

## Psychology 4910 – Chapter 10: The Psychology of Adaptation

Heraclitus – World of Becoming – world that we see is in a constant state of change  
- *physis* (fundamental substance of matter) was fire

Parmenides – World of Being – underlying permanent reality of the world was an unchanging substance

Aristotle's *Scala Natura* or Great Chain of Being + observations of fossils & different forms of life in foreign countries → Lamarckian evolution theory

- Vitalism – living things cannot be explained in purely mechanical terms because something immaterial distinguishes living from nonliving things

- Vitalism – enabled living things to improve and perfect themselves over long periods of time.

→ just as living organisms changed throughout life (e.g. grubs grew wings & became butterflies) – species could change over time → idea of evolution

Theory of evolution needs two principles:

(1) Mechanism for change

(2) Mechanism for preserving the changes that arise.

### Romantic (Lamarckian) Evolution

Jean-Baptiste Lamarck (1744 – 1829) – taxonomist

- living species have innate drive to perfect themselves

- organisms adapt to their environment and change in the process → inheritance of acquired characteristics

Herbert Spencer – “survival of the fittest” (1852)

**Charles Darwin** (1809 – 1882)

- provided the mechanism for change in species: Natural selection

- naturalist on board *Beagle* which sailed around the world

- noticed the huge variety in living things

- e.g. variety of finches on Galapagos Islands which differed slightly (e.g. in

type of beak) depending on food sources used by birds on different islands

→ likely that the different species had a common ancestor & different species changed in a way that made them better able to survive in their environment

- continued to collect data on species differences after returning to England –

- studied selective breeding - how plant and animal breeders improved their

stocks by breeding individuals with certain traits

- realized that nature also selected some traits and not others
- read Thomas Malthus' *Essay on the Principle of Population* (1798): population growth always exceeds the resources (e.g. food) available
- struggle for survival is mechanism for selection → only the fittest survive

### **Formulating the Theory**

- has the essential points of his theory by 1842, but didn't publish until 1858

- 1) struggle for food and (later) struggle to reproduce and raise young
  - 2) Nature produces variation within and between species. Some variations assist organism to survive, mate and reproduce
  - 3) Successive small adaptive changes occur until...
  - 4) New species emerge
  - 5) Environments change; thereby new species develop
- Observed diversity in nature – explained by a few simple mechanical principles

Problem: How are small changes passed on to successive generations. No understanding of genetics at this point. Gregor Mendel's work on genetics of peas not done until later, published in 1866 but not recognized until 1900.

- discovery of DNA structure by Watson & Crick – 1953

### **Publishing the Theory**

- June, 18, 1858 - Alfred Russel Wallace wrote to Darwin with his independently conceived theory of evolution which was the same as Darwin's.

- both Darwin & Wallace's papers were read July 1, 1858 at the Linnean Society of London.

- Darwin then produced a short version of his theory (*The Origin of Species...*) which was published 1859.

- Thomas Huxley popularized Darwin's theory

→ Leakey: Newtonian revolution in Biology

- in Psychology, Darwin's ideas led to Psychology of Adaptation: how do mind and behavior help living creatures to adapt to their environments?

## **Evolution and Scientific Psychology**

Evolution raises two questions:

- 1) Species question – in what ways has evolution shaped thought and behavior of organisms?  
→ comparative psychology, ethology, evolutionary psych.
- 2) Individual question – How do individuals adapt to their environment during development? → study of learning

- Are laws of learning the same for all species? → associationistic view of the mind as developed by Locke, Hume, Mill, Hartley, Bain etc suggested that principles of association would also apply in animals as well as humans.

→ Behaviouristic approach – we can study one convenient species (lab rat) and generalize to other species.

### **Lamarckian Psychology: Herbert Spencer** (1820 – 1903)

- Spencer integrated associationism and reflex arc (sensori-motor) conception of the nervous system with Lamarckian (Romantic) evolution.

