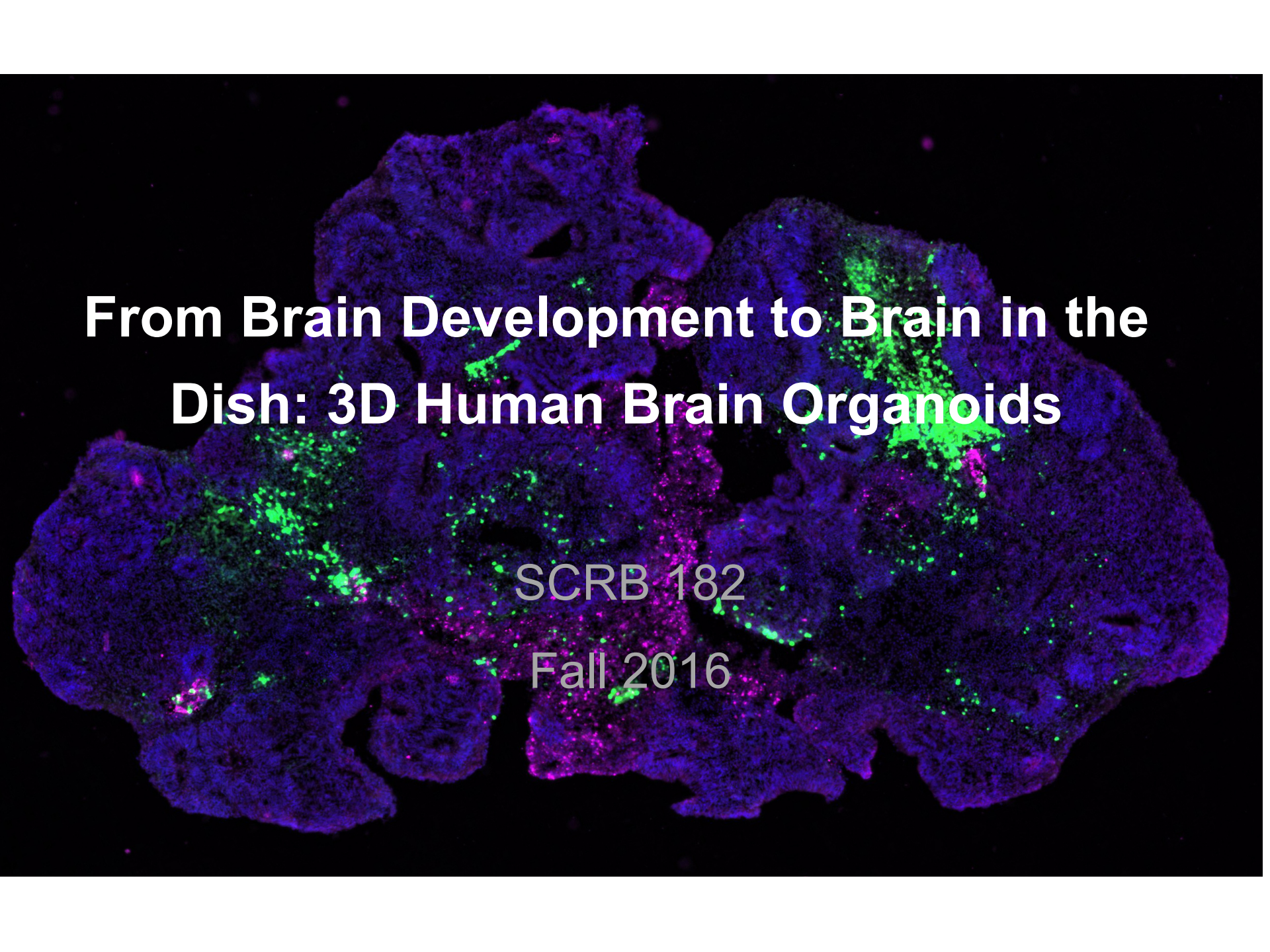


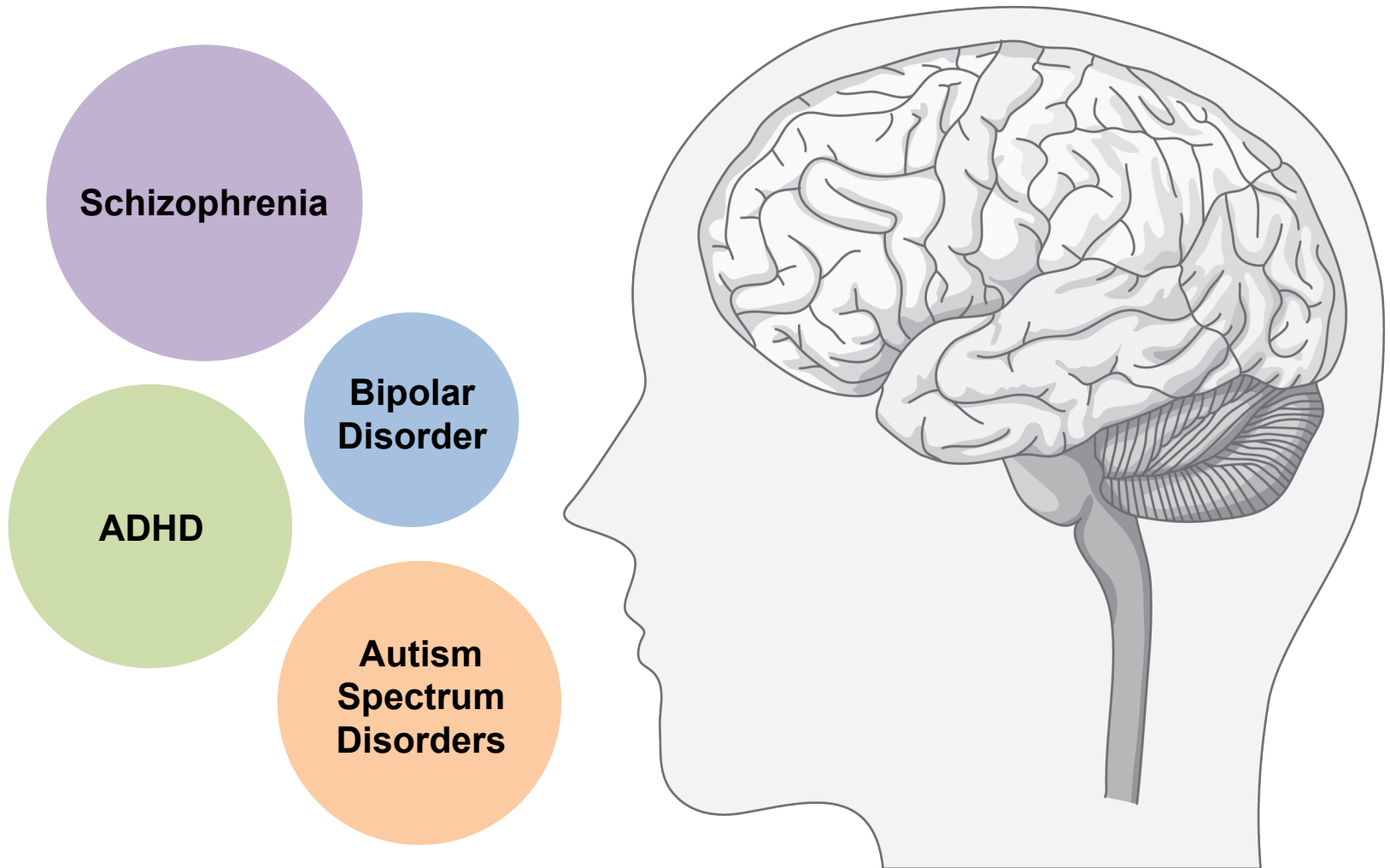


From Brain Development to Brain in the Dish: 3D Human Brain Organoids

