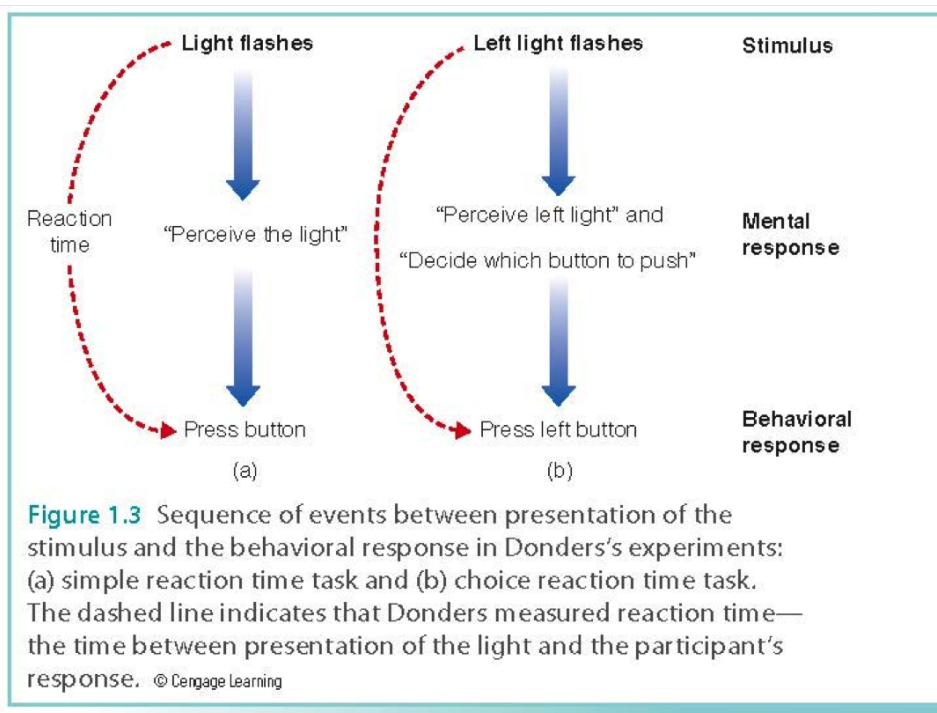# WEEK 1 SUMMARY:

Chapter 1:
- The mind is involved in many processes & can be described in many ways:
  - Memory, problem solving, make decisions, normal functioning, valuable, intelligence.
  - *The mind creates and controls mental functions such as perception, attention, memory, emotions, language, deciding, thinking and reasoning.*
  - *The mind is a system which creates representations of the world so that we can act within it to achieve our goals.*
- History of cognitive psychology:
  - 1800's:
    - Donder's experiment- interested in how long it took for a person to make a decision. Measured reaction time (simple and choice). Mental responses cannot be measured directly, but must be inferred from behaviour.

Figure 1.3 Sequence of events between presentation of the stimulus and the behavioral response in Donders's experiments: (a) simple reaction time task and (b) choice reaction time task. The dashed line indicates that Donders measured reaction time— the time between presentation of the light and the participant's response. © Cengage Learning

- Wundt's experiment: first psychological, scientific experiment. According to structuralism, our overall experience is determined by combining basic elements of experiences the structuralist's call sensations.
  - Tried to create a list of basic sensations involved in experience using analytic introspection.
  - Structuralism was abandoned in the early 1900's.
  - He was the first to conduct psychological experiments with a controlled condition.
- Ebbinghaus's experiment: interested in determining the nature of memory and forgetting, specifically how much information learnt is lost over time.

