

6: The Cognitive Revolution

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Was It a revolution?? When we have seen it was a build up

Part a. — *Historical Perspectives:*

- 1) Provide **examples** of how **philosophers** have taken an interest in **human cognition** throughout the ages

Edwin Smith's Papyrus (1,700 BCE+)

Ancient Egypt

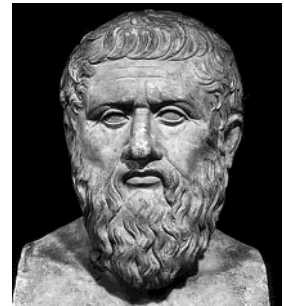
- In 1862 a papyrus scroll was purchased in the city of Luxor, Egypt
 - Details in the papyrus dated 1700- 3000bce
 - The scroll perplexed medical practitioners
 - Because it documented detailed information about 48 cases of head and neck injuries, including diagnosis and treatment (i.e., surgery procedures)!
 - The scroll included information about diagnosing and treatment
 - In ancient Egypt!
 - Therefore hinting at brain and cognition
- Despite evidence of emerging knowledge of neurology in Egypt,
 - Heart was considered seat of soul;
 - the brain was removed before mummification (through the nostrils)
 - However the heart was preserved
 - However, they recognized that



Plato (~400 BCE)

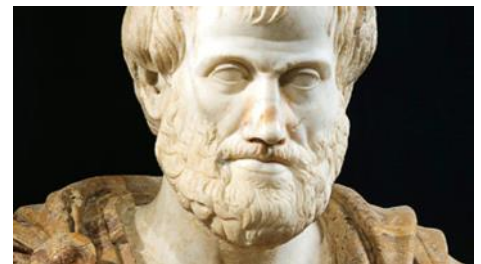
Ancient Greece

- In Greece around 400bce discussion about seat of soul continued
 - **Plato** believed the soul is divided into 3 parts:
 1. **Higher reason/ BRAIN**
 - World of immortal ideas and concepts
 - Can't be extinguished
 - Highest part of the soul
 2. **Sensation/ HEART**
 - emotion
 3. **Appetite/ BODY**
- Brain can be a part of cognition
 - Also recognition of sensation/appetite being two separate elements



Aristotle (~400 BCE)

- Believed heart is seat of soul
- Brain just a cooling mechanism
 - The only function that the brain serves
 - The heart does so much/pumps so much blood, it needs a 'cooling mechanism'
- Rationale:
 1. Heart is affected by emotion, brain not
 2. All animals have a heart, not all animals have a brain



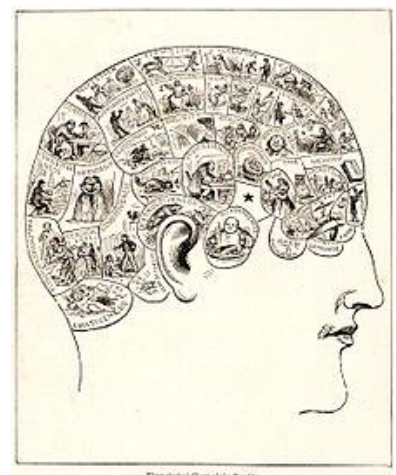
3. Heart is the source of blood, brain is bloodless
4. Heart is warm, brain is cold
5. Heart is connected to all sense organs, brain is not connected
6. Heart is essential for all life, brain is not
7. Heart develops first and last to stop working, brain formed second
8. Heart is sensitive to pain, brain has no pain receptors
9. Heart is central to body, brain is isolated

	Heart	Brain
Affected by Emotion	Y	N
Animals	All have	Not all have
Blood	Y	N
Temperature	Warm	Cold
Connected to all sense organs	Y	N
Essential for life	Y	N
Development	First (and last to stop working)	Second
Sensitive to pain	Y	No pain receptors
	Central to body	Isolated



Galen (130-200)

- More interested in **medicine** (than Plato & Aristotle - who were more traditional)
- Experimented with **animals** (to see how certain organs function/how blood flows)
- Demonstrated **how brain communicated with other organs**
 - Not an isolate thing
 - Isn't just the heart coordinating
 - If you suppress certain nerves/they will be influenced by info running to/from the brain
- However, he still believed in spirits
- **He concluded:**
 - Soul distributed via spirits that manifest through the ventricles and communicate between organs
 - Incorporating mythological/physiological approaches
- **Brain considered critical to cognitive function from this point on**
 - However, we still had a mythology to explain why
 - Still understood why
 - However, it changed perspective from just the heart controlling the body



