

Psychology 4910

Chapter 5: The Scientific Revolution (approx. 1600 – 1799, 15th and 16th centuries)

- medieval view: world was made by God & rationally ordered
 - hierarchy of both heaven & earth
 - signs of God everywhere
- Copernicus – Earth not the center of the universe, sun was.
 - mathematical, mechanical universe which could be understood by reason
 - scientific investigation
- Newton's laws about planet motion
- 1500s – ships sailing around the world, trade with far east, discovery of America
- developments in technology: invention of telescopes, microscopes
- mechanical view of the world

Why did Scientific Revolution Occur in Europe?

- must consider social institutions & conditions unique to Europe
 - 1) Islam vs. Christianity: Christianity spread through conversion not military conquest - people persuaded to convert, not forced .
 - Islam spread through conquest (Compare Islamic State in Iraq & Syria)
 - 2) Separation of Church & State: Biblical quote in which Jesus acknowledges that secular, nonreligious authority is valid in its own sphere.
 - discovery of Roman civil law code
 - 3) Universities were being established 12th and 13th centuries
 - like cities, they were self-governing institutions independent of church and king.
 - universities set their own curricula, students gathered to discuss philosophy
 - Islamic *madrassas* – taught religion, *Sharia* – law based on Koran & teachings of Mohammed
 - 4) Authority of the Book
 - Bible “interpreted” by different scholars. – open discussion & disagreement on what the writings meant
 - Sharia law based on Koran and *hadiths* & were incontrovertible, unquestioned

- 5) Reception of Aristotelian Natural Philosophy
 - Europeans tried to reconcile Aristotle's teachings with Christianity (e.g. Aquinas)
- 6) Public Knowledge
 - Neoplatonism (e.g.) – knowledge was not shared freely but only to elite people who had been initiated into the group
 - Islam banned printing until 1800s; Gutenberg press invented circa 1450
 - discussions of philosophy were public
- 7) Secondary Causation
 - Aristotle's medieval followers proposed God created the world & gave objects power to affect other objects
 - God didn't do all the work himself
 - secondary causation rejected by Islam → *occasionalism*: God continually annihilates & then recreates the world. God responsible for every change, not people or natural forces
 - this notion does not promote investigation into causal mechanisms in physical world
- 8) Technology – medieval artisans made lenses, clocks, sailing ships etc.

In China – emperor ruled by divine right, no separation of church and state, no autonomous corporations

- astronomy (astrology) studied to determine the gods' pleasure or displeasure with Emperor's actions & to find signs as to what actions he should take.
- Chinese did not know about Greek philosophy, *Mandarins* (government officials) studied Chinese literature

Mechanization of the World Picture

- 1543 – Copernicus: *Revolution of the Heavenly Orbs* → sun is centre of solar system
- Galileo – produced telescopic evidence that supported heliocentric hypothesis
- Newton's laws of motion – supported idea of world worked like a complex clock made by God, but not operated by him

What was Revolutionized? Mathematical versus Experimental Sciences

- Kuhn: mathematical (classical) sciences vs Baconian (experimental) sciences
- classical sciences (astronomy, optics) – observation → development of laws, but no actual experimentation
 - Baconian sciences – experimentation to create situations that don't occur in nature
 - initially not much theorization (e.g. chemistry)

- *theoria vs metis*: various artisans & tradesmen had practical knowledge which was kept from outsiders. Guilds, groups like Masons kept secret documents.

Printing → knowledge spread.

- modern science combines both search for universal knowledge but also practical application

Psychology Invented: The Way of Ideas

- Aristotle thought that perceptions were directly connected with the world, that the form of an object entered our sensory organs. → direct connection between the world and our experience of it

- this changed with the Scientific Revolution

- Galileo (1564 – 1642), Locke (1632 – 1704) – primary (physically objective) and secondary (subjective) properties

Note: Greeks also understood this distinction – World of Being vs. World of Becoming

- Rene Descartes – introduced notion of consciousness – representation of the world which is incomplete and indirect.

Scientific Revolution provided mathematical view of the world that was not consistent with our perceptions (e.g. earth revolves around the sun, not the reverse; atomic theory in chemistry)

→ conquest of sensory perception and subjective experience to reason

Galileo: “I think that tastes, odors, colors, and so on ... reside only in the consciousness [so that] if the living creature were removed, all these qualities would be wiped away and annihilated.”