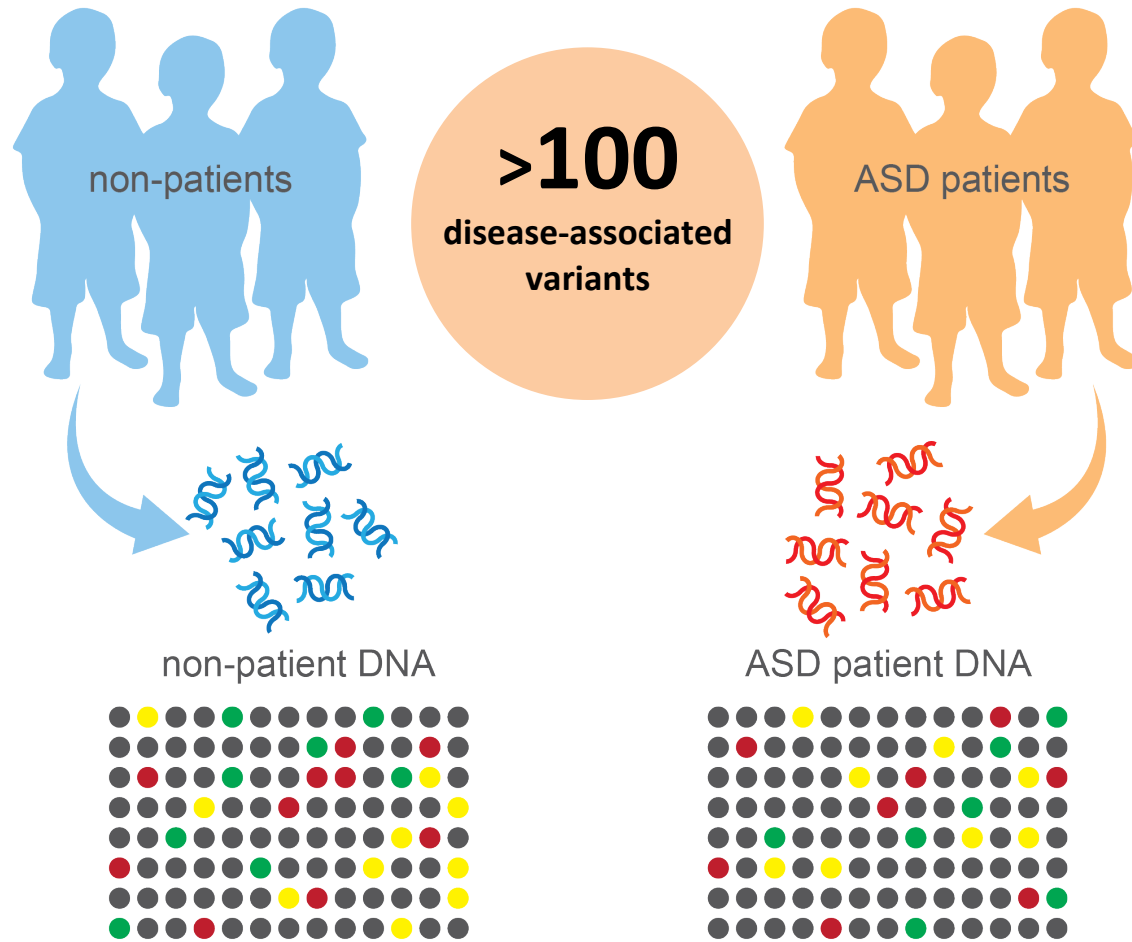
SCRB 182

Fall 2016

Neuropsychiatric Diseases

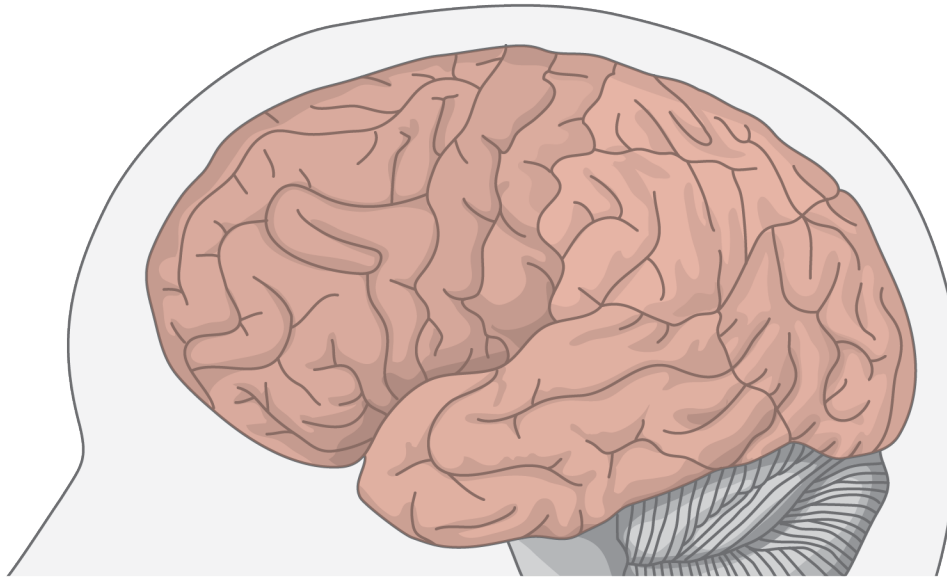


The Genetics of Autism



