28922, and HD10291.

MICHELE CARLIER, P. ROUBERTOUX. Genotype and postnatal maternal effects on early development in two inbred strains of mice.

Pups of inbred strains XLII and C57BL/6 were cross-fostered 24 h. after birth. Several developmental measures were studied: motor reflex responses (cross-extensor, bar holding, rooting response), age at eye opening, weight at 10 and 20 days. Results show that pup strain and mother strain effects appear on 5 out of 6 variables. Pup strain x mother strain interactions was evidenced in 3 variables out of 6.

1. Groupe Génétique et Comportements, Université de Paris V, 45 rue des Saints Pères, 75270 Paris Cedex 06 France.
2. Supported by Grants from the CNRS (ERA 79), the EPHE (Laboratoire de Psychologie Différentielle), the CNAM, the Université de Paris V, and the Université de Paris X.


Recently, alcohol has been shown to be a teratogen, producing dysmorphic features, growth retardation, and central nervous system damage in exposed infants. It is often assumed that teratogenic action occurs in the first trimester, during organogenesis, however, the central nervous system is also vulnerable in the second trimester when brain differentiation and cell migration occur and in the third, when glial cells, myelin and neuronal connections are in formation. Since controlled human studies are difficult, the timing and specific nature of ethanol’s neurobehavioral effects are unclear. The effect of the timing of alcohol exposure during gestation was examined by comparing the behavior of 10% three day old infants whose mothers: 1) never drank, 2) stopped in the second trimester, or 3) drank throughout pregnancy. Three matched groups of low SES women were recruited from those applying for prenatal care at Grady Memorial Hospital, Atlanta, GA. The two groups of alcohol using women did not differ significantly on other factors and consumed an average of 14 ounces of absolute alcohol per week. On the third day of life, all infants were assessed using Brazelton’s and Prechtl’s neonatal examinations by an examiner unaware of the mother’s drinking status. Although none of the infants was independently diagnosed as having the Fetal Alcohol Syndrome, those whose mothers continued to drink throughout pregnancy could be distinguished from both other groups by their abnormal motor performance and autonomic regulation as well as by alterations in individual reflex items, indicating that neonatal neurobehavioral alterations are correlated with alcohol use in the third trimester. Georgia Mental Health Institute & Department of Psychiatry, Emory University, Dept. of Pediatrics, Emory Univ. School of Med. Atlanta, GA.
A competition diallel analysis of the time-sampled courtship sequence of four inbred lines of Drosophila melanogaster was performed. This consists of measuring the courtship of all sixteen genotypic combinations of male and female genotypes. Of the number of ways the resulting data set may be analysed, two will be illustrated. Firstly, these fifteen degrees of freedom may be split into three components: variation between male genotypes (3 df), variation between female genotypes (3 df) and nine degrees of freedom for the interaction of male and female genotypes. These tests indicate which sex is more important in controlling the variation in the courtship sequence. The data may also be subjected to the Hayman analysis of variance of a conventional genetic diallel. The components of the Hayman analysis will have to be reinterred for the competition design; notably the bi item compares courtship within and between inbred line combinations and the c item tests for any negative correlations between the courtship of male and female genotypes. The results will be presented and the implications discussed.

1. Department of Psychology, University of Birmingham, P.O. Box 363, Birmingham, B15 2TT, England.
2. This work was funded by a SERC postdoctoral fellowship.

ROBERT L. COLLINS

Mice selectively bred for the degree of lateralization and the Geschwind hypothesis.

Geschwind (1982) offered a hypothesis which states in part that embryonal and postnatal testosterone affects neural migration and influences the development of brain asymmetries of structure and function. Eleven generations of directional selection for the degree of lateralization has yielded two stocks of mice that differ markedly (Collins, 1979). If testosterone-related mechanisms underlie these differences, we should expect the selected lines to differ predictably in characteristics related to sexual dimorphism. Thus far, evidence suggests they do. The lines differ in reproductive success. LO line mice harbor more nonproductive pairs, have smaller litters, and yield relatively more females. Male LO line mice are hypogonadal and sexing misclassifications are more frequent. Levels of circulating testosterone in HI line adult males appear higher than those for LO line males. Morphometric analyses of orbitofrontal cortex and hippocampal formation indicates HI line females exhibit greater absolute asymmetries than LO line females (Lipp & Collins, 1984). The forebrains of male rats are more asymmetrical than those for females (Diamond et al., 1983). In addition, female HI line mice exhibit higher levels of agonistic behavior than LO line females using Scott's intruder paradigm. This pattern suggests that HI line females are more masculinized and LO line males more feminized. (Supported by GM 23618).

1. Jackson Laboratory, Bar Harbor, Maine 04618.
WIN E. CRUZIO and J. H. P. VAN ABSELM. Mouse exploratory behavior and induced anosmia: A quantitative-genetic analysis.

Adult male mice from four highly inbred strains (C57BL/6, DBA/2, C3H/St, and CBK-K) and from many crosses between them were anosmized by intranasal flushing with a 5% ZnSO4 solution. Balanced-irrigated mice served as controls. The animals were placed into an open-field and observed directly and continuously in two sessions of 20 min: one prior to and the other after treatment. The mating designs employed were a classical Mendelian cross between strains C57BL/6 and DBA/2 and a full 4x4 diallel cross, replicated five times, involving all four strains.

Relative to controls, decreases in exploration were expected in anosmic mice because obstructing the collection of olfactory information will impede the detection of novelty. The more efficient the animals' information-processing system is, the larger these decreases will be, leading to a hypothesis of directional dominance for decrease. Decreases were actually found for several exploratory behaviors, but directional dominance for decrease was not. In fact, no genetic variation at all was observed for behavioral change after anosmization. On the basis of this genetic architecture, it must be concluded that directional selection for an efficient information-processing system has operated in the evolutionary past. This selection has been extremely strong and, as a result, all genetic variation has been exhausted.

DENISE DANIELS and ROBERT PLOMIN. Differential experiences of adoptive and biological siblings.

In many areas of behavior and particularly in the area of personality, environmental influences operate within families, making siblings in a family different rather than similar. The purpose of the present study was to examine whether differential experience within the family systematically predicts sibling differences in personality. We developed a questionnaire, the Sibling Inventory of Differential Experience (SIDE), which assesses siblings' perceptions of common and differential experience in the areas of parental treatment, sibling interaction, and peer group influences. This questionnaire and a personality questionnaire were administered to 105 adoptive sibling pairs and 65 biological sibling pairs between the ages of 12 and 28 years in the Denver area. In general, the siblings report that their experiences have been quite different. Three of the 11 SIDE scales suggest genetic influence in that differences are greater for adoptive sibling pairs than for biological siblings. Our results also indicate that the SIDE scales of differential experience are systematically related to sibling differences in personality. The study of biological as well as adoptive siblings allows us to determine the extent to which differential experiences of siblings reflect or affect sibling differences in personality.

CRAGH. DAVIS and M. N. NESBITT. Conditioned taste aversion sensitivities, ethanol preference and alcohol dehydrogenase (ADH 3) in A/J, C57BL/6J and Recombinant inbred strains of mice.