The Renaissance and Phrenology (1450-1850)

- **Galen's views predominate until about 1500**
 - when a greater interest in exploring anatomy of the human brain and body arose
- Around **the period of the renaissance** there was a greater **interest in injury**
 - How this led to cognitive impairments
 - Looked at this relationship
- Interest in **brain injury and relationship to cognition** (e.g., impaired speech)
- Greater focus on brain and CNS as a regulator for cognitive function
- Increased interest in reflexes

- **Phrenology** was developed
 - Feeling around peoples head
 - If *shape of skull differed* = would person think/act in a different way
 - **The beginning of looking at the brain/linking certain aspects of development to cognitive processes**

2) Describe the **five discoveries** in the **19th century** that **preceded the cognitive revolution**

5 Discoveries in the 19th Century (1850-1950)

1. Cerebrospinal axis

- Clear identification that it's not just the brain but the CNS/connection b/w brain and spinal cord that drives human function

2. Growing impact of the reflex

- Practitioners tried to understanding involuntary reflexes from science basis
- Role of CNS

3. Localization of brain function

- Looking whether certain cognitive functions were lateralized in the brain
- Speech/language processing
- Frontal Lobes: language processing (broca/wernicke)
- Isolating functions

4. Nerve cell

- With advanced microscopes, scientists could see the presence of the neuron
- And importance for cognitive function

5. Disentangling communication between neurons

- Formed the foundation for modern neurophysiology
- Studying how neurons communicate
- Neurotransmitters
- How synapses fire etc.

Other Notable Theorists (1850 -1950)

- **Paul Broca (1824-1880):**
 - Localisation of speech in left frontal lobe
- **Carl Wernicke (1848-1905):**
 - Localisation of language understanding in the rear part of the left hemisphere
- **Santiago Ramon y Cajal (1852-1934):**
 - Established the *neuron doctrine*.
 - Positing that the brain consists of individual neurons that communicate with each other
- **Charles Scott Sherrington (1857-1952):**
 - Described mechanisms of the spinal reflex

~ Growing interest in the CNS and how it works

3) Explain the **rise of neuropsychology** and the **two problems** within this field

Rise of Neuropsychology (Late 1900s)

- **Prelude to neuropsychology:**
 - WWII and prosopagnosia
 - where *soldiers couldn't recall memories after injury to the back of the head*
 - Soldiers could not recall faces after injury to back of brain
 - Scientists wondered why

- Towards **later half of 20th century** psychologists took a much **greater interest in brain injury**; prior it had been **mostly physicians** that took this role
- Founded the journal '**Neuropsychologica**', first published in **1963**
 - Focused on localisation of brain function and consequences of brain injury
 - Aimed towards a theoretical link between psychology and physiology
 - Marked a major turn in theory
 - Bridged the link b/w neuroscience and doctors with psychology

Problems

- **Correlations difficult to draw**
 - between brain function and physical function
 - damage/function usually never specific to a single isolated brain region
 - Neuroscience became a study of correlation, but there were conflicting findings
 - Damage to brain doesn't always cause a clear correlation with cognitive function
 - We now know that various regions play a part in function
- **Implications are difficult to conclude**
 - Despite being able to see physical impacts of neurological damage
 - minimum impact on the study of normal function
- **Resolution:** Cognitive Neuropsychology (1980s)

Cognitive Neuropsychology (Late 1900s)

- More **explicit** between brain function and cognitive function
- **Rather than only associating** brain and observable physical function
 - How is thinking influenced by the brain?
 - Original focus on brain injury eventually turned to cognitive processing, including deficits and functions
 - Interested in how this thinking related to the brain
 - How the brain influences the mind, and vice versa
 - Came about in the 1950s
 - But looking back, it was really there all along
- **Result:**
 - Much broader relevance to clinical psychology and research outcomes
 - A cognitive framework for neuroscience allows us to draw more meaningful conclusions about brain function
 - Broader relevance to normal functioning/everyday lives
 - Easier to study neurological processes from a research perspective, with a better cognitive network to explain from
 - Understanding the mind

- 4) Analyse the case study of '**Capgras Delusion**' from a I. **Freudian Psychoanalytic** and II. **Cognitive Neuropsychological standpoint**

Example of why cognitive neuropsychology was important to consider: (CAPGRAS DELUSION)

DSM-5

- Delusion:
 - Strong empirical belief supported by empirical evidence
 - Person believes what they are perceiving is true
 - And this is backed up by evidence
- Examples:
 - Paranoia (sense of being followed),
 - Religious delusion (God communicating with me) etc.