Neale *et. al*; *Nature*
2012 and
Silvia De Rubies *et.*
al; *Nature* 2014

The Cerebral Cortex



Creativity



Intelligence



Movement



Speech



Communication



Memory

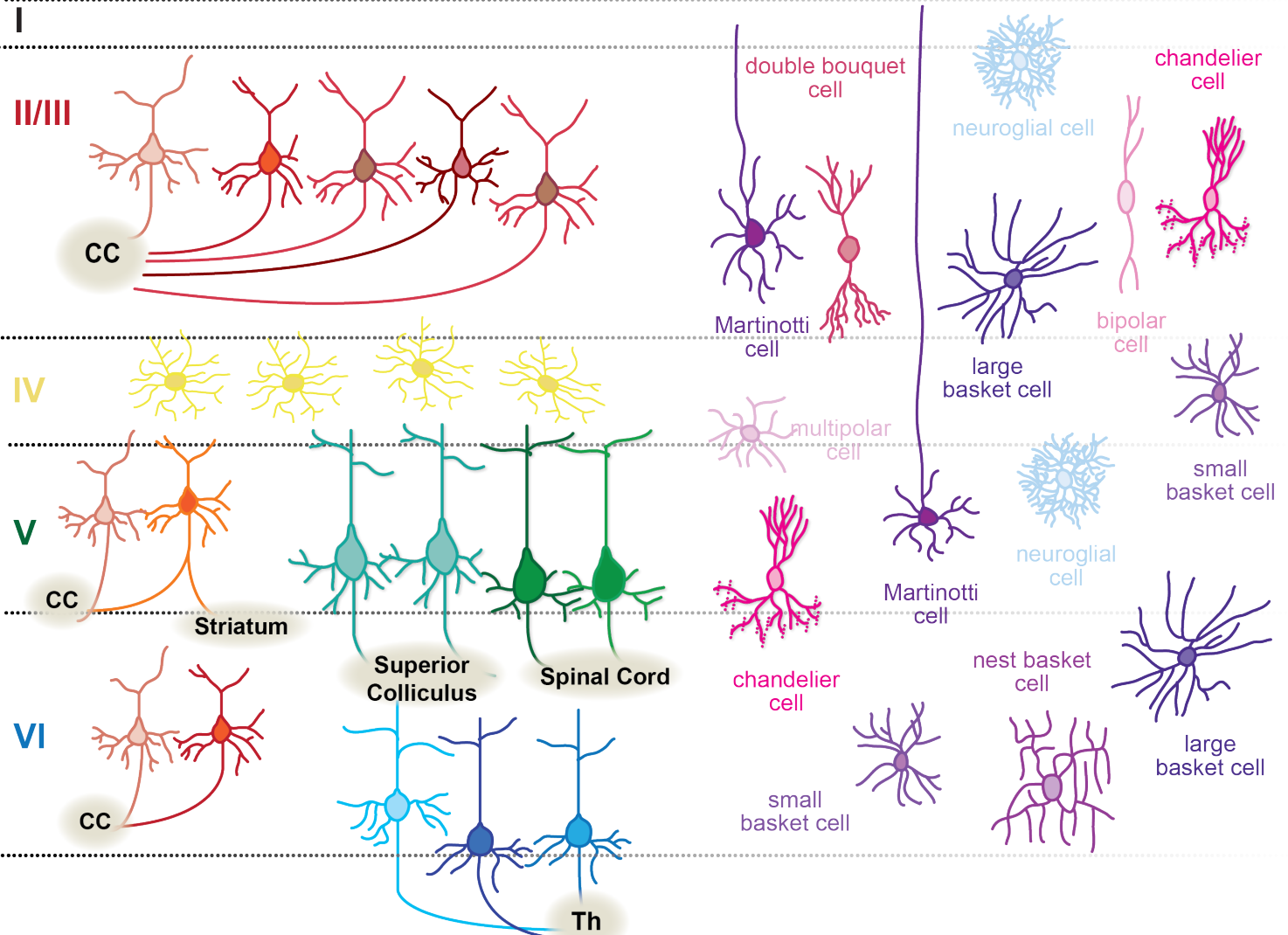


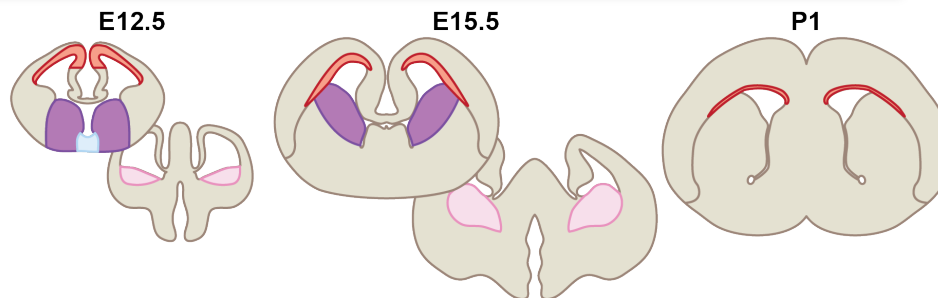
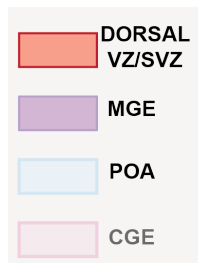