- Made up nonsense words and spent time learning and relearning the list.
- Used a measure called savings.
- Forgetting occurs rapidly in the 1-2 days after the original learning.
- James: based on observations about his own mind. Found that paying attention to one thing involved a withdrawal of others
  - 1900's
    - Behaviourism: developed by Watson, wanted to restrict psychology to observable data. Most famous experiment was "little Albert"
      - Watson's ideas are associated with classical conditioning, inspired by Pavlov.
    - Skinner: focused on operant conditioning

Skinner Box: Negative Reinforcement

- Rat was subjected to unpleasant electric current
- Accidental lever pressing – switched off electric current
- The consequence of escaping the electric current (an aversive stimulus) ensured that it would repeat the action (of lever pressing)
- Subsequently: A light would be switched on, just prior to electric current
- Thus lever pressing after the light was negatively reinforced
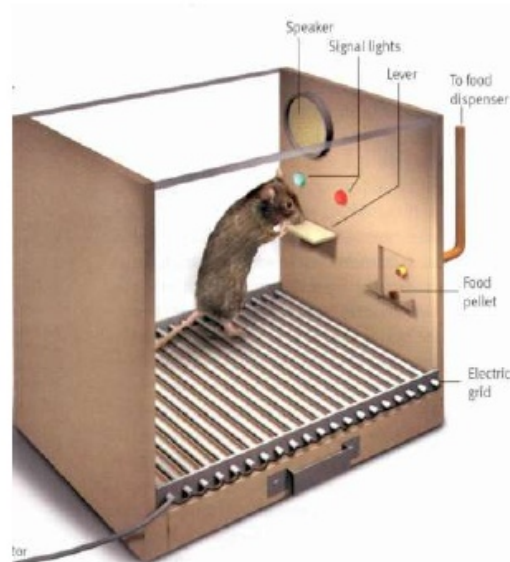
- Cognitive map
- Learning language:
  - Chomsky proposed the language acquisition device.
  - Skinner proposed language was learnt from operant conditioning
  - Chomsky's idea lead psychologists to reconsider the idea that language and other complex behaviours were not to only be measure observable behaviour but also to consider how this behaviour tells us how the mind works.