- Approx. 75% of those diagnoses with *schizophrenia* experience *persistent delusions*

Capgras Delusion

- Persistent perception that a close family member has been replaced by an identical double
- Facial recognition of family member in-tact
- But, cognitively, does not recognise person as their child/partner;
- Leads them to believe their actual child/partner has been replaced
- By a clone/double
- Can be quite emotional/devastating
- Researches were interested in how this came about:



Explained through 2 paradigms:

1) Freud Psychoanalytic theory:

- **Original explanations** centred on this theory: this **was a dominant paradigm**
 - Misperception could be to do with projections related to 'father complex'
 - Due to unresolved feelings leading to diminished affect towards other family members
 - But, as more cases of Capgras Delusion appeared, the Freudian explanation didn't hold very well
 - Other types of cases started appearing
 - Weren't as easy to explain
 - Various contexts/scenarios
 - In **not all cases** did people experience a sublimation of repressed sexual energy towards their father
 - Didn't make sense anymore
 - As cases appeared across varied contexts, it was difficult to generalise Freudian assumptions more broadly...

2) Neurological Explanation:

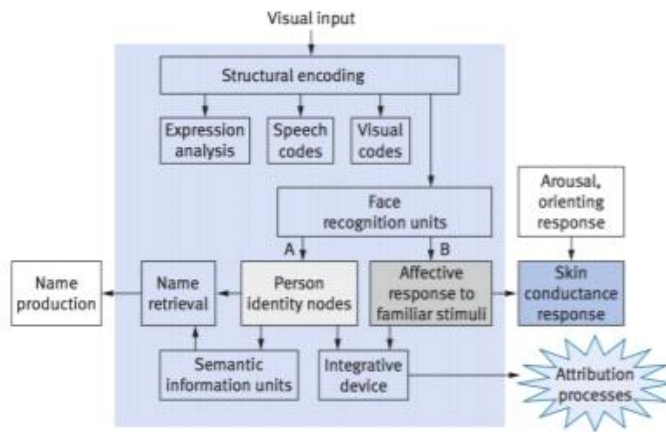
- **Disconnection** between the **temporal cortex** and the **limbic system**
 - *Temporal Cortex*: Facial recognition
 - *Limbic System*: Emotion
 - Why they recognize face but no emotional connection
- A better explanation that fits the diagnosis
- But needs a cognitive component to conceptualise the delusion

Through cognitive neuropsychology:

Neuro-cognitive Explanation:

- 1) A neuro-cognitive explanation provides both a neurological underpinning and cognitive representation of the delusion
- 2) Together, they explain how a person seems to perfectly recognise the face of their family member, while also experiencing decreased affective response, giving rise to the delusion

Input-Output models:



- How we process facial recognition
- Arousal response (galvanic skin response)
- If not having response/feeling -> develop the feeling it's not their family member
- Cognitive function described by neurological responses
- Provides useful conceptualisation

Follow-up questions:

1. When Capgras Delusion was first discovered, why do you think theorists were quick to form a Freudian analytical explanation, rather than looking at the empirical evidence in more depth?
2. Why was the neuroscientific explanation later accepted as more suitable, and the Freudian explanation invalidated?
3. Why is a cognitive conceptualisation of Capgras Delusion useful alongside a neurological explanation?