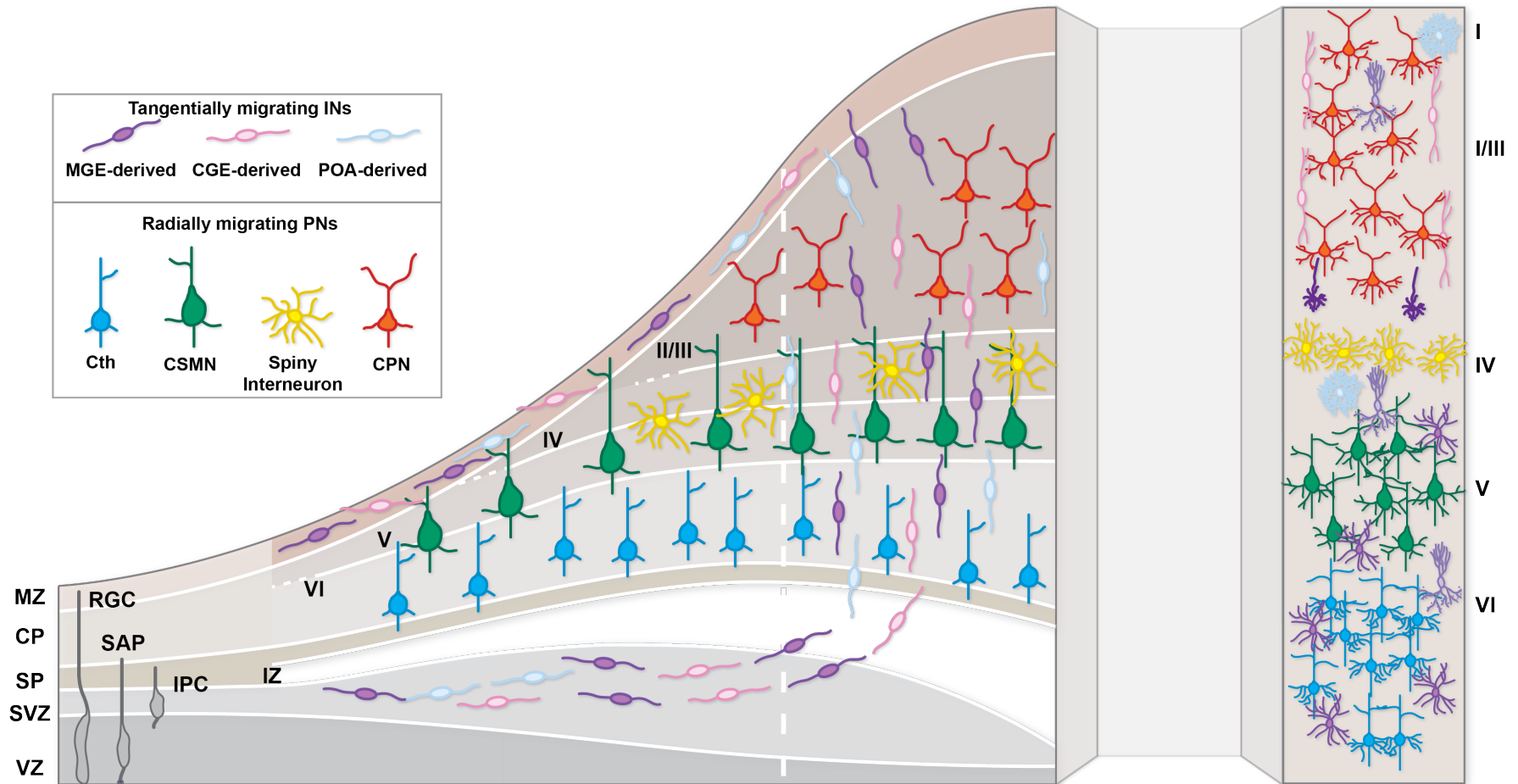
Sensory Perception

Neuronal Diversity in the Cerebral Cortex

Projection Neurons

Interneurons





Of Mice and Men



?