The degree of conditioned taste aversion was determined for dilute ethanol using apomorphine as a poison and for vanilla using ethanol as the poison. These aversions were compared to the unconditioned preference for 10% ethanol and the type of alcohol dehydrogenase (ADH 3) present. The two parental strains, A/J and C57BL/6J, as well as 17 recombinant inbred strains were examined. The strongest correlation observed was between the aversion to 2% ethanol induced by apomorphine and the unconditioned preference for 10% ethanol. However, none of the correlations were significant.

1. Department of Biology, San Diego State University, San Diego, CA 92182.
2. Department of Biology, University of California, San Diego, La Jolla, CA 92039.
3. Supported by PHS Grant GM29340.

HAROLD DOMEL, JOHN RINGO, and KAREN BARTON. A mathematical model of mating kinetics.

In mating experiments utilizing Drosophila, it is standard practice to employ the cumulative number of matings after some fixed interval as the basic datum. Recently, some workers have been reporting the curves showing the kinetics of cumulative matings, which seems to us valuable inasmuch as more information is conveyed. Taking this one step further, we have devised a simple model to describe the kinetics of mating in "no choice" experiments. Initially, we used the differential equation, dM/dT = K(A-M)(B-M), where M = cumulative percent of animals that have mated, A = initial percent males, B = initial percent females. The data from the later stages of mating experiments fit the integrated form of this equation quite well, but this was not true of data from the lag phase. We hypothesized that the initial lag phase was dominated by activity not leading to copulation, for example, random movement or searching. Therefore, we assumed that exp(-LT) animals were searching at time T. Thus, for the simplest case, where the initial numbers of males and females are equal, M = (1-exp(-LT))(AKT)/(1+AKT). We found that varying the relative number of males and females did not affect K appreciably. The model is useful in analyzing mating kinetics of genotypes differing markedly in their propensity of either sex to mate. In its present form, the model can be used only in "no choice" experiments, and with species in which the duration of copulation exceeds the duration of the experiment.

1. Department of Zoology, University of Maine, Orono, ME 04469.

Selection for brain weights is known to influence the rate of neural development and the animals' early interactions with its environment. The Fuller Brain Weight (BWS) lines, and the Binghamton Heterogeneous Stock (HET) from which they were derived, respond differentially to low-level lead exposure in studies of agonistic behavior and otore seizure susceptibility. Prior interest to the present investigation is whether this sensitivity to lead could be generalized and reflected in a learning paradigm. Prior reports have suggested that BWS mice also differ in details of learning processes. Male mice from high, mid, and low BWS lines and HET mice were administered lead from birth and throughout testing. At 18 days of age, mice were randomly assigned to: (1) contingent odor-shock pairing; (2) a non-contingent; or (3) no exposure group. Administration of lead significantly reduced body and brain weights in all genotypes, though the HET mice were the least suppressed in this measure. Odor preference scores based on extinction trials occurring 0, 24, and 48 hours following training indicate subtle differences in odor association as measured by the increased amount of time spent on the previously aversive odor. Complex lead effects were observed in this learning paradigm. That is, genotype interacted with lead exposure as reflected in the rate of extinction, supporting the hypothesis that BWS mice are differentially sensitive to environmental insult which may further be influenced by periods of neural development, lead administration, and behavioral testing.

1. Department of Psychology and Center for Neurobehavioral Sciences, State University of New York at Binghamton, Binghamton, NY 13901.

2. Supported in part by NSF (DAI791233).

P. DRISCOLL, B. ZIKOVIC, and J.R. MARTIN: Adrenal tyrosine hydroxylase (TH) activity in Roman high- (RHA/Verh) and Roman low- (RLA/Verh) avoidance rats.

Rla/Verh rats are considered to be more emotional than RHA/Verh rats on the basis of many physiological and behavioral parameters. The present experiments measured TH activity (method: Zikovic et al, Molec. Pharmacol. 10, 727, 1974) in the paired adrenals of both rat lines, as a) TH activity has been found to be higher for RHA rats than for RLA rats from another colony (Cayle et al, Psychopharmacologia 31, 25, 1973), and b) TH activity in non-stressed rats from a less emotional strain was significantly higher than that from a more emotional strain (McCarty et al, Life Sci. 25, 747, 1979). We confirmed both findings in three separate experiments with male rats. Averaged together, the (remarkably consistent) results were RHA/Verh: 73.8±3.3 mmol CO₂/h vs RLA/Verh: 62.3±2.6 mmol CO₂/h (Ns = 25, p < .05). One of the experiments conducted together with a study which investigated central nervous changes after shock stress and avoidance learning (Driscoll et al, Life Sci. 33, 1719, 1983), also showed that adrenal TH activity was markedly reduced in both situations, as well as in shuttle box-exploration controls, as compared to cage controls. This effect was seen in both lines of rats and was more pronounced in RLA/Verh rats than in RHA/Verh rats. These preliminary, and seemingly paradoxical, results must be considered in the light of the characteristic physiological responses to stress which occur in RHA/Verh and RLA/Verh rats and in other groups of rats which differ in emotionality (Stone and McCarty, Neurosci. Biobehav. Rev. 7, 29, 1983).

1. University of Lausanne, Institute of Anatomy, 1011 Lausanne, Switzerland.
2. Synthelabo, Pharmacological Biochemistry Division, 9220 Bagnex, France.
3. Institute of Behavioral Science, ETHZ, 8092 Zurich, Switzerland.

LINDON J. EAVES: A new model for the quantitative genetic analysis of behavioral development.

We present a new model which allows for the continuous and cumulative effects of genes and environment on development. A small number of parameters can capture the main aspects of developmental change and serve as a basis for discriminating between alternative hypotheses of behavioral development. Different constraints upon the parameters of the general model predict different continuous changes in heritability and family resemblance as a function of age. Simulated examples are given to illustrate the predictions of different developmental models for statistics commonly derived in genetic studies of family resemblance. The model may be employed with cross-sectional and longitudinal family data and maximum-likelihood methods may be used to estimate the parameters of the continuous model, including the age at which sets of genetic and environmental effects are first expressed. The method is applied to longitudinal and cross-sectional twin and family data relating to behavior and stature.

1. Department of Human Genetics, Medical College of Virginia, Richmond, VA 23298, USA.

2. Supported by NIH Grants GM-30250, HD-28922, and HD-15838. We thank our colleagues N. G. Martin, Linda A. Corey, and W. E. Nance for criticism and access to illustrative data.


Abnormal finger and palm prints have been associated with such phenomena as chromosomal defects, prenatal exposure to rubella, and several forms of mental retardation. Other behavior disorders for which dermatoglyphic aberrations have been tentatively identified include schizophrenia and infantile autism. The few studies which have analyzed the dermatoglyphics of infantile autism suggest that there are several characteristics of finger and palm prints which seem to be associated with this severe disorder of early childhood.

Finger and palm prints were taken of ten autistic children located through the Evansville Psychiatric Children's Center. Only clearly-defined cases of autism were included. A control group of non-autistic children was included in this study for comparison purposes. All prints were independently analyzed by the two authors. In accordance with earlier studies, an association was found between the dermatoglyphic abnormality of palmar ridge dissociation and infantile autism. Preliminary analyses also suggested a larger-than-anticipated proportion of complex patterns (i.e. whorls and loops) on the palm prints of certain autistic children. Photographs documenting these findings will be presented. Evidence for a genetic/teratogenic factor in infantile autism will be discussed.