Part b. – Epistemological Perspectives:

- 5) Explore how **Piaget's** and **Vygotsky's** work contributed to **cognitive psychology** as a science

Lev Vygotsky (1896-1934)

- Russia
- Cultural-historical theory

Jean Piaget (1896-1980)

- Switzerland
- Cognitive Developmental Theory

Correspondence

1. Despite often being represented as polarized from a theoretical standpoint, Vygotsky and Piaget collaborated to a limited extent
2. Collaboration was not limited due to a lack of interest but due to difficulties communicating between Russia and the West, especially after the Iron Curtain was erected
 - Couldn't communicate because of circumstance
 - Not because didn't agree
3. Communication can be traced to 1924 when Vygotsky wrote to Piaget, proposing the notion that learning is a socially, culturally, and historically grounded process
 - Vygotsky stated that although Piaget's theories were sound, they were missing the cultural/social aspects



grounded process

→ Vygotsky stated that although Piaget's theories were sound, they were missing the cultural/social aspects

4. This discussion intermittently continued, and **both influenced each other's work**, providing commentary on each other's theories
5. **Piaget**, while acknowledging the social and historical impact on development (as a result of his interactions with Vygotsky) **ultimately emphasised the autonomy-driven** and standardised developmental processes of the child



Psychological constructivism

• Both theorists can be situated within a philosophical context of constructivism

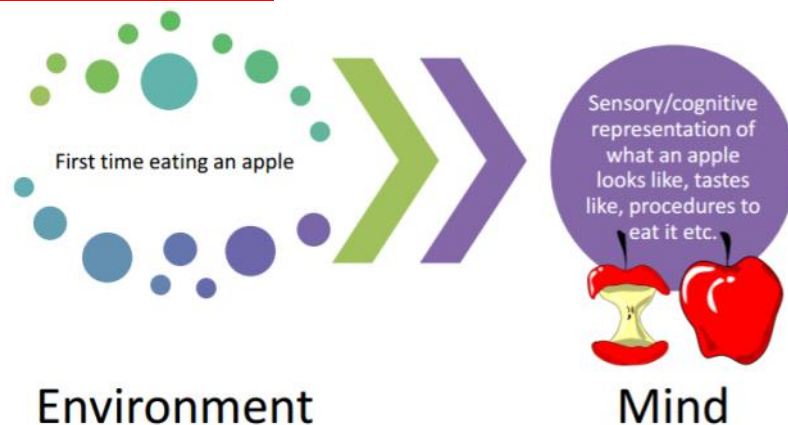
- Constructivism: how we construct knowledge in the mind
- Construction we make of the world
- How we construct representations

- Concepts within social phenomena are not 'thing like' products in solitary confinement but rather relate to transactions between human beings and the environments they are situated in
- Not static things in the external worlds

• In particular, both Piaget & Vygotsky significantly contributed to what we now know as psychological constructivism

- Knowledge and learning is not innate,
 - Not born with a representation of the world
 - but must always be situated within a given context for development
 - All psychological processes must be regarded in relation to social processes
 - There was a difference in the degree of this though
 - Although Piaget focused on the individual's development, he made it clear that this can never completely be divorced from their social environment
- There were other theorists that also contributed to this approach of psychological constructivism (e.g., George Kelley)

Construction (example)



- They develop or construct a sensory/cognitive representation of the apple
- So next time they see the apple they know what it is
- Piaget = assimilation/accommodation

Constructivism:

Piaget's model:

- We form mental constructions in order to best adapt and suit to the environment

- around us
- Accommodation/assimilation
- grounded in biological adaptation/survival principles
- Similar why to biological adaptation to the environment

Vygotsky:

- Similar concept but the main difference is Vygotsky believed constructions cannot be situated outside of:
 - ❖ Historical, social and cultural factors that give rise to constructions
 - ❖ Power dynamics inherent in a given society
- SOCIAL ENVIRONMENT IS CRITICAL
- And are reinforced by:
 - ❖ The subjective language system in a society
 - ❖ Symbolic mediation: (the 'tools' a given society uses)
- And... are collaboratively rather than individually developed

Different Hand Gestures Meanings Across the World:

<https://www.youtube.com/watch?v=OWFPHW7BCCI&feature=youtu.be>

- Demonstrates psychological constructs developed by cultural rather than environment
- Types of things Vygotsky was concerned with
- How language/culture etc. shapes constructs
- Versus Piaget, who was focused on the environment

Philosophical SIMILARITIES:

- ❖ Human action is **transformative**
 - *leads to active learning & cognitive development*
 - mind *not a passive container*
 - Child has *active role*
- ❖ Human action is **transactional**
 - occurs between a developing child and other factors
 - such as people, places, and things in their environment
- ❖ Knowledge is **not static**,
 - but rather a *dynamic representation* of the world
- ❖ Both **oppose** the notion that **knowledge/development is innate** and isolated from environmental influence
 - (e.g., both theories oppose Noam Chomsky's thesis of universal grammar which posits that language development is innate)
 - Both recognize environment
 - Language is actively developed and not in-built