#### First Influence of Spencer on Psychology

“Mind can be understood only by observing how Mind is evolved.” (Leahey, p. 308)

- Individual question: Spencer saw development as a process by which connections between ideas come to reflect connections between events in the world.

- Connections between ideas established by repeated co-occurrence of events

- Lamarckian idea of transmission of acquired characteristics (e.g. learned behaviours) → instinct became acceptable concept.

- innate instincts = associative habits learned extremely well & passed on to offspring

#### Second Influence of Spencer on Psychology

- differences between species (or individual humans) a function of the number of connections brains can make

- brains differ only in the number of associations that can be learned.

learning could be applied to humans

### Influence of Spencer on Society

- Social Darwinism – natural selection should be allowed to weed out the poor, weak, unhealthy etc.
- government should not interfere in business or have social programs to help the “needy”

→ Eugenics movement

### Darwin on Humans

- humans seen as part of nature, not beings who were partly divine
- 1871 – *The Descent of Man* published
- humans now seen as differing from the animals quantitatively, not qualitatively
- sympathetic to faculty (Scottish) psychology rather than associationistic psychology
  - assumed that faculties were inherited

### Francis Gaulton (822 – 1911)

- use of fingerprints to identify people
- studied twins to determine genetic influences on intelligence
- invented free association technique to investigate memory
  - Note: free association later used in Freudian psychotherapy
- used questionnaires on topics such as mental imagery
- anthropometric tests (e.g. head size)
- claimed that psychologists should study individual differences
- used statistics, behavioural measures of mental states (e.g. fidgeting as a measure of boredom)
  - believed that intelligence, character, personality etc. were innate.
- interested in improvement of the human species → involved in positive eugenics

(encouraging the “fittest” to breed) – gave wedding gifts of money to the “fittest” couples

- gave £1,500 to establish Eugenics Education Society
- Eugenics movement in Britain was based on social class not race (as it was in America) and involved encouraging upper and middle classes to breed.

### **Rise of Comparative Psychology**

- theory of Evolution → encouraged comparative psychology
- Darwin – *The Expression of Emotions in Man and Animals* – 1872
  - continuity between humans and animals
  - universality of emotional expression across human races
- George John Romanes – surveyed mental abilities from protozoa to apes & tried to outline mental development over time
  - introduced study of behavior; comparative psychologists attempted to infer mental processes of animals from their behaviour

C. Lloyd Morgan – believed Romanes overestimated animal intelligence

- Romanes attributed complex thinking by analogy to his own thought processes
  - anecdotal method, criticized because it over estimated animal intelligence & lacked experimental control
  - Romanes’ method valuable because animals were observed in their natural environments.
- Morgan’s Canon: inferences about animal thought must be minimum needed to explain animal behavior
- distinction between **projective inferences** (called ejective inferences by Morgan) and **objective inferences**
  - objective inferences – based on observation. E.g. dog gets excited when he sees his owner coming but not other people → can infer that dog can sense (see, smell, or hear) the difference between his owner & others.
  - objective inferences permissible
  - projective inferences – based on projecting our own human emotions onto animals

- projective inferences not permissible

### **Psychological Ideas in the New World**

- no feudal hierarchy, no aristocracy, no established church, no ancient universities, no monarchy
- everyone had to make their own way in the wilderness
- early settlers brought Protestantism, evangelical Christianity – sought salvation of individual souls through emotional conversion experience
- also brought Enlightenment & romanticism (religious reaction against the Enlightenment, Scottish philosophy (See Berkeley, Stuart, Reid, Hume).
- Enlightenment philosophers: Benjamin Franklin (studied electricity, framer of US constitution), Thomas Jefferson (applied mathematician, author of Declaration of Independence)
- emphasis on business → valued practical knowledge (*metis*) not *theoria*; somewhat anti-intellectual
- clever inventions considered to glorify ingenuity of God in creating the human mind.
- ordinary person's intuition was usually right; no need for experts
- Americans tend to be strongly empiricist – any American can become President
- cult of self improvement – with goal of being a better businessman or farmer

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### **Psychology in Religion**

- Jonathan Edwards (1703 – 1752) – early American philosopher – read Locke & adopted empiricism and association.
- Laws of association: contiguity, similarity, cause & effect (similar to Hume)
- also concluded that we can only know our perceptions and cannot know the real world directly
- like Hume – was driven towards skepticism, & felt that emotion, not reason was the true spring of human action
- saw emotion as the basis for religious conversion
- **transcendalism** – revolt against stuffy & dry Puritanism. – wanted a more emotional religion with direct passionate encounter with God.

