

Study guide for Lecture 3 (Chapter 3)

The interactive theory of development

Why “nature or nurture” is too simplistic
genotype, phenotype

Example: honeybee task progression

Behavioral development within an individual’s lifetime

Experimental use of single cohort colonies

Changes in genetic activity are correlated with change in role

Environmental inputs

Juvenile hormone

Social influence

Learning – a form of behavioral development

Definition

Imprinting – Konrad Lorenz, greylag geese

Prepared brain (applies to all forms of learning)

Spatial learning – a specialized learning ability (like imprinting)

Birds that cache seeds: black-capped chickadee, Clark’s nutcracker

Birds better than humans at this task.

Hippocampus size correlates with caching ability

Learning is dependent on brain mechanisms that must be due to genes.

Learning has costs associated with it (brain space, etc.) so must be adaptive to persist

Examples of learning being adaptive

Wasps and orchid mimics

Specific “spatial intelligence” in food caching birds

Voies with sex differences in spatial learning ability only when the sexes have different size ranges

Individual differences in behavior due to environment

Paper wasps learn their nest odor, and hence, the odor of nestmates.

Specialized learning—programmed to learn odor and respond according to whether other individuals match it or not.

Genetic basis for constructing nervous system set up to learn nest odor

Environment determines what odor is learned—the difference in behavior is due to environment

Ground squirrels – Learn which individuals to treat as kin

Sisters reared apart are less aggressive—somehow still recognize each other

Armpit effect – differences among individuals in their odor environments leads to differences in behavior

Individual differences in behavior due to genetics

Redstarts and migratory restlessness

What does behavior of hybrids say about genetic component?

Humans – identical twins show behavioral correlations, but their behavior is not identical (still an environmental component)

Single gene effects on behavior

Most behaviors involve many genes

“Knockout” animals

Fruit fly larvae – rover and sitter phenotypes

Evolution and behavioral development – how natural selection shapes behavior

Coastal garter snakes eating banana slugs – example of fairly recent behavioral evolution

Evidence for genetic differences between populations indicates that the behavioral difference has evolved

Artificial selection

Researchers determine which behavioral phenotype gets to reproduce—if phenotypic differences are hereditary, then should see a shift in allele proportions (in other words, evolution).

If artificial selection causes a shift in genotypes, you know that the original variation in the population was at least in part genetic. (Why can't you say it was all genetic?)

Developmental homeostasis

Harlow's experiments with rhesus monkeys

Isolated from birth—with artificial “mothers” grew normally but showed pathological behavior (rocking, fear, biting self)

Isolated infants allowed to interact with 3 other isolates for 15 minutes a day—enough for nearly normal social behavior to develop

Homeostasis and symmetry—particularly important if mate choice is based on symmetry.

Symmetry may indicate individual's capacity to deal with challenges to normal development, may indicate good genes to pass to offspring, may indicate good condition mate who can provide good care for young.

Examples: Barn swallow, Humans, brush-legged wolf spider

Polyphenisms

Alternative phenotypes

Types of environmental factors that favor polyphenisms

Examples: tiger salamander, etc.

Operant conditioning and adaptive behavior

Operant conditioning (trial and error learning)

Had been argued that conditioning could be done with almost any action—not true – clearly natural selection has effects on operant conditioning too

Taste aversion

Running to avoid shock

Understanding behavior in light of natural behaviors

Vampire bat—a dietary specialist with no need to learn taste aversions

Can't be conditioned to avoid taste

Interesting links:

Readable and interesting summary article on food caching by birds.

<http://www.sciencenews.org/articles/20040214/bob8.asp>

Review article on the evolutionary basis of human facial attractiveness

http://www.unm.edu/~hebs/pubs/ThornhillGangestad_1999_FacialAttractiveness.pdf