Philosophical DIFFERENCES:

Vygotsky: Social basis

- Context = Marxist tradition, situated within a collectivist society
- ZPD + tools in society = collaborative learning and cognitive growth
- ❖ Development as transformation
 - Transformative collaborative experiences lead to learning and cognitive development
- ❖ Development as inherently social

Piaget: Biological basis

- Context = Darwinian school of thought, heavily influenced by principles of evolution
- Mind and knowledge evolve out of adapted behaviour in response to environment
- ❖ Development as adaptation
 - Learning and cognitive development help the child fit in better with their external conditions
- ❖ Development as autonomous and individual

experiences lead to learning and cognitive development

❖ **Development as inherently social**

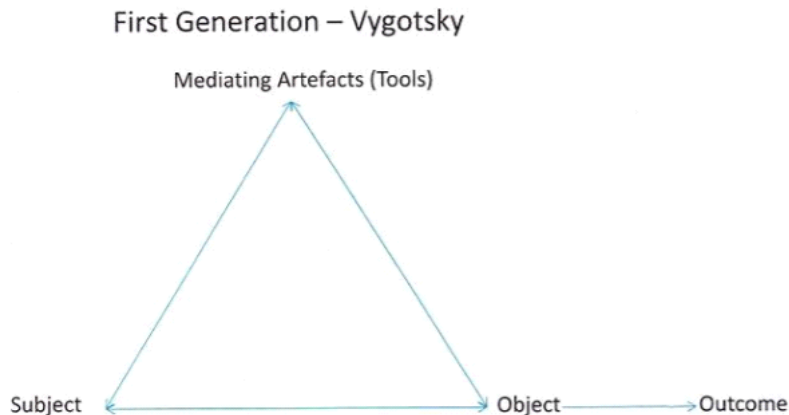
- Cognitive development is influenced by AND INFLUENCES the world a child grows up in through participation in collaborative activities

help the child fit in better with their external conditions

❖ **Development as autonomous and individual**

- Child develops alone as they explore the world around them, but may be influenced to some (limited) degree by social & historical factors

Vygotsky: CULTURAL-HISTORICAL THEORY



- The child will develop differently based on the tools provided by society
- Tools can be symbol or material
- Give rise to different developmental processes

Piaget: COGNITIVE DEVELOPMENT THEORY

- **Piaget rarely called himself a 'psychologist'**
 - More so saw himself as a natural scientist, interested at science more broadly
- **He was instead interested in *conceptualizing cognitive development to the same degree or rigor as our understanding of physical development***
 - Apply similar models to cognition as the ones in physiology
 - Why his model can be seen as quite rigid (wanted to make as clear-cut as possible)
 - Based on how cognition can be seen as an adaptive mechanism to environment
- **Questioned children on various task and found different conceptualisations**
- **Stage theory of development**
 - indicates what children *can* and *cannot* do until next stage
 - Can't go onto next stage without completing the previous
 1. Sensory-motor stage
 2. Preoperational stage
 3. Concrete operations stage
 4. Formal operations stage
- 6) Explain how Piaget's '**genetic epistemology**' is relevant in **cognitive psychology** as a science

Piaget's Genetic Epistemology:

- Piaget termed his collective theories on childhood development as a: **"genetic epistemology"** which he related to:

- 1) The formation of cognitive structures -> genesis (formation)
- 2) Through which we understand the world around us -> epistemology

→ Genesis [origin of] knowledge

- **Genetic epistemology situates:**

Stage- based cognitive development:

→ The four stages

WITHIN AN

Epistemology of psychological Constructivism

→ How the child creates knowledge within each of these four stage

- Progression of development AND how cognition is constructed
- The older a child gets, the better they are at understanding the world

Piaget's unique epistemology: Perception and knowledge of the world is not innate

→ "behaviour is the motor of evolution" - Piaget

Contrasting Piaget's Epistemology with that of Immanuel Kant:

Immanuel Kant (1724-1804)

