# Centre for Brain and Cognitive Development
# The First 10 Years and beyond

Michael Thomas (2002)

CBCD 21st Anniversary Workshop
Mary Ward House
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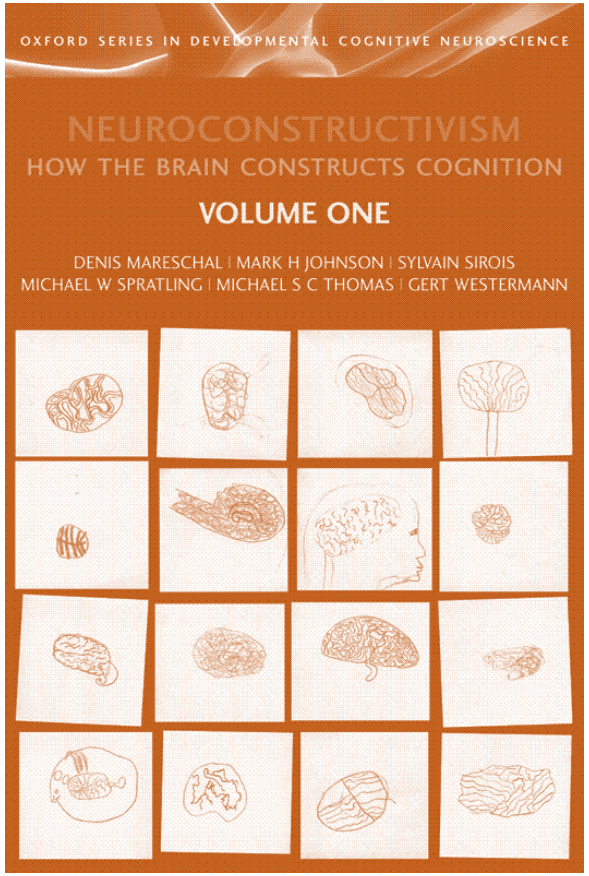
# Where I came from:

- Atypical development
- Williams syndrome
- Modularity, representational redescription
- Developmental trajectories
- Computational modelling

# Impressions of the CBCD when I arrived

- On TV / in the media a lot
- Testing lots of babies!
- Very bothered with where babies were looking
- Faces
- EEG
- Very Biological
- Typical development
- Interactive specialization, sensitive periods

# Developing ideas at the CBCD




# We couldn’t agree on the difference between ‘Learning’ and ‘Development’

| | Timescale | Reversi-bility | Age of onset | Rate | Passive or Active? | Domain general vs. specific | Underlying mechanisms | Type of info processed | Inductive method |
|---|---|---|---|---|---|---|---|---|---|
| **Learning** | Quick<br>One shot | More reversible (forgetting) | Later in life<br>Episodic? | Can be increased through practice | Passive internalisation | Specific to task | Strengthen synapses within architectures? | Experiences of an individual | Search hypothesis space given experience |
| **Development** | Slow<br>Several years | Less reversible | Earlier in life | Cannot be accelerated | Active exploration | Global across domains | Morphological changes of neural architectures? | Experiences common to all members of species | Alter / enrich hypothesis space |

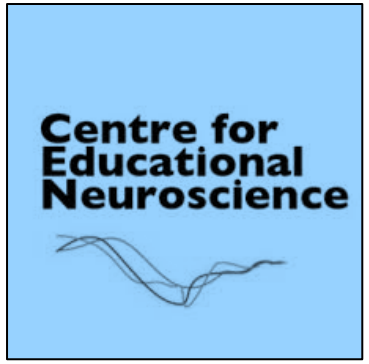
# Lots of activity on the surface, underneath things gradually move…

# CBCD moves…

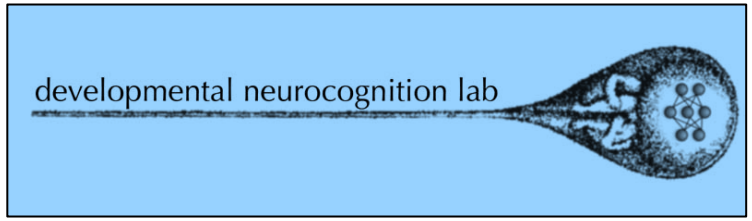
- Developmental disorders
- Autism, ADHD, Down syndrome
- At risk sibling studies
- Interventions
- Natural pedagogy
- fNIRS
- Global health
- Infants and technology

# My moves…

- Educational neuroscience




- Computational modelling of variation in typical development
  - Genetic versus environmental influences on developmental trajectories




# What I've learned (theoretically)

- What's special about human development?

- What changes in how the brain works across development? (… not learning!)

# What I've learned (theoretically)

- What's special about human development?
  - Mammalian central nervous system is selected by evolution for generality / flexibility (similar plan across species)
  - Species specialisations come from:
    - Sensory or motor periphery forcing structure on CNS
    - Changes in neuromodulators altering social motivation and attention
    - Flexible reallocation of neural tissue to active channels (neuronal recycling is the main principle of operation)
  - Insight into the origin of uneven cognitive profiles in heritable developmental disorders?

Evo-devo


- What changes in how the brain works across development? (… not learning!)
  - Resolution of the specialized systems increases
  - Speed of communication between neurons increases
  - The modulatory system is slow to develop - gradually improves in its ability to control the specialized systems according to goals and context
  - Brain better able to build plans that stretch deeper into the future
  - Learns basic lessons about 'what works to get what I want', whether people are to be trusted
  - Dynamic coordination of all the parts of the brain improves, including the interface of plans, emotions, and actions
  - Motivations change at puberty, altering social behavior, decision-making and environment