- transcendentalism – evangelical Christianity with individual’s feelings and conscience above authority

- Scottish common sense philosophy – continued to be influential

### **Phrenology in America**

- Orson & Lorenzo Fowler – popularized phrenology in USA.
- focused on practical applications & minimized “scientific” aspects
- believed that “faculties” could be improved by practice
- clients paid for phrenological service → first “guidance counselors” in USA
- told people whom to hire or marry

### **The Metaphysical Club**

- Oliver Wendell Holmes Jr. (1841 – 1935, famous jurist), William James, Chauncey Wright & Charles S. Peirce met to discuss philosophy

### **Pragmatism**

- beliefs = dispositions to behave
- treated mind as a part of nature, not gift from God
- Wright – proposed early stimulus-response theory & proposed that beliefs evolve just as species do; “survival of fittest” principle applies to beliefs.
  - “best” beliefs led to action that led to successful behaviors
  - self consciousness = awareness of connection between stimuli & responses

Pierce (1839 – 1914) – build a small computer when he was a student & was one of the first to ask whether computers might be able to emulate human thinking.

- summarized the ideas of the Metaphysical Club → formulation of pragmatism

- Pragmatic Maxim: to ascertain to meaning of an intellectual conception, one should consider what practical consequences might result from the truth of that conception—and the sum of these consequences constitute the entire meaning of the conception (From Wikipedia)

- the purpose of thinking is to produce “habits of action”

- the best beliefs are those that assist us to adapt to our changing environment

- therefore a scientific concept was meaningless if it could not be translated into some observable phenomenon (behavior)

- pragmatism anticipated 20<sup>th</sup> C behaviourism

### **William James** (1842 – 1910)

- wrote an influential psychology text

- MD degree & taught physiology, obtained a chair in psychology at Harvard & finally was a professor of philosophy

- primary method is introspection, accompanied by Wundt's experimental methods & comparative psychology's observational studies.

- not a believer in associationism, thought that we directly perceive objects (compare to Brentano)
- the important thing about consciousness is not what it is, but rather what it does
- consciousness makes decisions that lead to action.
- function of consciousness is important, not its contents.

### Challenge of Will, Reflex Theory of the Brain

- consciousness arises when humans cannot act by reflex, instinct or habit
- "Consciousness gives its bearer interests" (Leahey, p.321) We are motivated to behave in a way that promotes our well-being & gives us satisfaction & pleasure. We have an interest in surviving and flourishing.
- consciousness arises when we have to solve a problem or resolve a conflict
- consciousness has a vital adaptive function → has survival value.
- believed in importance of understanding physiology in order to understand psychology

Note contradiction between reflex theory (stimulus → brain → response) which explains human behavior in a mechanical fashion & James' belief in free will (We make choices.)

### James-Lange Theory of Emotion

- the usual assumption is that we have a perception that arouses an emotion which leads to a physiological response.
- the J-L theory proposes the opposite: the perception gives rise to a physiological response which then becomes conscious as an emotion. It is the physiological reaction which gives emotions their power.
- "Without the bodily states following on the perception, the latter would be purely cognitive in form, pale, colorless, destitute of emotional warmth." (Leahey, p. 322)

- reflex theory of the brain → brain is similar to telephone switchboard in which a call gets connected to the correct receiving telephone.
  - brain not capable of initiating action on its own but merely responds to stimuli.
  - James: emotion-producing stimulus elicits a physiological response and also an adaptive response (e.g. running away from a predator)
  - James believed that the physiological response was not in the brain but the viscera (guts) → emotions (plus kinesthetic feedback) are bodily states of which we are conscious.