- Major philosopher that contributed to cognitive science we know today
- We construct the world through categories of perception?
- Depends on the mind of the perceiver
- We perceive the world through our senses
- Making sense of the world depends on the mind of the perceiver
- Major philosophical antecedent to modern cognitive science
- **"Critique of Pure Reason"**
 - Innate categories of knowing, 'a priori' or 'posteriori' knowledge
 - **Is experience necessary for knowledge?** - how to distinguish
 - Can we know these things without having personal experience of it?
 - '5+5 = 10'? (yes) "It is raining outside? (no)
 - Some knowledge can only be gained through experience rather than theory
 - Corresponds broadly to the rationalism v empiricism debate

Kant:

- Innate categories for perceiving and understanding the world
- Intuitive concepts are hard-wired:
 - **Example:** Time, space, cause and effect, quantity
- *"Concepts without intuitions are empty, intuitions without concepts are blind"*

Piaget

Challenges to Kant:

- Concepts are not hard-wired but learned through adaptation to environment
 - Piaget believed our understanding of these concepts was not innate
 - Understanding of these concepts developed with time and experience
 - Demonstrated through object permanence etc.
- Major philosophical challenge to Kant:
 - cognitive development arises through stages
 - sequential
 - as opposed to looking at 'a priori' or 'posteriori' distinctions in knowing
 - Piaget argued that via specific stages of cognitive development over a period of time we develop a more complete representation of the world

Distinguishing Cognition from Base Intelligence

- Originally cognitive scientists were interested in looking at Intelligence as the base of cognition
- Piaget received his PhD in natural science at age 22 (1918)
- In the same year as receiving his doctorate he studied under Jung and took an interest in psychoanalysis
- In 1920, he worked in collaboration with Théodore Simon at the Alfred Binet Laboratory in Paris
 - Evaluated standardised tests to measure intelligence (now known as IQ tests)
- **Binet-Simon Scale of Intelligence:**
 - intelligence varies quantitatively with age
 - Single value of intelligence/allowed to quantify intelligence
- Piaget had a problem with this assertion
- *Piaget witnessed that younger children make more errors than older children do*
- However:
 - Not due to being less intelligent
 - When children *explained the logic* of their incorrect answers, *it all made sense*
 - They have an underlying logic or cognitive structure
 - They didn't lack reason, **they lacked experience**
- Piaget proposed that intelligence varies quantitatively and qualitatively with age
 - What if four stages aimed to do (look beyond intelligence, and involve development of increasingly complex understanding of the world)
 - Maturation and experience
 - Cognitive structures become more articulated and behaviours become more adaptive and complex
 - Cognition is more than intelligence and it differs in ways across age

Back to the Cognitive Revolution:

- **It is difficult to engage in any discourse without thinking**
 - Bit of a paradox
 - thereby our study of cognition necessitates the use of cognition in the first place!
 - We explored how cognitive psychologists hone these tools by enacting the Socratic Method or Hegelian Dialectic in semester 2 last year, but the issue remains
 - We must use cognition to conceptualise of cognition, we cannot avoid it:
 - Theory-theory: All children seem to ask 'why?' until they formulate workable theories of the world
- **Was there ever a cognition revolution, OR merely increasingly more accurate conceptualisations of the nature of cognition?**
- After all, when we think about 'psychology' we cannot help but refer to mind and cognition

7) Consider the cognitive revolution from a **Kuhnian** perspective of paradigm shifts

What is a revolution in science?

- **Max Planck** (1858-1947)
 - "A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it... Science advances one funeral at a time."
- **Kuhn drew upon this,**
 - Paradigm is a cohesive set of ideas, scientists within that field sit with those ideas
 - **Don't introduce radical treatment/extreme ideas, because they sit outside of those cohesive set of ideas/practical practice**
 - Paradigms can be changed/challenged -> this is how they progress

- **Status of cognition** (i.e., memory, attention, language, reasoning):
 - Between 1930 and 1950, **cognition was ignored**
 - Mental events didn't exist,
 - Or If they did exist, they were epiphenomena of brain activity
 - It was really only during this period that strict behaviourism/positivism was employed
 - Before this, there was always a focus on cognition
 - So did it really disappear altogether or just put to this side?
 - Psychology has always been cognitively orientated
 - **We are now in a cognitive phase/paradigm of psychology**
 - (But psychology has always been cognitively oriented)

Kuhnian Paradigm:

