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History of Animal Behavior Research

- Comparative Psychology, Ethology, Sociobiology
- Differences in these fields were all large enough to create criticisms and misunderstandings among the disciplines
- most of these differences are gone now, as the field has become united and interdisciplinary

Comparative Psychology

- evolved from being comparative animal behavior to comparative learning psychology
- focus on reinforcement, stimuli, punishment
- all species have a basic law of learning, so it doesn't really matter what species is studied
- observations limited to stimulus and response, no subjectivity
- originally studied only laboratory species, but broadened over time
- eventually developed to include study of:
 - development of behavior
 - genes and environmental interactions
 - hormones and behavior

Ethology

- branch of zoology that studies the behavior of animals in their natural habitats
- European ethologists described many different types of behaviors in many different species without manipulation
 - not much theory involved, except evolutionary history/phylogeny
- Duck Courtship
 - in three different species of ducks, they all have this "grunt-whistle"
 - the order of displays are similar, but the specific postures are different
 - in closely related species, these differing postures may serve as reproductive isolating mechanisms, really differentiating the species
 - similar behaviors suggest recent shared evolution
- Lorenz' Fixed Action Patterns
 - all members of the species show it, without experience
 - think of the mother duck pushing her egg back into the nest example
 - behavior goes to completion
 - "supernormal stimuli" can exaggerate the behavior (an oversized egg, for example)

Critiques of Fields

- Comparative Psychology's Critique of Ethology
 - lack of scientific control

- just animal lovers that like to watch and describe nature
- no quantification of behavior or statistical tests
- no explanation for expression of species-typical behaviors
- Ethology's Critique of Comparative Development
 - the topic of study, animal learning, was too limited
 - ignore species differences without justification
 - there is no reason to assume the same process underlies learning in all species
 - ignore evolutionary history of animal
 - need to study range of species in natural environments

Sociobiology

- also known as "evolutionary social biology" or "behavioral ecology"
- emphasis on the "why" explanations for behavior
- like ethology, uses evolution and natural selection
- but unlike ethology, function (current adaptiveness) is emphasized over evolutionary history
- predictions rather than post-hoc explanations
- def: the systemic study of the biological basis of all social behavior, using evolutionary theory as an explanatory tool
- started with Darwin's *The Origin of Species*

The Sociobiology Controversy

- relationship between genes and behavior
 - "lock and key, robot-like control, predetermined" (?)
 - biological determinism-if you're born with it, you can't improve people or societies for the better
- to its critics, sociobiology was another attempt to invoke genetic determinism to explain human behavior
- but scientists would never say that there is a "gene for" altruism or homosexuality, just as they wouldn't say there is a "gene for" toes and fingers.
 - they would say that because of evolution there might be genetic effects on behavior
- evolution applied to human behavior
 - humans DID evolve
 - critics say it ignores cultural processes unique to humans
 - but if evolution influences our physiology and morphology, then why not our behavior?

Comparison of the Three Fields

	<u>Comparative Psychology</u>	<u>Ethology</u>	<u>Sociobiology</u>
<u>Research Environment</u>	Lab	Field	Field and lab
<u>Methods</u>	Experiments	Observations	Experiments and observations
<u>Questions</u>	Learning	"Innate" behavior, phylogeny of behavior	Reproductive success; function
<u>Species</u>	Few (rats, pigeons, etc.)	Diverse	Diverse
<u>Theory</u>	Learning theory	Little: some evolution	Darwinian evolution

Tinbergen's Framework for Behavioral Studies

-a methodological and theoretical approach to the study of behavior

-What to Do?: observe and describe

-ethogram

-sit and watch unobtrusively, record what is seen without interpreting

-record the form and the consequence

-two types of way to describe behavior, without interpretation:

-1. Motor pattern: describe actual pattern of body's movement (flap wing, lick fur, etc.)

-2. Description by consequence: describe how the environment is affected by the behavior (displacement, grooming, nest building, etc.)

Tinbergen's 4 Questions

-ABC's: Animal Behavior = Causation, Development, Evolution, Function

-asked four classes of questions or explanations about behavior

-1. Immediate Causation

-neural or physiological explanation for individual's behavior

-ie: hormones, learning, hunger

-2. Development

-change in individual's behavior with age or experience

-ie: ontogeny of avoidance behavior, hunting skills in lions

-3. Evolutionary History

-changes in species' behavior over many generations

- ie: phylogeny of group size, communication behaviors
- can involve more than one species (comparative approach)
- 4. Function
 - adaptive significance or reproductive consequences of an individual's behavior
 - namely, how behavior increases chances of passing on genes
 - ie: male traits and mate choice, anti-predator behavior
 - think of the experiment where the birds had their tails lengthened and shortened

Levels of Analysis of the 4 Questions

- proximate; "how?" questions
 - immediate causation, development
 - within a generation
- ultimate; "why?" questions
 - evolutionary history, function
 - across generations
- based on time scales
 - individuals develop, species evolve
- levels are not mutually exclusive or competitive
- they should be viewed as complimentary alternatives, not right vs. wrong
- there may be multiple proximate or ultimate explanations for a particular trait

Darwin's Theory of Evolution by Natural Selection

- On the Origin of Species*
- convinced skeptics that evolution occurred
- presented a process for evolution (natural selection)
- all aspects of life were natural phenomena, not divine intervention, and were subject to scientific study
- forced the reconsideration of human origins
- definition of evolution or evolutionary change: change in gene frequency across time within a taxonomic group that results in changes in anatomy, physiology, or behavior

Darwin's Observations

- 1. Variation
 - each trait varies among members of a species
 - individuals differ in structure, physiology, or behavior
- 2. Parent-offspring resemblance
 - offspring resemble their parents more than their offspring
- 3. Reproductive potential
 - it's enormous in most species