Problem with J-L theory: consciousness does not cause behavior; it results from bodily reactions to emotional stimuli. → We respond automatically. We do not make a choice; that is, we do not have free will.

- even worse, consciousness is a by-product and doesn't have any function in behavior, so there is nothing for psychology to study!!!

James' emotional conflict: he believed in free will and had "cured" himself of depression through "will power". But he was also committed to a scientific approach to the study of mind and behavior; therefore, he had to assume that behavior was determined by factors that could be identified through scientific study.

- James got Hugo Munsterberg to take his place as Harvard's experimental psychologist and turned to philosophy.

### James' Contribution to Psychology

- understood the importance of relating physiology to behavior and producing psychological theories that were consistent with known physiology
- importance of psychology being "relevant" and practical
- emphasis on the function of behavior in helping organisms adapt to their environment

### Jamesian Pragmatism

- there are no Platonic eternal Truths, but people want certainty → pragmatism offered a guideline
  - truth of an idea depended upon its agreement with one's total life experience
  - emotions just as important as cognition (reason, knowledge etc)
  - e.g. notion of God or free will not acceptable to many scientists because there was no empirical proof
  - but ideas about God and free will affect people's behavior, and are true in the sense that they help us understand our experience and guide our behaviour
- although there were no ultimate Platonic Truths, Pragmatism offered a practical approach

### **The Motor Theory of Consciousness – Hugo Munsterberg**

- adopted James' idea that consciousness represented feedback stimuli from physiological and motor responses
- Munsterberg: consciousness was just a "spectator" of its bearer's actions
- no free will –apparently no role for free will in reflex theory of the brain
  - brain produced behavior by connecting incoming afferent sensory nerves to efferent motor nerves
- Munsterberg: "our ideas are the product of our readiness to act . . . our actions shape our knowledge"
  - feeling of will results from awareness of our behavior & incipient tendencies to behave

"The contents of consciousness are determined by stimuli impinging upon us, by our overt responses, and by peripheral changes in muscles and glands produced by physiological processes linking stimuli to responses." (Leahey, p. 328)

### **Functional Psychology (1896 – 1910)**

- according to Wm. James, the content of consciousness was not important; what was important was its function in helping the organism to adapt to its environment
- conscious enabled the organism to **choose** to behave in a way that was beneficial to the organism.
- experimental psychologists were switching from using introspective reports to determining the correlations between stimuli and responses

James Rowland Angel – experiment on sound localization

- participant pointed to location of the sound & gave introspective report – psychologists soon realized that the objective evidence (the direction in which the participant pointed) was more useful than the introspective reports.

Bryan & Harter (1897) – studied the development of telegraphic skills by new railroad telegraphers

- charted improvement in skill with practice (Compare with Ebbinghaus' work on memory)
- important knowledge that was useful to industry – telegraphers kept track of goods shipped by rail

Bryan & Harter's study – sign of the direction in which psychology would go

- focus on study of learning
- learning = growth of stimulus-response connections
- objective, experimental psychology with no use of introspection
- production of useful knowledge

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### John Dewey (1859 – 1952) & the Reflex Arc

- Dewey criticized notion of breaking behavior into stimulus → idea → response. These were not distinct events but more like 3 parts of a whole.  
 - sensations did not involve passive reception of information but rather interaction with other on going behaviours (This was also Ulrich Neisser's idea.)

- current behavior gives a sensation its meaning. Only when person's behavior needs to be co-ordinated to some new sensation does experience of sensation and emotion arise.

e.g. person walking through the woods hears a funny sound. A hiker might look to see if there is an animal nearby or another hiker approaching. A soldier on a training exercise might hide or prepare to attack or defend against an opposition soldier.