- "The structure of Scientific Revolutions" 1962, Thomas Kuhn (1922-1996)
- **Science occurs within a certain context**
- Can't ignore the context
- **He introduced the term 'paradigm'**
- **Paradigm** can be defined as:
 - "the *entire constellation of beliefs*, values, techniques and so on *shared* by the members of a given [scientific] *community*"
- Drew on that said by Max Planck (see above)

Example:

- Laws, assumptions, proven methods, acceptable concepts and practice in a given discipline
- Psychology could be considered a paradigm (what are the shared beliefs within it)

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Kuhnian Paradigm Shift:

- Because b/w 1930 -1950 we lost the focus on cognition, it's not to say this disappeared altogether
- Knowledge never completely disappears
- This notion of cognition didn't disappear altogether
- During this time, the notions of cognitive psychology didn't vanish, they were more latent/underlying the dominant paradigm at the time (behaviorism)

What constitutes a paradigm shift:

1) Pre-science

- Looking at examining concepts outside of the scientific method/discipline working with
- *Example:* dreams/hypnosis (weren't considered apart of psychology, but are not apart of the psychology paradigm)
- Previously pre-science/not a part of the paradigm

2) Normal Science

- Psychology today
- Regarded as a science
- With particular conventions, methodology, concepts that are acceptable
- Radical concepts that aren't acceptable will be out of this paradigm
- Psych does a pre good job at explaining cognition, but it cannot fully explain everything (like any science)
- Science addresses most questions it aims to
- There are some questions that can't be explained

3) Model Drift

- If there are too many things that can't be explained,
- It causes a 'drift' in that particular science
- Some will ask the question: is this still valid? If we cannot explain?
- The paradigm is still quite fixed
- Some disgruntled scientists that the science can't explain too many anomalies
- Are the assumptions still valid?

4) Model Crisis

- More and more scientists can't explain certain phenomena with tools that are

- relied on
- While some scientists are saying "no we can explain this, just with time etc.)
- There is now a conflict/crisis b/w scientists in the paradigm

5) **Model Revolution**

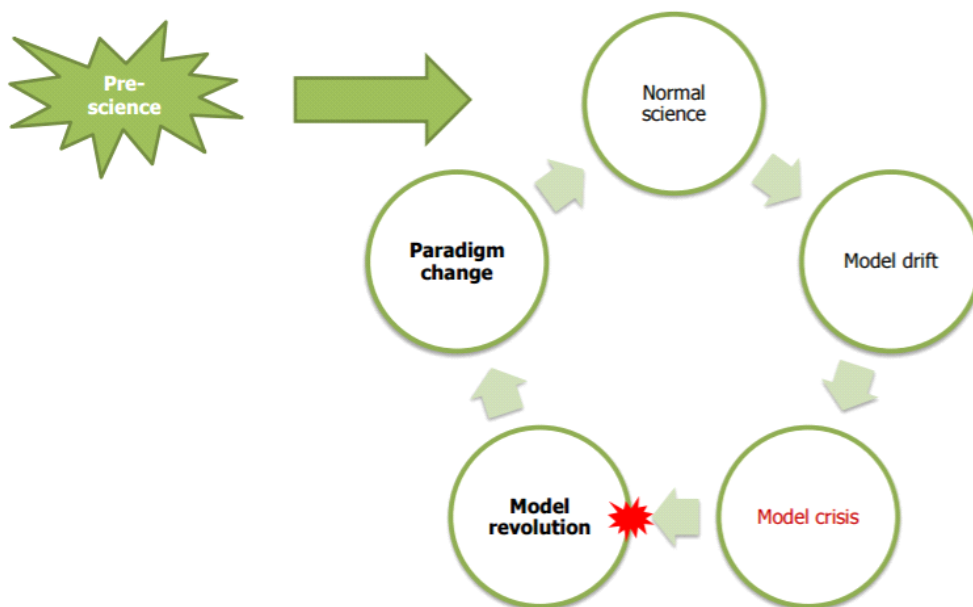
- There will be a clash until something gives way in the model
- There may be too many anomalies to explain
- Or there could be a new discovery/invention that changes the way of thinking/exploration
- This leads to a revolution

6) **Paradigm Change**

- This eventually leads to a change within the paradigm

Was cognitive psychology bought about as a model revolution when behaviorism model was under crisis?

- Many different perspectives on this
- Eg. Cognition was always there
- Cognitive revolution will say that behaviorism couldn't explain everything and interest in cognition arised through this.