→ creation of “inner world” of consciousness populated by “inner objects” (perceptions, memory, images, ideas etc) that possess sensory properties not found in the objects themselves such as beauty, justice, truth etc.

→ ask how and why sensory properties arise → psychology defined (late 1800s & early 1900s) as the study of relationship between subjective world of consciousness and the physical world.

- psychology could shed light on the scope and limits of human knowledge.

Consciousness Created: Rene Descartes (1596 – 1650)

- Reformation (1517) – Catholic church emphasized *orthopraxy* (correct religious practice) rather than *orthodoxy* (correct beliefs).

- new Protestant sects emphasized correct Christian beliefs

- mechanical view of universe → God seen as a clockmaker who made a perfect clock-world which ran by itself. → removed God from the world.

- compare earlier notion of God being omnipotent & in control of everything

→ similar to Hellenistic era, people turned to introspective religions seeking inner insight and truth, not just rules for behavior (e.g. rites to attain ecstatic state)

- Renaissance naturalism tried to eliminate supernatural explanations of natural phenomena. Eg. Magnet had physical properties (not magic spirits) that attracted iron. → appeared to grant magical powers (ability to move certain objects) to physical objects.

→ raises the question of the body (brain) having the power to think. This power was always attributed to the soul (compare Aristotle's model of the mind.)

→ Maybe there is no such thing as a soul!

- Descartes saw animals as machines whose functioning could be explained in terms of physical processes. What about humans?

Descartes as a Physiological Psychologist

- *Le Monde* – book on physics & *L'homme* –book on physiology (incomplete)

- Nov 1633 – learned of Galileo being condemned to house arrest for life & stopped publication of *Le Monde*, didn't finish *L'homme*.

- Greek & Islamic physicians (e.g. Avicenna or Ibn Sina) tried to attribute mental activities to different areas of the brain. This idea was not compatible with Christian theology. The soul was responsible for mental activity. Giving matter the ability to think was heresy because thinking was the “divine” part of human beings.

- did dissections of animal brains to learn about mental functioning

- wanted to create mechanical models of mental processes – contemporary craftsmen could build mechanical models of human parts that behaved similarly to humans. (Compare 20th C information processing models in cognition.)

- Descartes had to make his theorizing consistent with Catholic theology. Activities of the soul could not be described in mechanical terms.

Two Examples of Heresy

Averroism – Mind interpreted by some Islamic scholars (including Ibn Sina) was divine inter light that illuminates general knowledge & reunites with God after death. Catholic theology held that soul was judged after death and must therefore be individual, the essence of the person. Ibn Sina's idea of the soul was not consistent with Catholic teaching.

Alexandrisism – attributed to the brain the power of perceiving, remembering, & thinking. Alexandrisism denied the immortality of a personal soul.

Descartes separated humans and animals by claiming that only humans had souls, and humans differed from animals in experience, behavior and possession of language.

-Descartes: brain controls behavior but not consciousness.

- Animals lack reflective consciousness (awareness of their own awareness)
 - thought makes human behavior more flexible than animal behavior. Human behavior more than instinct, not governed just by expected pain and pleasure, and is not restricted to what we would call conditioned responses.

- proposed innate human language of the mind (mentalese). Actual languages are translations of this inner language.

- compare to Chomsky's 20th C idea – innate language acquisition device

Descartes as a Philosopher

- Descartes unsatisfied with Aristotle's scientific methods & wanted to find or create rules to guide scientific thinking

- he turned to introspection & method of radical doubt. He questioned every belief & assumption in order to find fundamental truths that could not be doubted

- conclusion: doubting is an act of thought; therefore he could not doubt that he could think → *Cogito, ergo sum*. I think, therefore, I am.

→ "The soul, the thinking thing, was a spiritual substance wholly without matter, not occupying space and completely separate from the body." (Leahey, p 143 – 144)

- Soul is immaterial (note the dualism) but resides in the material body.

- two worlds: (1) material world which could be investigated scientifically, and (2) subjective world of experience which could be known through introspection

- separating consciousness from "self", Descartes created consciousness as an object of study, e.g. we can study our own sensations, perceptions, feelings etc

- Daniel Dennett – *Cartesian Theatre* (illustration in 6th ed of Leahey

- nerves in the perceptual systems send information to a "screen" (the pineal gland) which the self can observe. What the "self" sees is not the real world, just an image.

- mechanical (physiological) model of perception

→ sensations and images can be examined through introspection and therefore can be studied.