- Cognitive resolution (1950's)
  - Introduction of the computer:
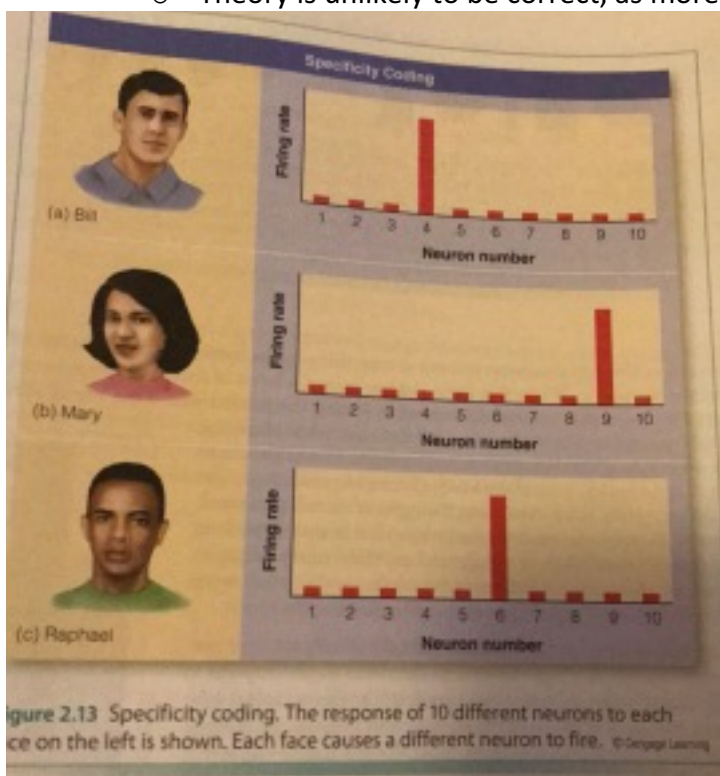   - Information processing approach
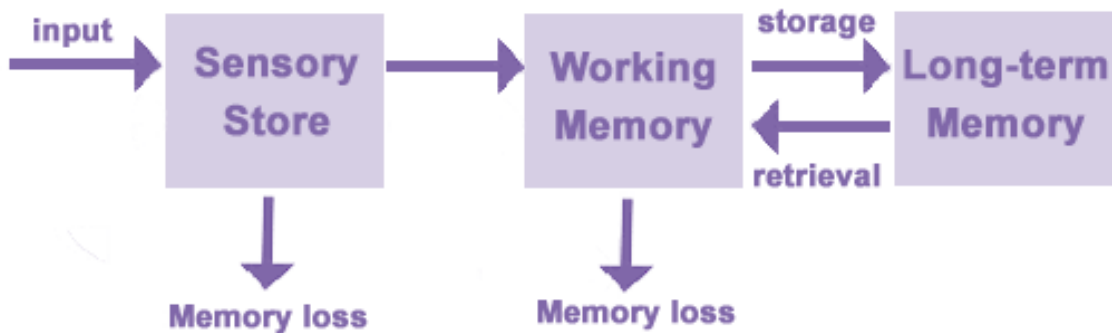
> > > ▪ ^ stage for memory/mind, similar to computers
> > > > • input processor → memory unit → arithmetic unit → output
> > o Attention:
> > > ▪ Example of attention: listening to 2 different headphones and only concentrating on one. Participants reported hearing both but only concentrating on one.
> • Artificial intelligence
> > o Making a machine behave in a way that would be called intelligent if a human were so behaving.
> > > ▪ Logic theorist: computer program that had same base of logic to it
> > o Found out that humans could only remember around 7 things at a time.
> • Research progresses from one question to another
> • Models are representations of structures or processes that help us visualise/explain the structure of process.
> > o Structural models: represent structures in the brain that are involved in specific functions.
> > > ▪ Purpose of models is to simplify, they cannot contain all the information being represented
> > > ▪ By being simpler, it is easier to study and understand
> > o Process models: illustrate how a process operates.
> > > ▪ Often shown in boxes
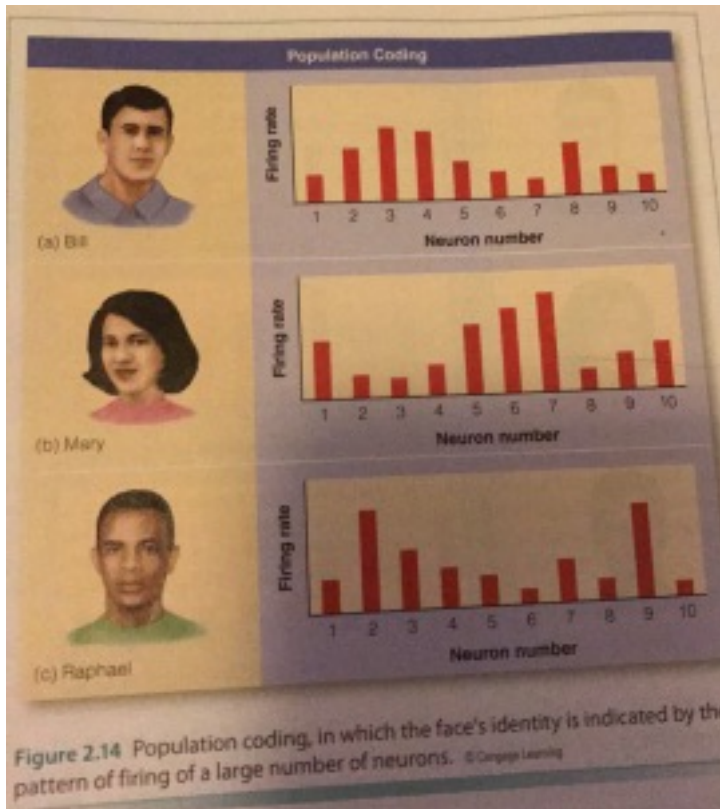> > > ▪ Can make complicated systems easier to understand

