

Connectome

Grace Zhao

Computer Science



THE UNIVERSITY OF
TENNESSEE
KNOXVILLE

BIG ORANGE. BIG IDEAS.®

Connectome

Connectivity of brain

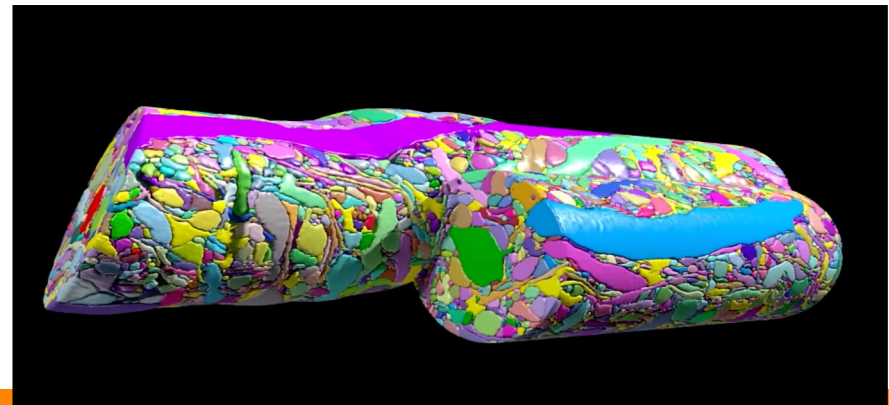
- Functional and structural
- Microscopic level
- Macroscopic level

Connectome

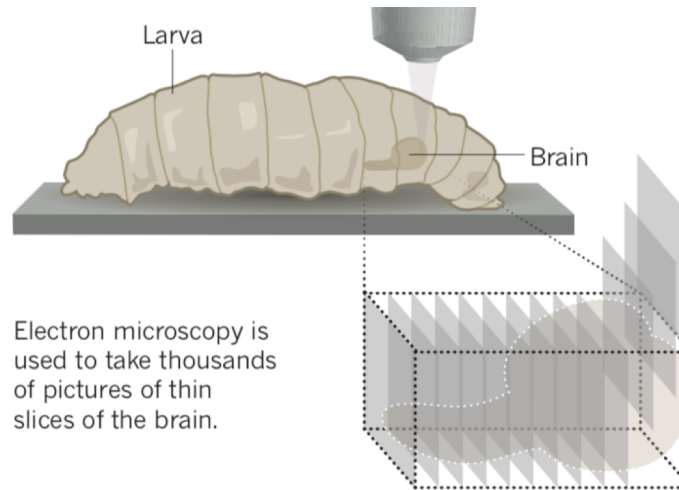
- Structural connectivity
- Functional connectivity
 - Real time

Microscopic Level

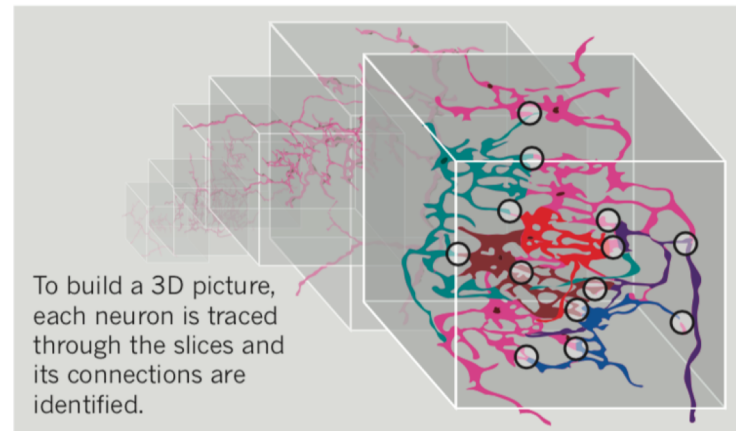
- Connection between neurons
- 1 millimeter cube – on going
- Brain slides
- Require resources
- Tremendous amount of data



Brain Slides



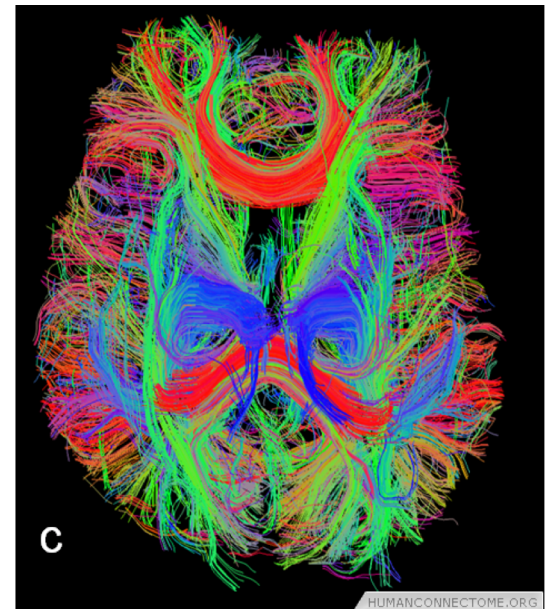
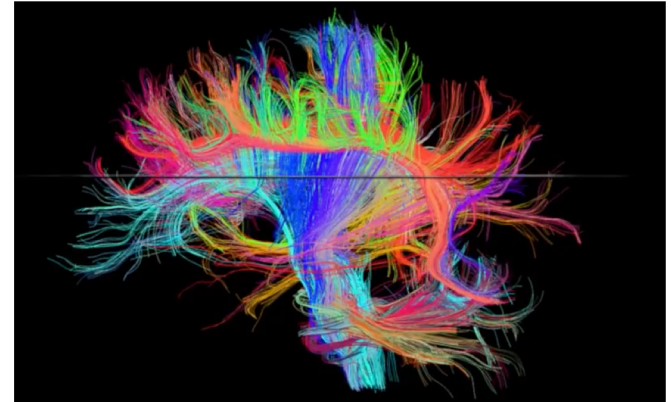
Electron microscopy is used to take thousands of pictures of thin slices of the brain.