1. Department of Psychology, Indiana State University Evansville, Evansville, Indiana 47712.
Significant differences among men and women in six different ethnic groups were obtained in analyses of self-reported consumption of beverage alcohol. In general, women reported drinking smaller amounts than men, and respondents of Hawaiian or European ancestry were heavier drinkers than members of other ethnic groups. In each group, the distributions of consumption scores were approximately log-normal suggesting that the underlying causal factors act in a multiplicative fashion. Large differences among groups were also obtained for the percentage of heavy drinkers which was defined as a daily intake in excess of 80 grams. Because variances among groups were homogeneous despite their very different average consumption levels, the relationship between mean consumption and prevalence of heavy drinking was approximately exponential but with less curvature than reported in other population surveys. These data reveal that subcultural influences which may be both biological and sociological have important influences upon individual differences in the consumption of beverage alcohol.

1. Institute for the Study of Human Development, The Pennsylvania State University, University Park, PA 16802.
3. Institute for Behavioral Genetics, University of Colorado, Boulder, Denver, CO 80309.

Frank R. George (1) and Richard A. Meisch (2). Oral narcotic intake as a reinforcer: Genotype x Environment interactions (3).

Studies indicate that C57 mice show a higher morphine preference than DBA mice, but this work has not incorporated the well documented effects of food deprivation on drug intake. In this study, 32 male mice from each of two strains, the C57BL/6J and DBA/2J, were evenly divided into four groups: Etonitazine (ETZ)/Food Satiated (FS), ETZ/Drug Deprived (PD), Water (W)/FS, W/PD. C57 mice consumed much higher quantities of ETZ per unit body weight than did DBA mice. Since food deprivation typically results in an increase in drug consumption, we examined this possibility in the ETZ accepting (C57) and non-accepting (DBA) strains. Food deprivation markedly enhanced ETZ intake per gram of body weight in C57 mice. In DBA's, most ETZ concentrations produced a decrease in liquid intake, and food deprivation enhanced this aversion. The initial ETZ aversion within DBA mice is not unusual since ETZ has a bitter taste, but it was thought food deprivation might overcome this effect and increase ETZ intake. Thus, it was hoped that food deprivation might be the appropriate environmental condition which would make ETZ come to serve as a reinforcer in DBA's. The results suggest, however, that food deprivation serves to enhance the effect of an interaction between a genetically defined organism and a reinforcer, whether that reinforcer is positive or punishing. Thus, genotype is important in determining whether or not a drug can come to serve as a reinforcer, regardless of the environment which accompanies introduction of the drug to the animal.

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David M. Gilliam and A. C. Collins. Indomethacin antagonism of ethanol-induced narcosis at high but not low ethanol concentrations.

The administration of anti-inflammatory drugs, such as aspirin or indomethacin, which are known to inhibit the formation of prostaglandins, antagonize several behavioral and physiological effects of acute ethanol administration. Ethanol-induced narcosis is one behavior antagonized by pretreatment with indomethacin. Recently, a concentration-dependent response curve has been described for ethanol-induced narcosis in mice. In order to investigate if indomethacin antagonized ethanol-induced narcosis, regardless of ethanol concentration, the following experiment was performed.

Separate groups of male DBA/2J and C57Bl/6J mice were injected with 0, 1.25, 2.5, 5.0, or 10.0 mg/kg indomethacin 15 minutes prior to an IP injection of 3.9 g/kg ethanol delivered in an injection concentration of 20% or 40% W/V. Ethanol-induced narcosis and blood ethanol concentrations were measured on all subjects. For both the C57 and DBA mice the 1.25 mg/kg dose of indomethacin antagonized sleep time at the 40% concentration. Waking blood ethanol concentrations were significantly increased over control levels suggesting a decreased sensitivity to ethanol's effects. However, indomethacin was totally ineffective at any dosage level in reducing sleep time at the 20% concentration. These results suggest that pretreatment with indomethacin may antagonize a nonspecific peripheral effect of high ethanol concentrations rather than having a direct effect on CNS sensitivity.

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David B. Gray and G. W. Carter. Behavior Genetic Research Supported by the Human Learning and Behavior Branch of the NICHD.

The program of the Human Learning and Behavior Branch (HLB) of the National Institute of Child Health and Human Development (NICHD) supports basic research and research training on behavioral development from the perinatal period through adulthood. The primary focus of the Branch is to determine how the interaction of biological, psychological, and socio-environmental factors result in normative behavioral development and to identify those factors which interfere with such development. The current level of support for such programs is approximately $14.9 million. Regular research grants (116), program projects (8) and training grants (18) are funded by the HLB Branch. A variety of behavior genetics research studies are included in this total: aggression in mice, color preference in quail, mate selection in fish, normal development in children, and the development of language in children.

The record of research grant applications in the field of behavior genetics made to the NICHD during the past ten years is reviewed. The rates of approval and disapproval, priority score distributions, mechanisms of funding, and study section assignment are discussed. The five year plan for the HLB Branch is highlighted. Finally, the role of the program staff in assisting applicants is described.

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Norwegian twins born 1915–1960 have reported the years of education completed by themselves and by their parents. The decline in parent-offspring resemblance is especially marked when twins born immediately before and after 1940 are compared. MZ twin correlations remain virtually constant, but there is a marked drop in the male DZ twin correlation. Liberalization of the educational system in Norway in the 1940s has reduced the importance of environmental transmission of educational advantage but rendered innate ability more important, especially in males. Model-fitting analyses, which correct for biased reporting of their parents’ education by the twins, are consistent with this interpretation. An environmental transmission model gives an excellent fit for twins born 1915–1939, though allowing also for additive gene action gives a better fit. Non-genetic models are rejected, and substantial estimates of additive gene action and (especially in males) dominance are obtained for twins born after 1940. An important effect of the family environment on educational attainment is still found for females born after 1940, suggesting that attempts to provide equal educational opportunities have been less successful for females than males.

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Resemblance among young male twins’ cardiac reactivity during psychological stress, as assessed by a video game, could not be accounted for by environmental factors. In addition, reactions were significantly greater for subjects whose parents both had relatively high blood pressure. These data suggest that cardiac reactivity during stress is a heritable component of a behavioral predisposition to developing hypertension. The implications of this and additional psychometric data for the etiology of hypertension will be discussed.

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2. This work was supported by grant G8207495W and a studentship (JRT) from the British Medical Research Council.


The potential importance of habitat selection within natural populations is being increasingly considered, however most studies primarily consider gene (in particular electrophoretic) and chromosome polymorphisms. Interpretations tend to be controversial, since it is difficult to relate genotypic assessments to field. The direct study of ecobehavioural traits important in determining distribution and abundance is an alternative but more rarely considered approach.

Accordingly, we studied attraction of flies at the phenotypic level in a wind tunnel to resources (apples, peaches, plums) found in nature. After two generations of laboratory culture, a consistent trend was found whereby flies were attracted to the odours of fruit types from which they originated, indicating genetic differences in the attraction of D. melanogaster to resources.

This demonstrates the usefulness of a phenotypic approach to habitat selection. It emphasizes the role of quantitative genetics in habitat selection studies compared with the genotypic approach based upon population genetics.

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R. Jardine and N. G. Martin. Differences in genetic architecture of personality traits.