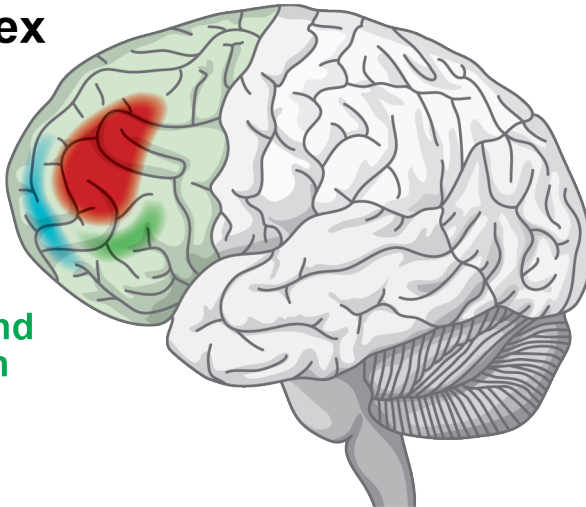


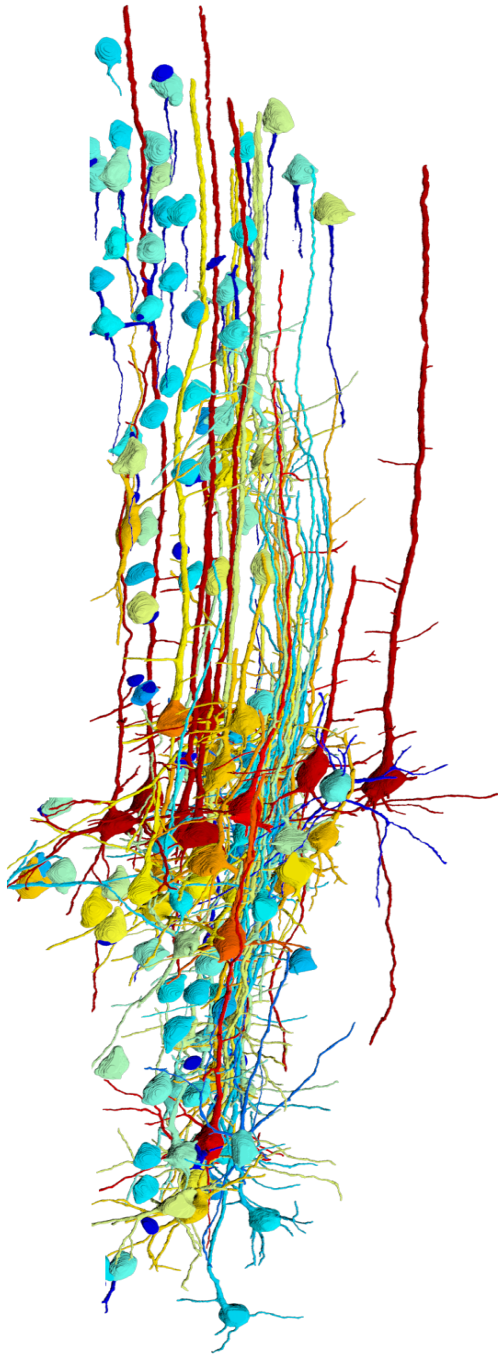
**Prefrontal
Cortex**

Attention

**Emotional
Responses**

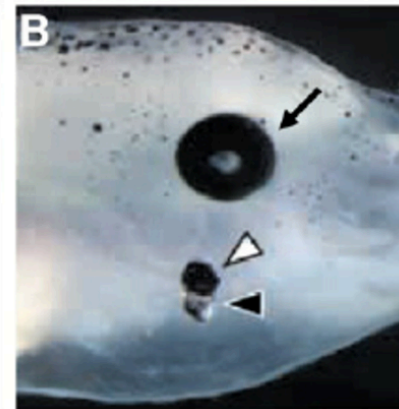
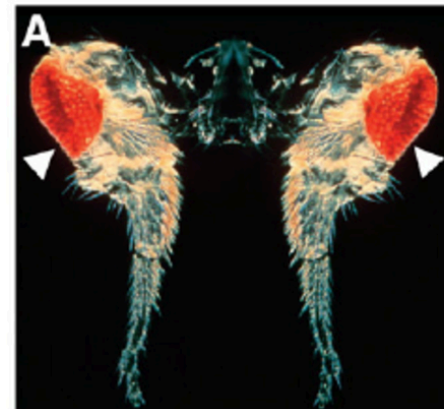
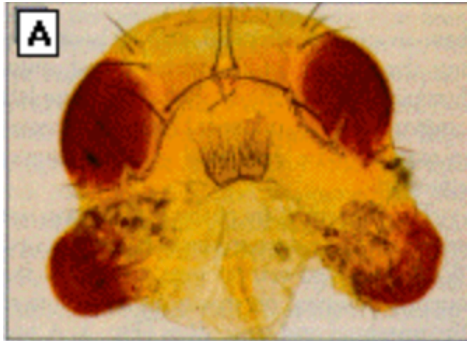
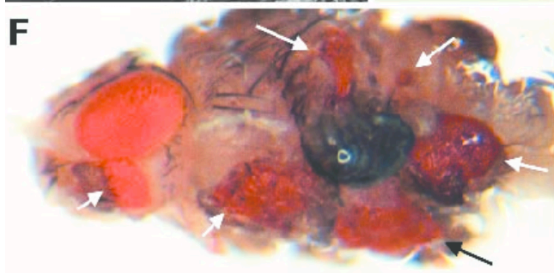
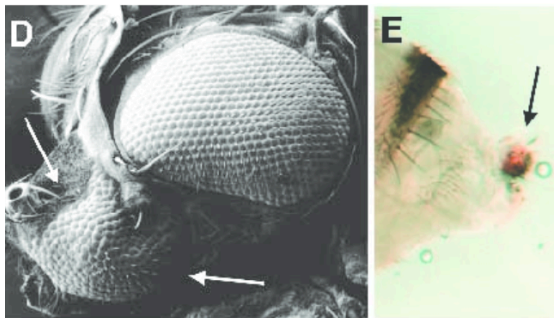
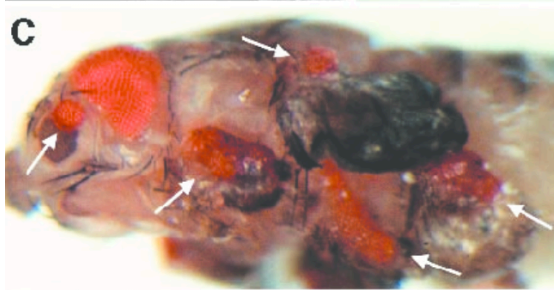
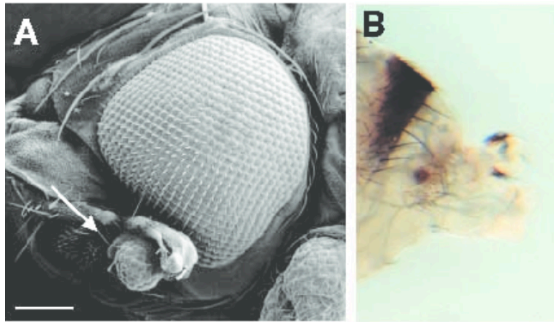
**Reward and
Motivation**