Examples of paradigm shifts:

<u>Year</u>	<u>Old Paradigm</u>	<u>New Paradigm</u>
1543	Geocentric model - Earth is flat	Copernican heliocentric cosmology - Earth is round
1783	Phlogiston theory	Acceptance of Lavoisier's theory of chemical reactions and combustion ...known as the chemical revolution
1859	Evolution as goal-oriented	Darwin's natural selection - Adapted to environment
1905	Classical mechanics	Quantum mechanics
1905	Classical Newtonian Physics	Einsteinian relativistic worldview

- There will be a resistance before the shifts occur
- Usually a good thing
- **The more stable the science, the more dramatic, but possibly less likely, the potential paradigm shift**

- Eg. For a change in physics to occur, it must be a big one

“Thomas Kuhn Paradigm Shift Award” presented to theorists who present alternative perspectives and models that are at odds with mainstream scientific understanding – paradigm shifts are a good thing and important for the progression of science!

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The more stable the science, the more dramatic, but possibly less likely, the potential paradigm shift – e.g., physics

How Science Proceeds

- **The questions ‘allowed’ by the paradigm are investigated**
 - Other explanations will be put to the side
 - Eg. In behaviourism, only those that fit behaviourism will be accepted
 - Psychodynamic explanations will be put to the side
 - Only focus on behavioural explanations
- **Accepted methods of investigation are used**
- **What is investigated is limited by the paradigm**
 - What is explored is limited by the paradigm
 - Advantage: by looking deeply into those processes
- But what is investigated is really investigated
 1. Anomalies are reported
 2. These are persistent observations that the current paradigm can’t explain
 3. Some scientists will offer a new viewpoint that explains the old observations and the anomalous observations
 4. Adherents to the current paradigm resist strongly
 5. Eventually, the scientific community will adopt the new viewpoint
 6. A paradigm shift has occurred!

- **Science progress = scientific method + the psychological make-up of the scientist**
 - So the scientific process is not just the scientific method
 - It is also the context of society that is using the scientific method

8) Provide **alternative explanations** for the rise of cognitive science

Alternative Explanations

Cognitive Psychology was not a revolution/cognitive revolution because:

1. Cognitive science **was already around but less prevalent** in certain periods
 - People have always been interested
 - It was only in the brief period where behaviorism dominated it was forgotten
2. The introduction of cognition to **complement** the study of behaviour was **progressive rather than radical**
 - not really in crisis
 - Suggests wasn't a paradigm shift
 - Introduced progressively rather than radically

3. People have **always associated** psychology with **thought processes**

- (i.e., cognition)
- cognitive science focused on prior theoretical assumptions

4. Cognitive psychology **BUILDS** on behaviorism rather than replacing it

- could be more of an evolution of theoretical frameworks
- Evolution/refinement of theory rather than revolution of theory

If not a Kuhnian paradigm shift then:

1) **Refined methods**

- Better methods at looking at cognition
- of establishing neural correlates that correspond to cognitive processing
- allowed cognitive science to establish itself to a greater degree

2) **Neuroscience** as a discipline, while grounded in tangible observations, has shown **deficiencies**

- which **cognitive science** can fill

3) More **rigorous testing** has allowed us to demonstrate real-world **applications of cognition** such as those related to perception, memory research, and decision-making

- (e.g., risk and gambling)

4) But still unanswered questions?

Revolution or resolution?

The future for Psychological Science

1) PRE-PSYCHOLOGY:

• PRE-PARADIGMATIC STAGE

- a) Philosophy IS psychology
- b) Many competing viewpoints
- c) No unifying theory
- d) No formed theory/just ideas that come together

1) PSYCHOLOGY:

• PARADIGMATIC STAGE

- a) Accepted epistemology (way of looking at knowledge)
- b) Accepted methodology (how to do research/experiments etc.)
- c) Legitimated practices and procedures (APA etc.)
- d) Where we are now
- e) However, are we in crisis now? Is a new paradigm on the horizon now?

1) WHAT'S NEXT?:

• REVOLUTIONARY STAGE..?

- a) A new paradigm displaces the old
- b) Will psychology just disappear?!
- c) This could be **embodied cognition?**
- d) **What will happen to psychology when we expand our idea of human behaviour**