3,810 pairs of MZ and DZ twins aged 18-88 years completed the Eysenck Personality Questionnaire and a scale of Anxiety and Depression. No E2 effects for any of the personality scales were detected. 50% of total variation in Extraversion is heritable and this was previously thought to be entirely due to additive genetic effects. We find that it is largely due to dominant gene effects and this may suggest a history of strong stabilizing selection acting on this trait. The trait Neuroticism has a heritability of approximately 50% and the two symptom states, Anxiety and Depression, have lower heritabilities of about 0.35. The three variables are intercorrelated about 0.7 but we show that this is due to genetic intercorrelations of about 0.8 more than to environmental factors which intercorrelate about 0.4. There is genetic variation specific to Neuroticism which is not expressed as either of the symptoms Anxiety or Depression. We find sex differences in the heritability of Psychoticism and the Lie (social desirability) scale; for P about 36% of variation in females is genetic and about 50% in males, but these proportions are reversed for L. The repeatable portion of variation is the same (about 20%) for both traits in both sexes which suggests that "true" E1 effects have different importance depending upon the trait and the sex.

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We report the correlations of family background, own cognitive abilities, and own personality factor scores with the educational and occupational attainments of 348 HPSC offspring aged 25 years or older. Data are reported for the sample as a whole and for males and females of Caucasian and Japanese ancestries separately. Family background generally had a substantial association, and personality factor scores (for some groups) a considerable association with achievement. Educational attainment (except for Japanese females) was substantially associated with occupational attainment.

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MICHELE C. LABUDA and J. C. DEFRIES. Longitudinal stability of reading performance and symbol-processing speed in the Colorado Family Reading Study.

Fifty-one matched pairs of reading-disabled and control children who participated in the Colorado Family Reading Study were administered a retest approximately 5 years later. In order to test the hypothesis that the accuracy of predicting later performance can be improved by incorporating parental data into a prediction equation, composite measures of reading performance and symbol-processing speed of reading-disabled and control children were subjected to hierarchical multiple regression analysis. The regression model expressed the child's expected score at retest as a function of initial test score, sex (coded 0 or 1), group (reading disabled versus control), mother's score, father's score, and all possible two-way interactions. Main effects due to initial test score, child's sex, and group are significant (P < 0.05) for both reading performance [F(1,96) = 150.18, 5.04, and 4.09, respectively] and symbol-processing speed [F(1,96) = 45.45, 10.78, and 8.88, respectively]. As hypothesized, there is a significant increase in the multiple R2 when parental data are added to the regression equation for reading performance [mother's score, F(1,96) = 7.72; father's score, F(1,96) = 6.94], but not for symbol-processing speed. The two-way interaction between group and initial test score also is significant for the reading measure only [F(1,96) = 7.27] and is due to the lower longitudinal stability (correlation between initial and follow-up test scores) of reading performance by reading-disabled children.

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JEAN MICHEL LASALLE and G. LE PAPE. Influence of pre and post-natal maternal effects on learning performance in C57BL/6 adult mice.

The objective of this study was to investigate the lines of the contribution of the maternal environment to the achievement of the behavioral phenotype in adult mice. In order to assess the respective influences of pre and post-natal maternal effects and to test for the absence of adoption effect per se, a crossfostering plus embryo transfer design was performed.

- C57BL/6 mice were either infostered, unfostered to a C57BL/6 dam, or crossfostered to a F1 hybrid dam (from a BALB/C x C57BL/6 cross).
- C57BL/6 embryos were transferred to the uterus of F1 hybrid females, then reared by them from parturition until weaning.

When adult, (90 to 110 days of age), mice were submitted to four trials in a water-escape learning task. Results confirm the absence of adoption effect per se. They also reveal the existence of two distinct maternal effects. A pre-natal one which is responsible for an improvement in learning performance and a post-natal maternal effect which only affects the behavior of mice during the first trial in a novel experimental environment. Pre and post-natal maternal environments produce long lasting effects largely sensitive in adult mice. Pre-natal maternal effects are quite important as far as they are able to entirely compensate for genotypic differences between F1 hybrids and C57BL/6 mice.

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GILLES LE PAPE and J. M. LASALLE. Embryo transfer, cross fostering and maternal effects in weaning mice.

When post-natal maternal effects are easily approached by the adoption method, there are many more difficulties in isolating intra-uterine maternal effects. Stress, radiations or pharmacological treatments of the mother either before mating or during pregnancy are the most frequently used methods. On the contrary, the method of embryo transfer associated with the method of adoption allows to evaluate the norm of reaction of a genotype submitted to various maternal environments ascribable to a normal range of variation. In order to differentiate between uterine and post-natal maternal effects, we performed a comparison between infibred C57BL/6 mice. Mice were either infostered, unfostered to a female of their own strain, crossfostered to a F1 hybrid female, or transferred at an early developmental stage (blastocyst) into the uterus of such a hybrid female and then nursed by it until weaning. At 21 days of age, mice were weaned, examined for body weight, then isolated in a semi-natural device where they found a nest box, food and water ad lib.. Locomotor activity was recorded hourly during 48 hours. Young mice are heavier when reared by a hybrid dam than when reared by a dam of their own strain. When the embryos develop in the uterus of a hybrid female, weaning mice are also heavier than those only reared by a hybrid female. The amount of locomotor activity is affected in the same way by maternal care and intra-uterine environment. It is quite noticeable that intra-uterine and post-natal effects act in the same way, in additive fashion and with similar intensities.

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CHRISTINE H. LITTLEFIELD. When a child dies: Differential within family grief intensity.

According to sociobiological theorizing, genetic replication is the primary motivation of behavior. If this is so, then the death of a child is the ultimate loss. The grief intensity of bereaved parents and their immediate families was estimated from ratings made by 263 bereaved parents. Predictions were derived from the following tenets of sociobiological theory: relative to males, females (a) are reproductively more limited, (b) invest more energy in each offspring, and (c) are more certain of their parenthood. Consequently, it was found that (1) mothers grieved more than fathers, (2) mothers' siblings grieved more than fathers' siblings, (3) maternal grandmothers grieved more than either maternal grandfathers or paternal grandmothers, who in turn grieved more than paternal grandfathers, and (4) male children were grieved for more than female children. In addition, healthy children were grieved more than chronically ill or disabled children, a finding also predicted from the theory of parental investment.

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M3J 1P3.

CAROL B. LYNCH. Clineal variation in thermoregulatory traits in Mus domesticus.

Traits contributing to thermoregulation, including aspects of morphology, behavior, and physiology, were measured on mice from 5 geographic populations (ME, CT, VA, GA, FL) representing a north-south cline along the east coast of the U.S. Results of extensive prior studies of laboratory mice led to the prediction that morphology and behavior would be most easily modified by selection acting through differences in ambient temperature, while physiological traits, the least heritable, would be least likely to change. All measurements were made on 1st generation lab-reared mice. Preliminary results agree with predictions and indicate that body weight and nesting have been adaptively modified (heavier bodies and nests in more northern populations), although one population (CT) was lower than expected on both traits. Parallel studies of restriction digests of mitochondrial DNA from these populations will be used to determine the pattern of genetic relationship among the 5 populations.

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JILL P. LYNES and DOUGLAS WAHLSTEN. Early postnatal behavior and morphology of Shaker short-tail mutant mice.

The shaker short-tail (sst) gene is an autosomal recessive mutation discovered at the University of Waterloo in 1980 (see J. Heredity, 1983, 74: 421-425) which produces severe defects of motor coordination and cerebellum in homozygous mice. Affected animals can be recognized at birth by either a short or blunted tail, one or more blood blebs at the dorsal surface of the skull, or both. The present study was conducted in order to characterize the disorder and measure its phenotypic variability.