This idea defines psychology until behaviourism develops in the early 20th C

The soul is a mathematical immaterial point in the pineal gland. It occupies no space and does only one thing—thinking

The essence of a person is a "small, self-aware point of pure thought" in the Pineal gland in the brain. (Compare to Aristotle's idea of the soul as the animating force of the body.)

- Descartes made psychology possible because we could legitimately study perceptions, sensations, hallucinations, etc.
- We can't know the true world. We perceive only selected information about the external world. Therefore it is important to study psychology (perception, cognition, memory etc) in order to understand the nature of human knowledge.

Difficulties with Cartesian Philosophy and Psychology

- 1) The homunculus problem – little person in the head viewing the Cartesian theatre. How do we explain the little person.
- 2) How can immaterial soul interact with material body. Descartes thought that the pineal gland was where the nerve-tubes entered the brain. The soul made the pineal gland tip in different directions to direct the “animal spirits” in the nerve-tubes and so guide the body's actions.
- 3) Other minds: How do I know that that my soul is not the only one in the universe? Descartes' solution: any creature that possesses language (and therefore can think) has a soul.
Note: Darwin's theory of evolution undermined the distinction between humans and animals.

- Descartes was a nativist – believed in innate ideas that did not come from experience, e.g. the ideas of God and the mind, and mathematical concepts

Leibniz (1646 – 1716)

- universe = point-like entities called *monads* which to some extent are living and have consciousness
- humans & animals – composed of monads that serve a most conscious and dominant monad (God?)
- consciousness and the material world are parallel but do not interact.
 - Analogy: God created two perfect mechanisms (clocks), one for consciousness and one for the material world. The two clocks always show the same time, but they cannot affect each other.
- consciousness reflects what is happening in the world because of the preexisting harmony
- proposed mind-body or psycho-physical parallelism – every event in experience had a corresponding event in the real world.

Leibniz main contribution led to psychophysics

- *petite perception vs. perception*
 - petite perception – subliminal perception – not consciously perceived, e.g. the sound of one drop of water landing on a beach
 - perception – the sound of many drops of water on the beach

- Leibniz' idea suggests that scientists should study how big a change in, e.g., loudness of a sound or brightness of a light can be perceived or what is the faintest light that can be seen
- for Leibniz, perception referred to "raw, confused idea, not really conscious" – what we might call a sensation
- when person becomes aware of perception & it enters consciousness – it is a sensation. (Note: our definitions are exactly the opposite)
- process of bringing L's perception into consciousness and making it into a sensation was *apperception* (studied by Wundt)
 - binding problem, pattern recognition
- distinguished between active attention (voluntary) and passive attention (attention drawn automatically to 'attention-getting' object)

Thomas Hobbes (1588 – 1679)

- first to declare that humans were machines, spiritual substance (soul) was a meaningless idea. –atheist
- no free will: actions of people determined by material causes
- empiricist – all knowledge comes from sensations
- nominalist – abstract ideas, universal truths are concepts – convenient names used to group objects & events
- philosophy = rational & meaningful; theology = irrational & meaningless
- known for ideas on relationship between human nature and human society
- previously – view that governments exist to enforce God's laws vs current view that government & society should be constructed to promote *eudaemonia* and be based on understanding of human nature
- Hobbes experienced English Civil War – believed that humans could be cruel & selfish & needed strong government that provides security & enable people to work & live in safety
- people must therefore give up some freedoms & be subject to laws
- best government is an authoritarian state

Baruch Spinoza (1632 – 1677)

- deterministic
- saw the state as a social agreement – people agree to give up certain freedoms in exchange for good peace and good government
- pantheist: God is nature; all things are part of God. God is not a separate being.
- mind is not something separate from the body – produced by body processes
- no free will
- right action & thought depend on control of bodily emotions by reason (Stoicism)
- Reason will lead to enlightened self interest. Wisdom is enlightened self control (compare to Greek *sophrosyne* – self control through wisdom)

Blaise Pascal (1623 – 1662)

- mathematical genius – made a mechanical calculator at age 19 to help his father do tax calculations
- realized that machines could mechanical actions that resembled thought
- Pascal's triangle
- feared life would be meaningless without belief in God, turned towards faith rather than reason
- Cartesian in that he valued self-consciousness which separated humans from animals.
- gave a rational argument for believing in God based on likelihood of possible outcomes and the value of each outcome. (This notion was developed later in Utility Theory)
 - made risk taking quantifiable