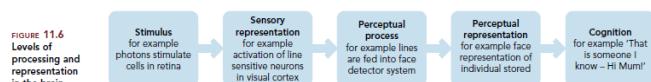


## Lecture 3 Piaget & Cognitive Development

### Hierarchy of Processing & Representation in the Brain



Plato (a rationalist):



from within

Locke (an empiricist):



from without

Piaget (a constructionist):



from the *interaction* between the child and the environment

The child constructs their own reality (*constructivism*)

The child is a little scientist – accumulating data to test hypotheses, and re-evaluating these on the basis of negative evidence

Jean Piaget  
(1896-1980)

- childhood interest in biology
- studied biological adaptation
- worked on first IQ measures
- interested in errors of reasoning
- prolific writer



### Why?

Why are we having a whole lecture on a guy whose work:

- was published in the 1<sup>st</sup> half of the last century
- was pretty impenetrable even then:  
"In stages IV and V there is progress towards symbolisation to the extent that the development of ludic assimilation leads to a sharper differentiation between signifier and signified"
- and has been seriously criticised since (see next lecture)?

### Because:

Piaget wrestled with the big questions of developmental psychology that we have already struggled with ourselves

- What is the child's task in development?
- Is the child 'precocious' or not?
- What is innate and what must be learnt?

### What's the theory?

The key question:

*Where does knowledge come from?*



## Piaget's Stage Theory

TABLE 11.1 Piaget's four stages of cognitive development	
Stage	Characteristics
Sensorimotor (birth–2 years)	Infant experiences world through movement and senses, develops schemas, begins to act intentionally, and shows evidence of understanding object permanence
Preoperational (2–6 years)	Child acquires motor skills but does not understand conservation of physical properties. Child begins this stage by thinking egocentrically but ends with a basic understanding of other minds
Concrete operational (6–11 years)	Child can think logically about physical objects and events and understands conservation of physical properties
Formal operational (11 years and up)	Child can think logically about abstract propositions and hypotheticals



### Four Characteristics of Theory

- a) constructionist
- b) stage theory
- c) invariant sequence
- d) universal



## Piaget

- How does the child construct reality?

Begins in a state of *adualism* (self and world undifferentiated) see also solipsism

Innate reflex actions prompt them to interact with the environment

This tells them what is self-generated and what is world generated



### Sensorimotor Period

Knowledge of physical world fundamental to all intelligence

Representation is critical

Infant constructs knowledge and representations through action

Initially, there is no knowledge and representation

Newborns are in an extreme form of solipsism

"In other words the true solipsist has no idea of self. There is no self: there is the world." Piaget (1927)



## Piaget

- Construct mental structures or 'schemas' which evolve or 'adapt' through innate processes of



*Assimilation* (bringing in new information that fits an existing schema)

and

*Accommodation* (modifying existing schema in light of new experiences)



## Infant Development

- The sensorimotor stage

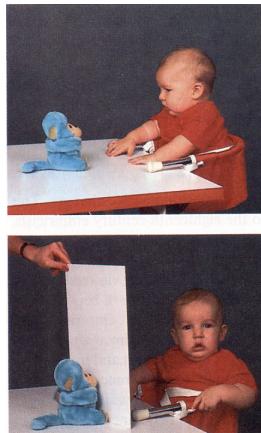
Substages reflecting the move from adualism (solipsism), through action upon the world, to thought independent of action. E.g.,:



## Infant Development

- *Stage 4 (8-12 mths)*
- Child pulls a cloth towards themselves in order to get a toy resting on it
- Increasing sophistication of object schemas, but these are object based – thought through action, rather than mental representation





### Stage III "Out of Sight, Out of Mind"

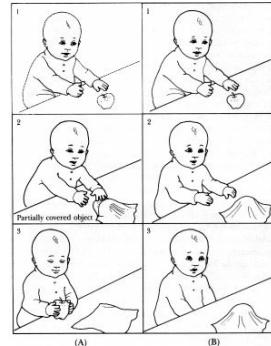
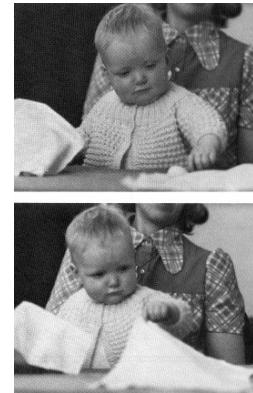


FIGURE 7.1 A Stage III infant will reach out and take a partially covered object (A) but is unable to obtain an object that has been completely covered by a cloth (B).

### Stage IV "A not B Error"

This infant at Stage IV has already found the toy under the left cloth (A) on a number of trials.

When the toy is hidden under the cloth on the right (B), the infant returns to location (A)



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## A not B Search Error



### Stage V Invisible Displacements

Although the infant can represent the continued existence of a hidden object, they are unable to represent the movements of that object.