Twenty-four mutant and 75 normal hybrid mice were produced by mating confirmed carriers of the mutation. At birth each pup was weighed, and at 6, 8 and 10 days each mouse also received a battery of reflex tests. After testing at day 10, all mutants and littermate controls were perfused with formalin and their body weights, tail lengths, brain weights and volumes of cerebellum were measured.

It was found that the reflex scores of mutant mice were significantly lower than normal at all three ages tested. The body weights of mutant mice were lower than normal at birth, and body weight, tail length, brain weight and volume of cerebellum were significantly lower than normal at day 10. The righting reflex, tail length and volume of cerebellum completely dichotomized the two groups at day 10; no mutant scored within the normal range on any of these measures. Moreover, tail length and volume of cerebellum were significantly more variable among mutant mice than among normal littermates. This result indicates variable expressivity of the mutation.

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FREDERICK A. MARSTELLER and CAROL B. LYNCH. Reproductive energetics and the evolution of mammalian photoperiodism.

Most seasonally-breeding temperate-zone mammals utilize photoperiodic cues to regulate seasonal changes in breeding condition. Recent evidence indicates that the frequency of individuals reproductively sensitive to photoperiod varies clinaly in several species, and that within one species responds rapidly to artificial selection. Our studies provide an energetic approach to associating individual physiology with environmental variation in temperature and food availability, and hence, the selective forces acting upon photoperiodism.

When both temperature and food availability are varied, the reproductive performance of house mice declines increasingly with food restriction as temperature is reduced. In our laboratory studies, this statistical interaction is due to the energetic costs of basal metabolism and thermoregulation. In the wild, locomotory and thermoregulatory costs of increased foraging when food is scarce would serve to magnify the synergistic depression of reproduction by declining temperature and food availability. This energetic approach has the potential of leading to the evaluation of the environmental conditions under which reproduction is thermodynamically possible, the covariance of photoperiod with the potential for successful reproduction, and finally, to the measurement of the natural selection acting upon photoperiodism.

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N. G. MARTIN and R. JARDINE. Genetic factors are more important than family environment in variation in Conservatism.

A genetic analysis of Conservatism scores in 3,808 pairs of twins is reported. The test-retest reliability of Conservatism in 96 individuals who completed the C-Scale twice at an average interval of 3 months was 0.86 in females and 0.92 in males. In both sexes, individual differences in Conservatism could be explained by the additive action of genes, individual environmental experiences, and between-families cultural differences, although the effect of environmental differences was greater in males than in females. After allowing for the effects of assortative mating, heritabilities were 38% in males and 48% in females but cultural influences accounted for only 21% and 14% of the total variation in males and females respectively. The fact that total variances, after correction for regression on age, were the same in MZ and DZ twins argues against differential treatment as an explanation for the large genetic components estimated.

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J. Jack McArdle (1,3) and N. Hill Goldsmith (2). Structural Equation Modeling Applied to the Twin Design: Comparative Multivariate Models of the WAIS.

Prior work by McArdle, Connell & Goldsmith (1980) and McArdle, Goldsmith & Horn (1981) have shown how the Reticular Action Model (RAM; see McArdle & McDonald, 1983; Horn & McArdle) may be simply and directly used with the popular LISREL algorithms (Joreskog & Sorbom, 1979) to provide a broad class of models for the traditional biometric twin design. In this paper we take a more detailed look at alternative multivariate models for this design, including: (a) the traditional multivariate approach (e.g., Loehlin & Vandenberg, 1968; Crawford & Defries, 1978), (b) the genetic covariance structure approach (e.g., Martin & Eaves, 1977; Fulker, 1978), and (c) the latent variable path model approach (e.g., McArdle, et al, 1980, 1981; Jaspers & de Leeuw, 1980). Using WAIS data on MZ and DZ twins from Vandenberg (1969), we detail: (1) fundamental differences in model specification, (2) alternative algorithms for least squares and maximum likelihood estimation, (3) formal procedures for metric and statistical comparison, and (4) the decomposition of alternative structure. These comparisons show how RAM may simply and flexibly provide a foundation for both traditional and novel modeling features. But, in a more general sense, we show that each alternative multivariate methodology has useful features, and we suggest how mixtures of each approach may be appropriate in actual applications.

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3. This research is supported by NIA Grant ROI-A00-04704. We thank Steven G. Vandenberg and David R. Saunders for making these data available to us.

DUANE G. McCLEARN and HERBERT P. ALPERT. "Popcorn stage" differences in selectively bred short-sleep and long-sleep mice.

"Popcorn" ("jumpy" or "hoppy") behavior is a potentially important index of brain maturation. Mice of the short-sleep (SS) and long-sleep (LS) lines were tested for the degree to which they demonstrated this behavior, a trait typically observable for a brief period (several days) in pre-weanling rodents. It was hypothesized that SS mice, insofar as they are hyperactive in other situations, would display heightened "popcorn" activity when compared to LS mice. Starting at 15 days of age, animals were individually taken from their home cage and placed in a small metal open-field apparatus. After a 5-second period, air blasts were delivered from a syringe at the rate of 1/second for 2 minutes or until the subject left the open field, whichever came first. All air blasts were directed at the subject's body. For each line, four mice were taken from each of eight litters and tested in this manner daily until they reached 25 days of age. Latency to exit the apparatus was the measure of "popcorn" behavior, with low values (short latencies) representing high "popcorn" activity. To decrease problems associated with the litter effect, means of each set of four litter mates were used for statistical analysis. t-Tests between the two lines were performed for days 15, 20, and 25. Significant differences existed for day 15 (t = 3.253, df = 14, p < 0.005 for a one-tailed test) and for day 20 (t = 1.867, df = 14, p < 0.05 for a one-tailed test), but not for day 25. Thus, SS mice show more "popcorn" behavior in the early part of the testing period, but the two lines are indistinguishable in this regard by the age of weaning (25 days). The pertinence of these results lies in the fact that SS mice are shown to exhibit delayed maturation for this behavior.

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CHRISTINE MICHARD. Strain x early androgen exposure interaction on aggressive behavior in female mice.

Intraspecific aggression in mice is one of the behavior forms for which sexual dimorphism is highly apparent. Early exposure of female mice to androgen reduces this dimorphism in different proportions according to genotype. Notably, females of inbred strains BALB/cBY and C57BL/6BY which were injected with propionate of testosterone (1 mg TP in .02 ml oil) at the age of 72 ± 8 hour manifest aggressive behavior towards a standard male at adulthood (respectively 90% and 46% of the total population). A genetic analysis of this difference of sensitivity to testosterone was conducted through the use of recombinant inbred strains of BALB/cBY and C57BL/6BY. The results suggest that this sensitivity may be attributed to a polygenic correlate since new phenotypes different from both the BALB/cBY and the C57BL/6BY appear. Our results differ from those obtained by Vale et al. (1972) with regard to their proportion of aggressive females C57BL/6BY (20%). The fact that in the present experiment the female mice were injected approximately 18 hours later than in Vale et al. may justify the hypothesis of different sensitivity periods for these two strains.

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2. Supported by grants from the CNRS (ERA 79), the EPHE (Laboratoire de Psychologie Différentielle), the CRM, the Université de Paris V.
MICHAEL C. NEALE: Temperament in young twins: Models of phenotypic interaction, genetic and environmental effects.