To build a 3D picture, each neuron is traced through the slices and its connections are identified.

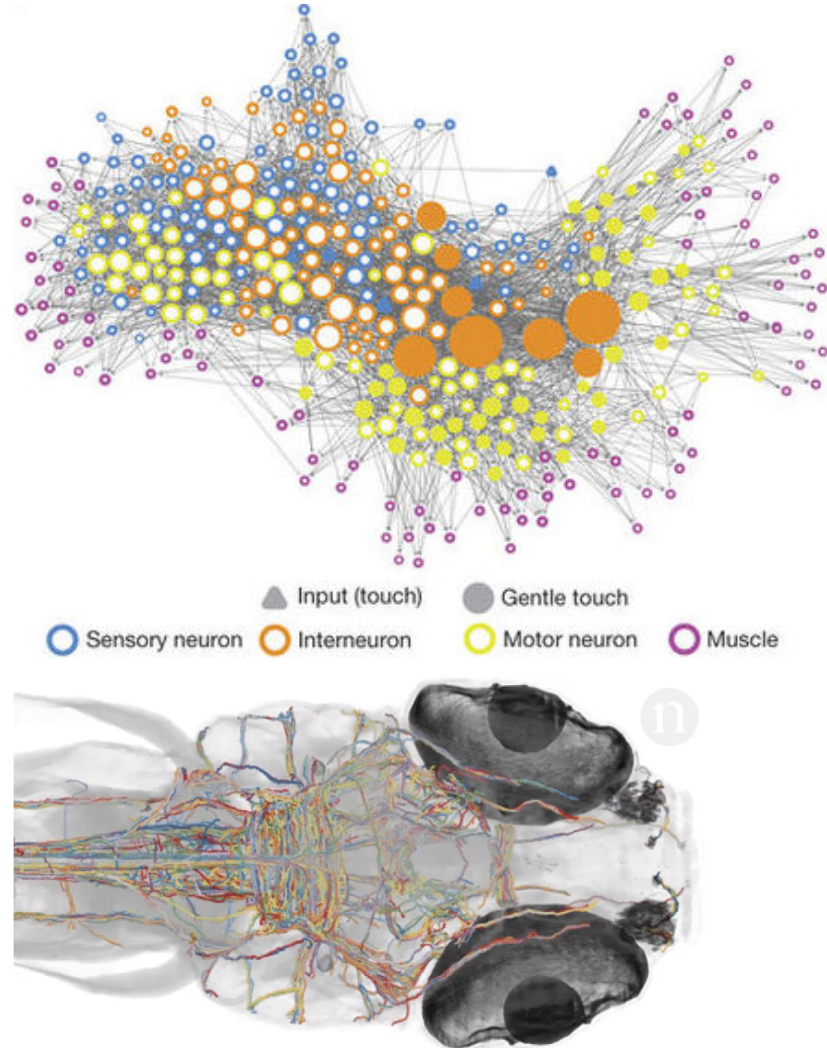
Macroscopic level

- From by cube brain
- Brain activity
- Different information and different problems
- fMRI (functional magnetic resonance imaging)
 - Oxygen activity mapping
- Inference



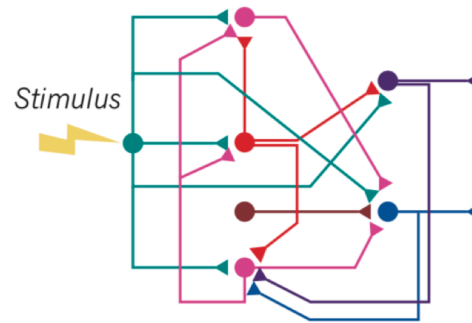
Caenorhabditis Elegans

- First connectome
- Created at 1986 by Sydney Brenner
- 300 neurons
- 7000 synaptic connections
- 10 years
- Debates

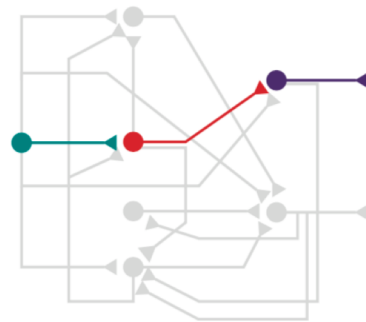


Fruit-fly Larva

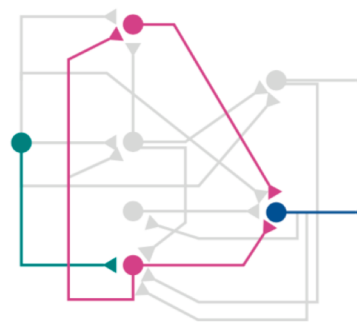
One neuron in a circuit is activated with a pulse of light. A signal passes through the network and the resulting behaviour is studied.



Behaviour 1: Turn head



Behaviour 2: Retract head



Importance

- Proof for brain principles
- Discover new brain area and functions
- Disease

Difficulty

- Time-consuming
- Large data
- Computational power

Question?

