Final Exam

- Where: GR 4.428 (regular classroom)
- When: Thursday August 10 - 6:00-9:45 PM
- No blue books required
- Format similar to midterm
- Final exam study guide can be downloaded from the course web page:
  http://www.utdallas.edu/~assmann/PSY3360/

Final Exam Review Benefit
Optional extra credit assignment
- Counts toward your participation grade.
- Due August 10 (same day as the final exam).
- Download instructions and the final exam study guide from the course web page:
  http://www.utdallas.edu/~assmann/PSY3360

Studies of animal behavior
- Natural history and field studies
- Laboratory experiments
- Ethology versus behaviorism

Ethology: The naturalistic study of behavior
- Niko Tinbergen (1907-1988)
- Konrad Lorenz (1903-1989)
- Karl von Frisch (1886-1982)

Neobehaviorism
- Intervening variables
  – Clark Hull (1943)
  – Edward Tolman (1951)
Comparative psychology

- Marion and Keller Breland (1959)
  *The misbehavior of organisms*

Methodological Behaviorism

methodological behaviorism: cognitive concepts may be necessary to explain aspects of behavior, but such intervening variables must be operationally defined.

Development and intelligence

- Francis Galton
  - sensory acuity, head size, reaction time
  - nature vs. nurture
  - biological determinism

Alfred Binet (1857-1911)

- Binet criticized Galton’s view of inherited intelligence; emphasized individual differences in intelligence, attention, motivation, and background
- Binet-Simon tests of intelligence
- mental age vs chronological age

Development and intelligence

- Charles Spearman’s two-factor theory of intelligence (“g” and “s”)
- William Stern: intelligence quotient (IQ)
- Howard Gardner: Multiple intelligences

Jean Piaget (1896-1980)

- Genetic epistemology
- Active construction of knowledge
- Interaction with environment involves psychological adaptations to environmental contingencies
Jean Piaget (1896-1980)

- Stage theory of cognitive development
- Intellectual development is not gradual but **abrupt**, progressing through a series of **developmental stages**.

**Stage theory of development**

- Sensory-motor stage
  - 0-2 years
  - egocentric
  - Basic sensory and motor activities
  - Pre-linguistic
  - Criterion for moving to the next stage: **object permanence** (basis for naming and linguistic reference)

- Preoperational stage
  - 2-7 years
  - Classification by similarity
  - Not yet able to master mental operations (e.g. arithmetic)
  - Emerging use of symbols
  - Criterion for moving to the next stage: **Conservation of quantity**

- Concrete operations stage
  - 7-11 years
  - Able to master conservation and some abstract concepts but only if applied to concrete problems
  - Reversibility
  - Transitivity
  - Less egocentric
  - Criterion for moving to the next stage: **mastery of abstract problems**

- Formal operations stage
  - 12 years - adulthood
  - Able to master abstract and symbolic reasoning
  - Metacognition
  - Hypothetico-deductive reasoning

**How does change occur?**

- **Schema/schemata** - cognitive structure or framework
- **Assimilation**: process by which new experiences are incorporated by existing modes of thinking
How does change occur?

- **Accommodation**: process by which existing modes of thinking (cognitive structures) are changed to incorporate new experiences.

- **Equilibration**: process of reconciling cognitive structures with experience
  - force responsible for intellectual growth
  - the “driving force” behind Piaget's theory of intellectual development.

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**Jean Piaget (1896-1980)**

- *The child's conception of number* (1941)
- *The child's conception of space* (1948)
- *The child's conception of time* (1947)
- *The construction of reality in the child* (1957)

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**Jean Piaget (1896-1980)**

- Stage theory of development
  - Invariant sequence
  - All-or-none
  - Hierarchical progression

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**Jean Piaget (1896-1980)**

- Stage theory of development
- How does change occur?
  - Assimilation
  - Accommodation
  - Equilibration

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**Jean Piaget (1896-1980)**

- Problems for the theory
  - Intermediate stages?
  - Children may show less mature modes of reasoning on some tasks
  - Underestimation of young children's reasoning abilities
  - Concepts of assimilation and accommodation are vague.
### Jean Piaget (1896-1980)
- Testing the theory
  - Cross-cultural studies
  - Generalization
  - Kohlberg – stages of moral development

### Linguistics: the study of language
- **Phonetics** – articulation & perception of speech sounds
  - Articulation & perception of speech sounds
  - Structure / function of larynx and vocal tract
  - Universal properties found across languages
  - Acoustic and articulatory properties

- **Phonology** – patterning of sounds (phonemes) in a language
  - How sounds are used to differentiate words
  - Example: the vowel in “bet” versus “bit”
  - Unit = **phoneme**
    - Smallest meaning-differentiating units
    - Similar to letters, but some English phonemes are spelled with more than one letter (/f/ in phone)
    - Some phonemes have multiple spellings (e.g., the vowel in “cup” and “enough”)