A study of temperament involving 132 MZ pairs and 170 DZ pairs of twins aged between 3 and 7 years old was conducted at the Institute of Psychiatry. The mothers of the twins completed the Behavioral Style Questionnaire from which 9 factors and 2 scales (linear combinations of factors) were extracted for analysis. Path models involving combinations of parameters representing additive genetic, phenotypic interaction, common and specific environmental effects were fitted to variance-covariance matrices. Results suggest the presence of sex differences and competitive phenotypic interaction effects for a number of variables. Heritability estimates vary across models, sexes, and variables but generally approximate to 50% of phenotypic variance. While a model involving phenotypic interaction provides a plausible explanation of differences in total variance associated with zygosity, a good fit of the model by no means excludes other explanations. Attention is drawn to other causal mechanisms that may be operating in young twin populations.


PATRICIA L. PECK1 and K. SCHLESINGER1 Idiosyncratic behavior in response to d-amphetamine in mice selectively bred to differ in open-field activity.

Locomotor and stereotypic behaviors were studied in mice bred to differ in open-field activity (Behav. Genet. 8:3, 1978). Equal numbers of male and female mice, 56±3 days of age, were used. Two measures of open-field behavior were obtained, a 3-min and a 10-min measure of activity. Rearing, defecation, licking and grooming (stereotypy) were also measured. Mice received 0, 1, 5, or 10 mg/kg of d-amphetamine (AMP), 15 min prior to testing.

In animals bred for high activity, H1 & H2, AMP did not increase locomotion. At high doses stereotypes increased and locomotion decreased significantly. In mice bred for low activity, L1 & L2, AMP increased activity at high doses, while also increasing stereotypy. In unselected controls, C1 & C2, AMP did not increase locomotion; high doses increased stereotypy. With increasing AMP, rearings were decreased in H1 & H2 mice, and increased in L1 & L2 animals. In C1 mice, rearings decreased with increasing doses of AMP; in C2 mice AMP did not change this behavior. Defecation decreased in all lines with increasing doses of the drug.

These experiments demonstrate that the effects of AMP on nearly all measures of locomotor behavior vary as a function of the genotype of the animals being tested.

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TANARA J. PHILLIPS and BRUCE C. DUDER. Genetic analyses of the biphasic nature of the ethanol dose response curve.

Genotype-dependent activating effects of low ethanol (ETH) doses, as well as depressant effects at higher doses, have been reported in mice. A variety of lines of evidence suggest these activating effects as a model for the reward properties of ETH. Locomotor responses of Long-Sleep (LS) and Short-Sleep (SS) mice to a range of ETH doses have previously been assessed and these findings were replicated in the current study for a dose range up to 2.75g/kg. The ETH-sensitive LS mice were depressed at most doses and the ETH-insensitive SS mice were activated at all doses.

We also examined the biphasic dose response function in a diallel cross of Au/Sabg (Au), C57BL/6abg (B6), DBA/2abg (D2) and Mus musculus molossinus (MOLD), and in two additional strains, the BALB/Cabg (C) and BALB/CbYabg (CBY), their reciprocal hybrids and the C by B6 crosses. A 15-minute locomotor activity test assessed doses of ETH up to 2.75g/kg. Wide differences were found among the inbreds with the B6 at one extreme exhibiting only depression and the MOLD at the other extreme showing large activation at all doses except 2.5 & 2.75g/kg. The F1 hybrids displayed primarily intermediate inheritance although some ambidirectional dominance was present. Females were more activated in most genotypes, but there was no evidence of maternal effects or sex linkage. A comparison of the 4 inbred strains used in the diallel cross with a segregating 4-way cross of these strains suggests a primarily additive architecture. Interestingly, C mice were more activated than were the closely related CBY mice suggesting that these strains may be an appropriate place to look for a major gene effect.


CHAIM G. PICK and JOSEPH YANA. Genetic differences in hippocampal behavior in mice.

The outbred strains B6/1bg (BS) and SAHRA/0uc (S), and the inbred C57BL(C) CBA/Lac (A) and BALB/c (B) were used to investigate strain differences in "hippocampal" behaviors. Hippocampal tests included spontaneous alternation (SA) and eight-arm maze performance (EAM). Intact male mice were tested for SA on age 41-42 days, and for EAM on age 50 to 54 days under conditions of water deprivation that commenced on day 45. In SA test, HS score - which was the highest - received the index 1.00. The comparative scores of the rest of the strains were, S .99, C .96, A .79 and B .73. In EAM test HS had the highest (1.00) score for the number of trials needed to enter all arms. The rest of the strains had the scores of, A .87, C .76, S .72 and B .59. Thus the correlation across strains between SA and EAM was only r = .335. Further evaluation, using more elaborate statistical analysis is now being conducted in order to elucidate the interrelationship between these two supposedly hippocampal behaviors. Although the number of strains used were small, one may tentatively suggest that outbred strains were not necessarily superior to inbred strains in performance in hippocampal behaviors (EAM). The present data may be used for evaluation of the relationship between different hippocampal behaviors, and in concert with data published in literature and future studies for the evaluation of the relationship between hippocampal behaviors and hippocampal morphology and biochemistry.

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TREVA RICE. Infant precursors of adult cognitive abilities.

Data from the Colorado Adoption Project suggest that individual differences in total Bayley Mental Developmental Index (MDI) scores in infancy are related to adult cognitive abilities. The present report explores this issue of infant precursors of adult cognitive abilities at the level of the Bayley items rather than the total MDI score. The Bayley test was administered to 182 adopted and 165 nonadopted (control) infants at both 12 and 24 months of age; the biological, adoptive, and control parents of these infants completed tests which assess general and specific cognitive abilities. Bayley items that yielded significant correlations between the control infants and the average cognitive ability scores of their parents were selected. Replications of these correlations in biological parent/adopted infant or in adoptive parent/adopted infant comparisons suggest, respectively, genetic and environmental links between aspects of infant mental functioning and adult cognitive abilities. At both 12 and 24 months, the results suggest that some Bayley items are related genetically to adult general cognitive ability but not to adult specific cognitive abilities. Language items at 24 months yield significant adoptive parent/adopted child correlations and may in fact be specific to parents' verbal ability, suggesting the importance of family environment for the development of language. We interpret these infant precursors of adult cognitive abilities as different facets of infant functioning with different etiologies that happen to be related to adult g.

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2. Supported in part by NICHD Grant HD-10333.

JEFFRY RICKER and JERRY HIRSCH. Divergent selection for geotaxis spanning 550 generations and genetic analysis in Drosophila melanogaster.

Geotaxis, the orientation and movement of individuals with respect to gravity, is measured in Drosophila melanogaster with the mass-classification maze. Intermittent though frequent selection over 550 generations (26 years) has produced two extreme lines which, contrary to all experience prior to 1978, now remain stable upon relaxed selection, but which still respond to reverse selection. Genetic analyses have been performed which involve hybrid crosses between lines and the fixing of individual chromosomes from the selected lines on an unselected isogenic background to assess their effects.

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In weights processes. Using psychology, but curtailed tions and catch-up growth to as H. L. ROSS and T. T. Poch. The genetics of catch-up growth: A preliminary report.