- feedback from thwarted actions (e.g. soldier can't continue whatever he was supposed to do) generates emotion (e.g. fear, anger, excitement etc.)  
 - conflicting dispositions to act (e.g. to continue what he was doing or to hide or attack etc.) generate emotions → a problem must be solved & decision made → soldier becomes conscious of surroundings & searches environment for additional information

- Note: Dewey no explaining thought, decisions, judgement etc in terms of activity of the soul but in terms of co-ordinated, adaptive, flexible behaviours.

### **Functional Psychology Defined**

Titchener – distinguished 3 types of psychology & drew analogy with 3 types of biology

	<u>Field of Biology</u>	<u>Subject Matter</u>	<u>Field of Psych</u>
1)	Morphology	Structure	Experimental
2)	Physiology	Function	Functional
3)	Ontogeny	Development	Genetic Psychology

Structural Psych – psychology of Wundt & Titchener, used introspection

Functional Psych – objective experimental techniques, sought correlations between stimuli and responses

Genetic Psych – studied development of organisms through the lifespan with focus on mental operations (now called developmental psychology)

John Rowland Angel – articulated definition of functional psychology & justified it  
- did experiment on perception of sound location

- structuralist position: mental elements were not permanent enduring objects but existed only at the moment of perception – conscious contents constantly changed. Thus function (e.g. perception) produces the structure (conscious content) which is the reverse of biology

- functionalist position: consciousness = “efficient agent in the furtherance of the life activities of the organism” (Leahey, p. 333) & therefore biologically useful

- conscious contents evanescent, but the mental faculties (attention, perception, judgement etc.) persist.

(Note: mental faculties appear now to be considered mental activities rather than mental structures as Aristotle & others saw them.)

### Functional Psychology

- 1) considered mind to have a biological function which arose from evolution & aids organism to adapt
- 2) consciousness arises from physiological functions
- 3) function psychology appeared to be socially useful in improving education, mental hygiene, business

→ note emphasis on biology, adaptation and practical value

### Functional Psychology in Europe – James Ward

- rejected atomism analysis of consciousness & advocated functional view of consciousness

- perception was not passive reception but active grasping of the environment

- “function of perception and intellection (what we call cognition) is . . . to guide action and subserve volition” (Leahey, p. 335) to promote self conservation & betterment

-consciousness is active, choosing entity that adjusts the organism to its environment promotes survival (Leahey p. 335)

- Frederick Bartlett – opposed associationistic study of memory (with pairs or series of nonsense syllables) and did studies of people remembering stories

### **The Consciousness Debate 1904 - 1919**

- Wm. James (as a philosopher) – articulated radical empiricism - questioned whether consciousness even existed and saw it as remnant of Cartesian dualism
- consciousness = experience. It did not exist as an entity but as a function.
- James ideas → relational theory of consciousness & functional theory of consciousness

### **Relational Theory of Consciousness: Neorealism**

- there is a world of physical objects that we know directly without mediation of internal representations
- consciousness is a relationship between self and world – relationship of knowing

### **Ralph Barton Perry (1876 – 1946)**

- Wundt et al. saw introspection as a special type of observation of one's own mental operations
- Perry saw introspection as being no different from inferring another person's behavior and making inferences about that person's thoughts  
→ contributes to validity of behaviourism

### **Functional Theory of Consciousness: Relationism (Dewey & his followers)**

- emphasis on mind an effective actor in the world
- did not see mind as passive spectator of the world but as a set of representations of the world that guided the organism's interactions with the external world
- believed that language was what enabled thought; language acquired through social interactions

### **American Psychology: The New Psychology and the Old**

- "Old" psychology was the faculty psychology based on the Scottish "school" and was closely connected with religion.
  - psychology taught to make students better Christians and moral people
- "New" psychology was secular and experimental (physiologically or biologically based)
- G. Stanley Hall – student of James
  - did experimental studies of higher mental processes, anthropology, abnormal behavior, & developmental psychology.
  - began the *American Journal of Psychology*
- James McKeen Cattell – student of Hall – mental testing