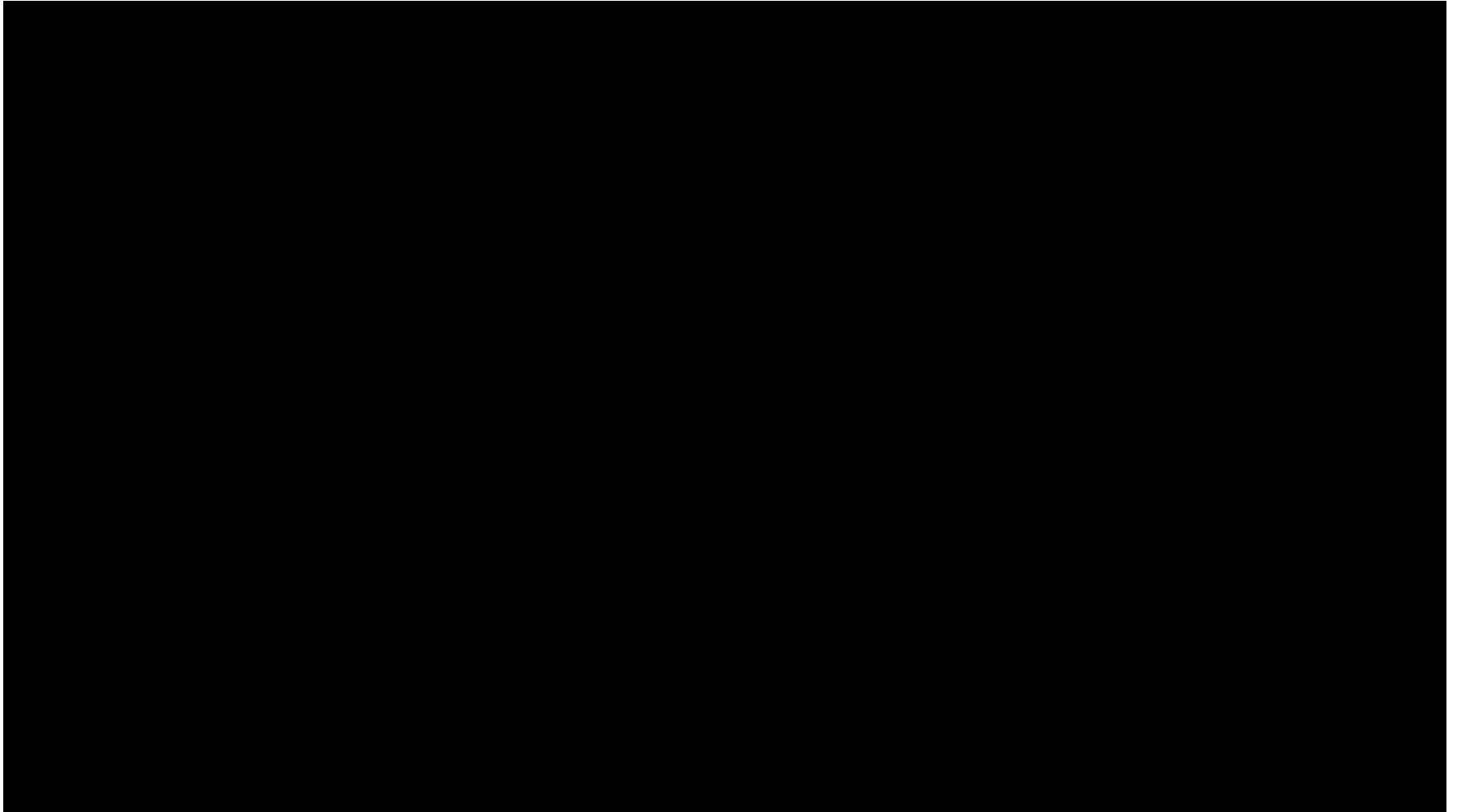


Self-directed Organogenesis