Concepts about the control and regulation of individual development such as canalization or homeorhesis are enjoying new popularity in developmental psychology, but little is known empirically about such dynamic control processes. Catch-up growth, the return to a normal or nearly normal developmental trajectory following severe growth restriction early in life, promises to be an interesting model for studying the genetic basis of developmental processes. Using a within-litter control design, we are currently studying catch-up growth in DBA/2 and C57BL/6 mice, their hybrid F1 and F2 generations and backcrosses. After weaning at 20 days of age, restricted mice are allowed only two days of ad libitum feeding before caloric intake is sharply curtailed to maintain weights within 1.0 and 2.0 grams of their weaning weights for a period of 19 days. Early results reveal substantial heterosis in that hybrids manifest dramatically accelerated growth during the first few days of recovery and reach control levels within 15 days. Inbred mice recover and eventually reach control weights but do not exhibit markedly accelerated rates of growth during the recovery period. Data from backcross generations should be available soon and will permit a complete biometrical analysis of the growth curves and of the catch-up phenomenon.

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PIERRE ROUBERTOUX. Courtship behavior in male guppies Poecilia reticulata peters (Pisces poecilida): Genetic and environmental correlates.

Two sets of variables describing courtship behavior in male guppies were defined. The first set deals with gonopodial swinging; the second with sigmoid display. The genetic analysis of the components of variation demonstrates an additive genetic component for sigmoid display variables. A selection experiment with replicated lines confirms this result: Occurrence of sigmoid display responds to bidirectional artificial selections. On the contrary, gonopodial swinging variables do not have an additive genetic component and as expected, do not respond to selection. The two different analyses of phenotypic correlations demonstrate: 1) the set of variables describing gonopodial swinging has no common genetic additive variance; 2) the set of variables describing sigmoid display has a common additive genetic variance; 3) the two sets of variables are genetically independent. Although they have genetic correlates, sigmoid display variables also have environmental correlates. Isolation decreases the frequency of courtship behavior and particularly of sigmoid displays. Gonopodial swinging is also correlated with the same environmental variables.

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2. Supported by a grant from the CNRS (ERA 79), the EPHE (Laboratoire de Psychologie Différentielle), the CNAM, and the Université de Paris V.

PIERRE ROUBERTOUX, N. CARLIER. Differences between NZB and CBA/H on intermale aggression: maternal effect and/or Y chromosome effect?

NZB (N) males display a higher frequency of attacking behavior than CBA/H-T6 (H) male mice in a dyadic test where the standard opponent is a N/N male. The reciprocal F1 differs (HFN attacks more than NFN). The results of cross-fostering experiment led us to reject the hypothesis of a post-natal maternal effect. The two remaining hypotheses: prenatal maternal effect and Y chromosome effect were tested by classical mendelian crosses performed on normal females, and on F1 female mice having received N and H ovary transplants.

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2. Supported by grants from the CNRS (ERA 79), the EPHE (Laboratoire de Psychologie Différentielle), the CNAM, the Université de Paris V, and the Université de Paris X.
J. PHILIPPE RUSHTON 1 Do "r" and "K" apply to individual differences in humans?

An hypothetical continuum exists between two extreme reproductive strategies. At one end is the "r" strategy where many eggs are produced but little investment of energy is made in any one. Oysters, producing 500 million eggs a year, exemplify this extreme. At the other end is the "K" strategy, where few eggs are produced but a large investment of energy is made in each. The great apes, producing only one infant every 5 or 6 years, exemplify this extreme. The r/K continuum organizes disparate data on several correlated characteristics pertaining to between-species differences, including: number of offspring produced, degree of parental care, rate of development, reproductive precocity, life-span, and body size. It is proposed that the r/K continuum also applies to within-species differences. Among humans, individual differences on a variety of personality traits which have been shown to be heritable (e.g. activity-level, aggression, altruism, extraversion, intelligence, and strength of sex drive) may relate to individual differences in r and K.


THOMAS F. SAWTER 1, ANNE HENGEROLD 1, WILLIAM PEREZ 1, and JU lie SCHLAUD 1. Genotypic and memory effects on social investigation in male inbred mice.

C57Bl/6J, CBA/J, and DBA/2J adult male mice were tested for their social investigatory behavior directed toward juvenile BALB/cByJ males. Ten minutes before each behavioral test a five minute exposure to one of the following conditions occurred, with subjects repeated across all of the conditions in a counterbalanced fashion: (1) exposure to the same BALB juvenile the subject was to be tested with, (2) exposure to a BALB different from the one the subject was to be tested with, (3) exposure to an A/J juvenile, or (4) exposure to a control cognition in which the field was unoccupied. The results indicated a significant effect of the pretest condition, F(3,99) = 28.48, p < .001. Further analyses revealed that after exposure to condition one subjects engaged in substantially less investigation of the juvenile than following the other conditions, while neither condition two nor three differed from the control. While this pattern was consistent for all three strains, there was an effect of genotype, F(2,33) = 29.81, p < .001, as DBA males showed much higher levels of investigation than CBA or C57Bl males for all conditions. The finding of reduced persistance of investigation only when the subjects were tested with the same juvenile to which they were previously exposed, suggests the presence of a memory for the particular individual. Factors which may be mediating this social memory, such as olfactory cues, will be discussed, as will the social and evolutionary implications of the results.

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DAVID G. SCOTT and R. C. RICHMOND 1 The effect of Esterase 6 on the early remating of Drosophila melanogaster females.

Recent experiments have indicated that Esterase 6 (EST 6) may reduce the attractiveness of mated D. melanogaster females at about 6 h post-mating. However, this effect does not always occur. In subsequent experiments, using EST 6 strains that were more completely isogenic than those used in the first experiments, we mated females to EST 6 and EST 6 males and tested the ability of the females to elicit courtship at 2, 4, 6, 8 and 10 h post-mating. These experiments were repeated using females of two different genotypes. No EST 6 effect was found for mated females of either of the two genotypes. During the experiments, one of the female types remated within the 10 minute courtship trials at a frequency of about 10%. By mating these females to males of different EST 6 genotypes, we were able to resolve a significant EST 6 effect on the frequency of remating at 6 h post-mating. By 18 h after mating, only a residual EST 6 effect remained. The effect did not appear at 6 h for females mated to sterile males, indicating an interaction between sperm and EST 6.

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2. This research was supported by an NIH Genetics Training Grant DGS and NIH and NSF research grants to RCR.

J. P. SCOTT. Evolution of social and behavioral systems.

Any comprehensive theory of the evolution of social behavior and organization must be consistent with 2 interlocking theories: genetic theory of evolution and systems theory. I have discussed the consequences of the former elsewhere: the principal consequences of systems theory relate to feedback and the inter-relatedness of phenomena at all levels of organization. In a species with a high degree of social organization, processes producing differential survival (selection) proceed from 3 general sources: its own social system, biotic systems including an overall ecosystem, and physical systems. The principal evolutionary function of a social system is to protect its constituent entities (individuals bearing genotypes) from the later two (often by modifying them), but also to protect its own existence through modification of social behavior. Thus there are reciprocal relationships among evolutionary processes on all levels. The principal consequences for Behavior Genetics are enhancing intra-species variation and providing a framework for analyzing the genetics of social behavior.
Ray H. Smith 1 A multiple-measure analysis of the behavioral effects of drift in a population of wild Mus musculus.