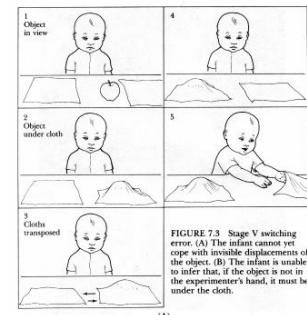


FIGURE 7.3 Stage V switching error. (A) The infant cannot yet cope with invisible displacements of the object. (B) If the infant is made to infer that the object is now in the experimenter's hand, it must be under the cloth.

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## Infant Development

- Emerging from the sensorimotor stage

### *Symbolic thought*

At sensorimotor stage 6 (18-24 mths) schemas become freed from action – get mental representation – can act on thoughts as well as objects

## Infant Development

- This has effects across the board at around 18 months
- object permanence  
objects are represented mentally
- the vocabulary explosion  
words are understood as symbols
- pretend play  
one object represents another



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# Child Development

- Childhood—discovering our minds
- Consists of 2 stages:
- (1) Preoperational stage—discovering our minds
- (2) Concrete operations stage
  - conservation
  - mental representations

Preoperational children fail conservation tasks.

They are perceptually bound.

Children <7 yrs focus on one dimension only.

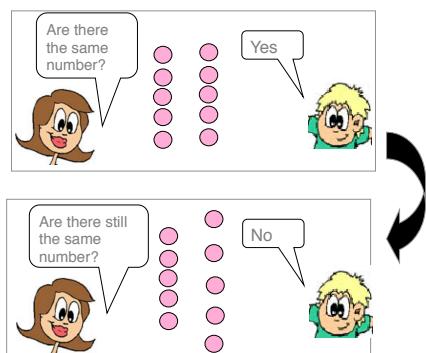
Conservation task	Original state	Transformation
Liquid	Is there the same amount in each glass?	Are they the same now?
Number	Are there the same number in both boxes?	Does one now have more?
Length	Are they just as long as each other?	Are they just as long or is one longer?
Mass	Is there the same amount of clay in each ball?	Are they still the same?
Weight	Will these two balls of clay weigh the same?	Will they still weigh the same?
Volume	Will the water level rise the same in each glass if the two balls of clay are dropped in?	Will the water level still rise by the same amount?

Figure 8.1 Piaget's conservation tasks (from Pidgeon & Insetter, 1995). Reprinted by permission of Psychology Press Limited, Hove, UK.

# Child Development

## Conservation

- failure to conserve both length and density



# Child Development

- see also for quantity:



Appearance-Reality Distinction (Flavell 1983)

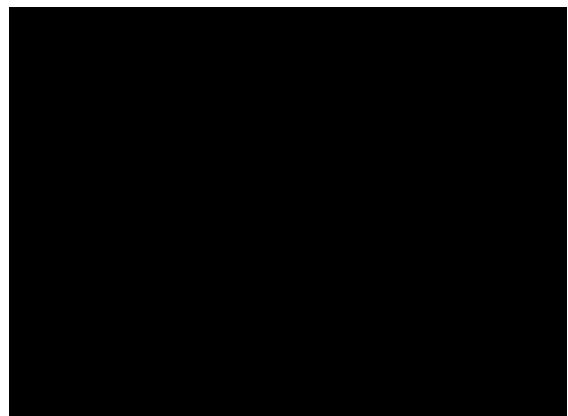
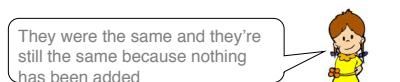
# Child Development

- Emerging from the pre-operational stage

Realise the logical necessity of conservation

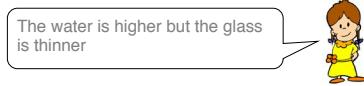


- mental operation of identity



# Child Development

mental operation of compensation



mental operation of reversibility



# Adolescent Development

- Formal operational stage—11 years through adulthood
- Childhood ends when formal operations begin
  - abstract reasoning
  - some mental representations have no physical referent

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## FORMAL OPERATIONAL THINKING



Figure 15.6 The balance scale task.

Combinatory thinking: thinking about two things simultaneously

## Formal Operations

Piaget argued that all children develop into adolescents capable of logical reasoning (Formal Operations Stage)

Problem is that many adults fail logical problems.

- E.g. All A are B  
All B are C  
Then All A are C  
Some A are C
- BUT All C are B  
All B are A  
Then All A are C  
Some A are C

abstract reasoning  
is harder than  
concrete  
examples

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# Summary

- Aims

- Think about whether development gradually or in discrete steps

*Piaget accepts a gradual process of assimilation, but his theory is really about the step-wise changes that occur through accommodation*

[quantitative vs. qualitative change]

But is Piaget's description & explanation accurate?

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