Chapter 2:
> • Levels of analysis: refers to the idea that a topic can be studied in a number of different ways, with each approach contributing its own dimension to our understanding
> > o We can consider measuring behaviour to be analogous to measuring the car's performance and measuring the physiological processes behind the behaviour
> • Quality of the senses refers to the different experience associated with each of the senses EG perceiving light for vision.
> • Quality within a particular sense: such as shape or colour.
> • Action potentials determine different qualities.

- Feature detectors: neurons that respond to specific stimulus features such as orientation, movement and length.
  - Found this through Hubel & Wiesel's experiment with the cat and stimuli
- Gross's experiment involved anesthetised monkey's whose neuron activity was shown. They found that some neurons only fired to complex stimuli
- Hierarchical processing: processing which occurs from lower to higher levels of the brain. IE see a shape, lower brain knows it is triangle, however sensations say differently. Both senses go to higher regions of brain to tell it is Dorito.
- Sensory coding: refers to how neurons represent various characteristics of the environment
- Specificity coding: the firing of a specialised neuron that responds only to that object. IE one neuron to recognise Mum, one neuron to recognise Dad.
  - Theory is unlikely to be correct, as more than one neuron usually responds.

Figure 2.13 Specificity coding. The response of 10 different neurons to each face on the left is shown. Each face causes a different neuron to fire. © Cengage Learning

- Population coding: representation of a particular object by the pattern of firing of large numbers or neurons.
  - Good evidence for this theory

Figure 2.14 Population coding, in which the face's identity is indicated by the pattern of firing of a large number of neurons. ©Cengage Learning

- Sparse coding: occurs when an object is represented by a pattern of firing of only a small group of neurons. Most neurons remain silent.
  - A neuron can respond to more than one stimulus
  - Possible that this type of firing helps remember memories

Figure 2.15 Sparse coding, in which the face's identity is indicated by the pattern of firing of a small group of neurons. ©Cengage Learning
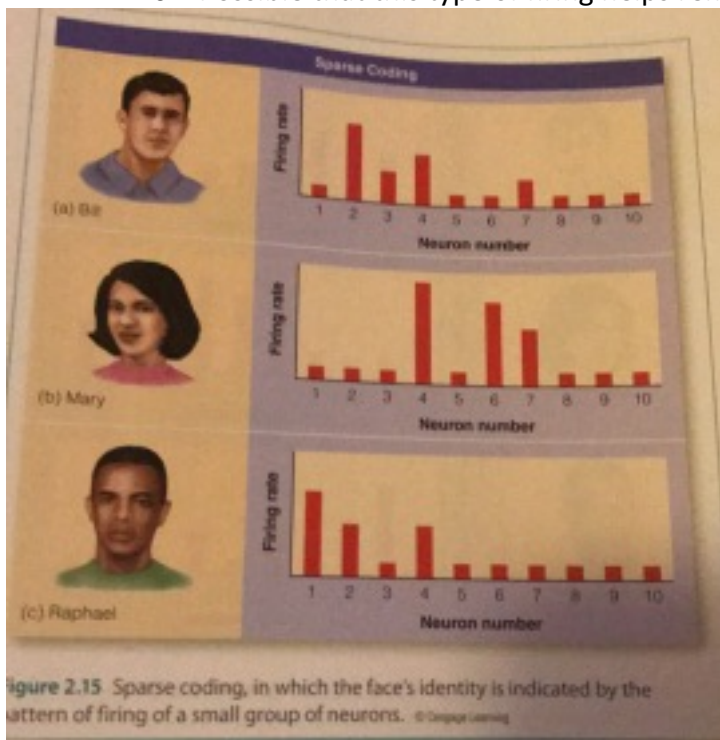
- Localisation demonstrated by neuropsychology
  - Wernicke's area- speech is fluent and grammatically correct but incoherent.
  - Broca's area- cannot produce language but can understand it.

- o Other localisations:
  - Occipital lobe = vision
  - Parietal lobe = senses
  - Temporal lobe = hearing
  - Frontal lobe = coordination of above.
- o Prosopagnosia: inability to recognise faces. Can recognise the shape but not the person.
- o Double dissociation: occurs if damage to one area causes function A to be present while B is absent and vice versa.
- Localisation demonstrated by recording neurons:
  - o Brain imaging:
    - MRI (magnetic resonance imaging): possible to create images of the <u>structures</u> in the brain
    - fMRI (functional magnetic resonance imaging): enables various types of cognition to activate different areas of the brain.
  - o Imaging for localisation of functioning:
    - Fusiform face area: distinguishes who are people are
    - Parahippocampal place area: info about spatial layout.
    - Extrastriate body area is activated by pictures of bodies and body parts.
- Distributed representation across the brain
  - o Distributed representation: specific cognitive functions activate many areas of the brain
- Diffusion tensor imaging is based on detection of how water diffuses along the length of nerve fibres.