Three “randomly bred” 2 non-selected populations of wild mice originating from a single founding population were given a battery of nineteen measures to test for differences among the populations due to drift. Two major populations, separated for fifteen generations, were maintained in the laboratory at an effective breeding level of twenty-four pairs. One of these was further divided for the last ten generations into two sublines, each with an effective breeding level of twelve pairs. Thus the effects of differing population size were compared with effects of different times of separation. Twelve of the measures showed differences between at least two of the populations. The two smaller populations separated for ten generations showed as many differences as did the larger populations separated for fifteen generations.

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2. Full sib matings were specifically excluded.


Genetic influences on cognitive abilities, particularly spatial ability, have been the focus of numerous studies in recent years. We measured a large pedigree of 78 individuals on several psychometric variables and a battery of genetic markers, including PTC tasting ability. Using a single measure of spatial ability, the Gestalt completion task, we examined the pedigree for an association of the spatial task with PTC tasting ability. In contrast to a recent study which reported a significant association of PTC tasting ability and two spatial tasks, we found no association of PTC tasting ability and spatial ability as measured by the Gestalt completion task. We next examined genetic influences on spatial ability as measured by the Gestalt completion task. Several lines of investigation have indicated that genetic variation in spatial ability is due, in part, to a major gene effect. Findings are equivocal as to whether the major gene lies on the X chromosome or an autosomal chromosome. We examined the mode of inheritance of the Gestalt completion task in the pedigree using a pedigree analysis program, GEMPED. Following the pedigree analysis, we attempted to identify the chromosome location of the “spatial gene” using a linkage analysis program, LIPED, and 30 genetic markers in the pedigree. Results from these analyses will be discussed.

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MARLA B. SOKOLOWSKI 1, SHARON J. BAUER 2, and VIRGINIA WAI-PING 1. Microhabitat variation in natural pupation sites of Drosophila melanogaster.

Drosophila melanogaster pupae were collected from the following four microhabitats in a pear orchard: 1) on the upper surface of the fruit, on the skin, 2) on the lower surface of the fruit, on the skin, 3) under the fruit, on the ground, and 4) under the fruit, in the ground. In order to determine the relationship between natural pupation sites and laboratory measures of prepupal behavior, “pupation height” (the distance a larva pupated from the surface of the medium) and larval foraging path length were measured on the progeny derived from each of these collections. A simple relationship between the behavior of pupae found in these four microhabitats and laboratory measures of larval and prepupal behavior was evident. Both pupal height and path length significantly increased from microhabitats one to four. The selective advantage of microhabitat variation for pupation sites will be discussed in the light of pupal parasitoids.

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RICHARD E. STAFFORD 1 and WILLIAM F. BROWN 2. Evidence for a hereditary component in an observational task obtained from a twin study.

Spatial visualization has been found to have a gender difference with males averaging higher than females, and while perceptual speed also appears to have a gender difference, here females have been found to average higher than males. Both of these aptitudes have been shown to have hereditary components. What about the ability to observe material presented on a screen? Thirty-one male twin pairs (15 DZ, 16 MZ), and thirty-six female twin pairs (15 DZ, 19 MZ) were tested with detailed material flashed on a screen for 15 seconds. Each slide consisted of two halves of identical combinations of letters with one exception, one letter on one side was missing, the job being to spot the missing letter.

Females averaged significantly higher than males in their ability to identify the missing letter within the given time limit. An F test of the DZ/MZ ratio of the within pair variances was also significant, indicating there is evidence that this ability has a hereditary component. Comparisons with the aptitudes for spatial visualization and perceptual speed are discussed along with some implications for education.

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Previous publications emanating from the Colorado Adoption Project have reported significant resemblance between parental IQ and Bayley MDX scores of their infant offspring. The present study compared rotated factor scores based on MDX items—Means-End, imitation and Verbal Skill factors at 12 months, and Lexical, Spatial, Verbal and Imitation factors at 24 months—for 182 adopted infants and 164 nonadopted infants to their biological, adoptive and nonadoptive parents' IQ and specific cognitive abilities. Only minimal resemblance was observed between 12-month infant scores and parental cognitive abilities. At 24 months, the Spatial and Lexical scores of the infants were related to parents' IQ, but not to their specific cognitive abilities. Significant correlations between infants' Spatial scores at 24 months and parental IQ were observed for both the nonadoptive parents and the biological parents, which suggests that individual differences in spatial ability at 24 months of age are genetically related to individual differences in adult IQ.

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2. Supported by NICHD Grant HD-10333, NSF Grant BNS-8200310, and NIMH Training Grant MH-16880.

STEVEN G. VANDENBERG
Marker-X, a new cause of mental retardation: A review.

A non-staining region near the end of the long arm of chromosome X is associated with moderate to severe mental retardation in males, as well as enlarged testes (macro-orchidism) in many of these males. In heterozygous females, selective inactivation of the normal X, leaving the abnormal X active, can produce moderate retardation. For that reason it is unclear whether the pattern of inheritance should be called recessive or dominant, or perhaps partial-dominant.

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MARK VARGO and JERRY HIRSCH
Genetic analyses of lines selected for central excitation in Drosophila melanogaster.

Central excitatory state (CES), the increased probability of a proboscis extension reflex to a water stimulus following sucrose stimulation compared to one preceding sucrose, has been demonstrated in D. melanogaster. CES has been shown to be correlated with classical conditioning of the proboscis extension reflex in both the blow fly, Phormia regina, and D. melanogaster. Hybrid and chromosome analyses of lines of D. melanogaster selected for CES revealed that (1) the dominance component for CES shifted across generations of selection from low expression being partially dominant to high expression being partially dominant, (2) at least two chromosomes, Numbers II and III, are correlated with CES expression, and (3) for the low line, Numbers II and III are both necessary for low expression, suggesting an epistatic interaction.

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GEORGE P. VOGLER and J. C. DEFRIES. Bivariate path analysis of reading performance and symbol-processing speed in nuclear families.

A bivariate path model which incorporates measures of phenotypic assortative mating and cross-assortative mating is formulated for the analysis of familial resemblance for two characters in nuclear families (parents and at least one child). The phenotypic correlation (r_p) between two characters is partitioned into components due to transmissible familial (genetic and/or between-family environmental) influences and specific, nontransmissible (within-family) environmental influences--i.e., r_p = f_f r_f + e_e r_e, where f is the square root of familiality, e is the square root of within-family environmentality, and r_f and r_e are familial and within-family environmental correlations, respectively. The model is applied to the joint transmission of reading performance and symbol-processing speed in 121 families with a reading-disabled child (RD) and in 122 control families (C) with children of normal reading ability. Maximum likelihood estimates of f for reading performance are 0.67 ± 0.06 (RD families) and 0.54 ± 0.08 (C families). For symbol-processing speed, f = 0.58 ± 0.07 (RD) and 0.60 ± 0.07 (C). r_f = 0.64 ± 0.16 (RD) and 0.74 ± 0.18 (C), whereas r_e = 0.33 ± 0.10 (RD) and 0.24 ± 0.10 (C). Thus, more than half of the phenotypic correlation between reading performance and symbol-processing speed is due to familial influences. The adequate fit of the model to data from control families (x^2 = 55.4, df = 44, p = 0.12) but not to data from families of reading-disabled children (x^2 = 90.5, df = 42, p < 0.001) suggests that reading disability may be etiologically heterogeneous.

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