- **Morphology** – principles of word (morpheme) formation
  - How sounds (phonemes) are combined to form words; how words are constructed
  - Unit = **morpheme**
    - Smallest meaning-carrying units
    - Similar to words, but some words contain multiple morphemes (cats => 2 morphemes; cat + plural marker; “walk” => “walked” (past tense formation rule))

- **Syntax** – arrangement of morphemes in sentences
  - the study of how words (morphemes) combine to form grammatical sentences
  - Traditional “grammar” (parts of speech: nouns, verbs, adjectives etc. and rules of sentence structure)
  - Active versus passive voice in English
    - “The boy hit the ball”
    - “The ball was hit by the boy”
Semantics
• the study of word meaning (lexical semantics), and how words combine to form the meanings of sentences
• Kinship systems: words used to describe relatives (second cousin, brother-in-law)

Pragmatics
• Use of speech and language in social context
• Choice of vocabulary and speaking style depends on the audience and circumstances

Theories of language behavior
• Pavlov – language as conditioned responses
  – first and second symbol systems
• Lashley – complex planned behavior
  – rejection of telephone switchboard metaphor
  – central planning agency for mapping and controlling long sequences of behavior
  – The problem of serial order in behavior

B.F. Skinner
• Operant behavior:
  – operant response (naturally occurring behavior)
  – reinforcement (alters probability of response)
  – setting (situation in which behavior is emitted)
• Experimental analysis of behavior: systematic description of contingencies of reinforcement

B.F. Skinner
• Verbal Behavior (1957)
  – speech and language are forms of verbal behavior whose reinforcement is mediated by other people.
  – operant responses
  – contingencies of reinforcement
  – tact: a verbal operant response under the stimulus control of the environment

Noam Chomsky (1928–)
• Transformational generative grammar
• Language as system of rules
• Cartesian linguistics
• Nativism: language as a biological, species-specific trait
Abstractness of syntax

Phrase-structure grammar

- S: sentence
- NP: noun phrase
- VP: verb phrase
- N: noun
- V: verb

Chomsky on language

- Noam Chomsky (1965) – all children are born with an innate capacity for language
- Language acquisition device (LAD)

Language acquisition

- Eric Lenneberg (1921-1975)
  - Critical period for language acquisition?
  - Hemispheric specialization
  - Recovery from aphasia
  - “Motherese” (infant-directed speech)
  - Stages of language development
Hemispheric specialization for language

The demise of radical behaviorism
- Chomsky’s attack on Skinner
- Intervening variables
- Rise of cognitive psychology
- Social and developmental psychology
- Psycholinguistics
- Information processing models
- Connectionism
- Cognitive science
- Behavioral neuroscience

Turing test
- Alan Turing (1950)
- Q: Can machines think?
- A: Only if they pass the Turing test.

Key Terms

<table>
<thead>
<tr>
<th>Darwin and natural selection</th>
<th>anthropomorphism</th>
<th>ethology</th>
<th>Tinbergen</th>
</tr>
</thead>
<tbody>
<tr>
<td>adaptive radiation</td>
<td>Morgan’s canon</td>
<td>sign stimulus</td>
<td>Lorenz</td>
</tr>
<tr>
<td>industrial melanism</td>
<td>Malthus</td>
<td>imprinting</td>
<td>Von Frisch</td>
</tr>
<tr>
<td>genotype and phenotype</td>
<td>Lamarck</td>
<td>critical period</td>
<td>honeybee waggle dance</td>
</tr>
</tbody>
</table>

Natural selection
1. Variation exists in behavioral traits
2. Some of that variation is heritable
3. More individuals are born than leave offspring for future generations
4. Certain behaviors make individuals better adapted to their environment. These individuals survive longer and leave more offspring than those with less successful traits
### Measurement of Intelligence

<table>
<thead>
<tr>
<th>Method</th>
<th>Statistic</th>
<th>Theory/Concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>Galton (sensory acuity, head size, reaction time)</td>
<td>Scatterplot</td>
<td>Spearman (g-factor, s-factor)</td>
</tr>
<tr>
<td>Binet-Simon test</td>
<td>Normal distribution</td>
<td>Stern (intelligence quotient)</td>
</tr>
<tr>
<td>Mental age vs. chronological age</td>
<td>Regression to the mean</td>
<td>Multiple intelligences (Gardner)</td>
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</tbody>
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### Theories of Language

- **Pavlov**
- **Chomsky**
- **Skinner**

### Theories of Learning

- **Pavlovian conditioning**
- **Operant conditioning**

### Theories of Animal Behavior

- **Ethology**
- **Behaviorism**

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**Duality of patterning**

If we did not have duality of patterning, the number of expressions we could produce would be quite limited.

Each word would have to be a single sound unit. We might be able to produce perhaps 100 such units, but then the capacity of our vocal apparatus to create new items would be used up.

Duality allows us to continue to create new words as needed and combine them into new sentences.

Because we can produce so many words, AND combine them in unlimited ways, duality provides productivity.