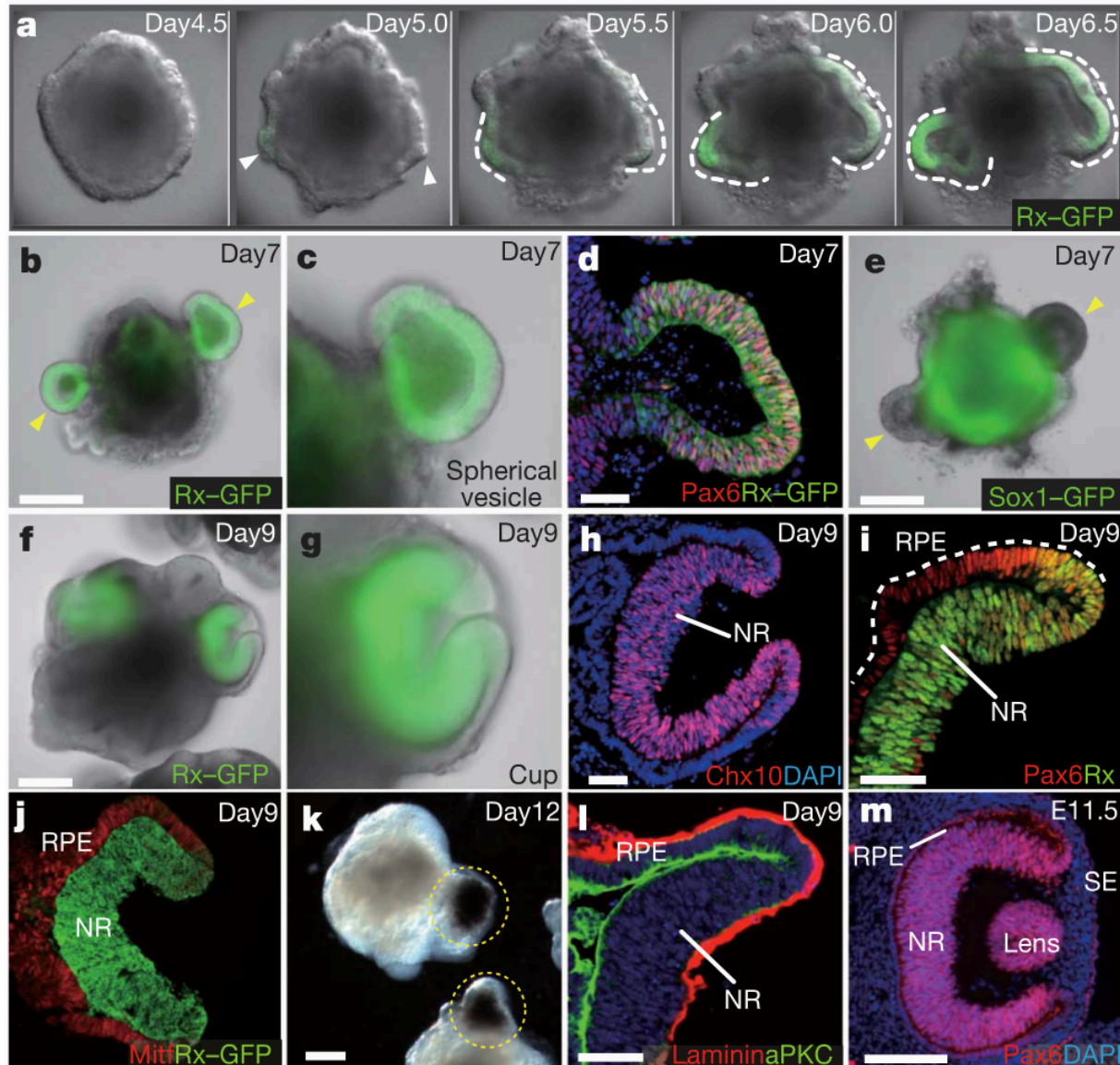
Making Ectopic Eyes



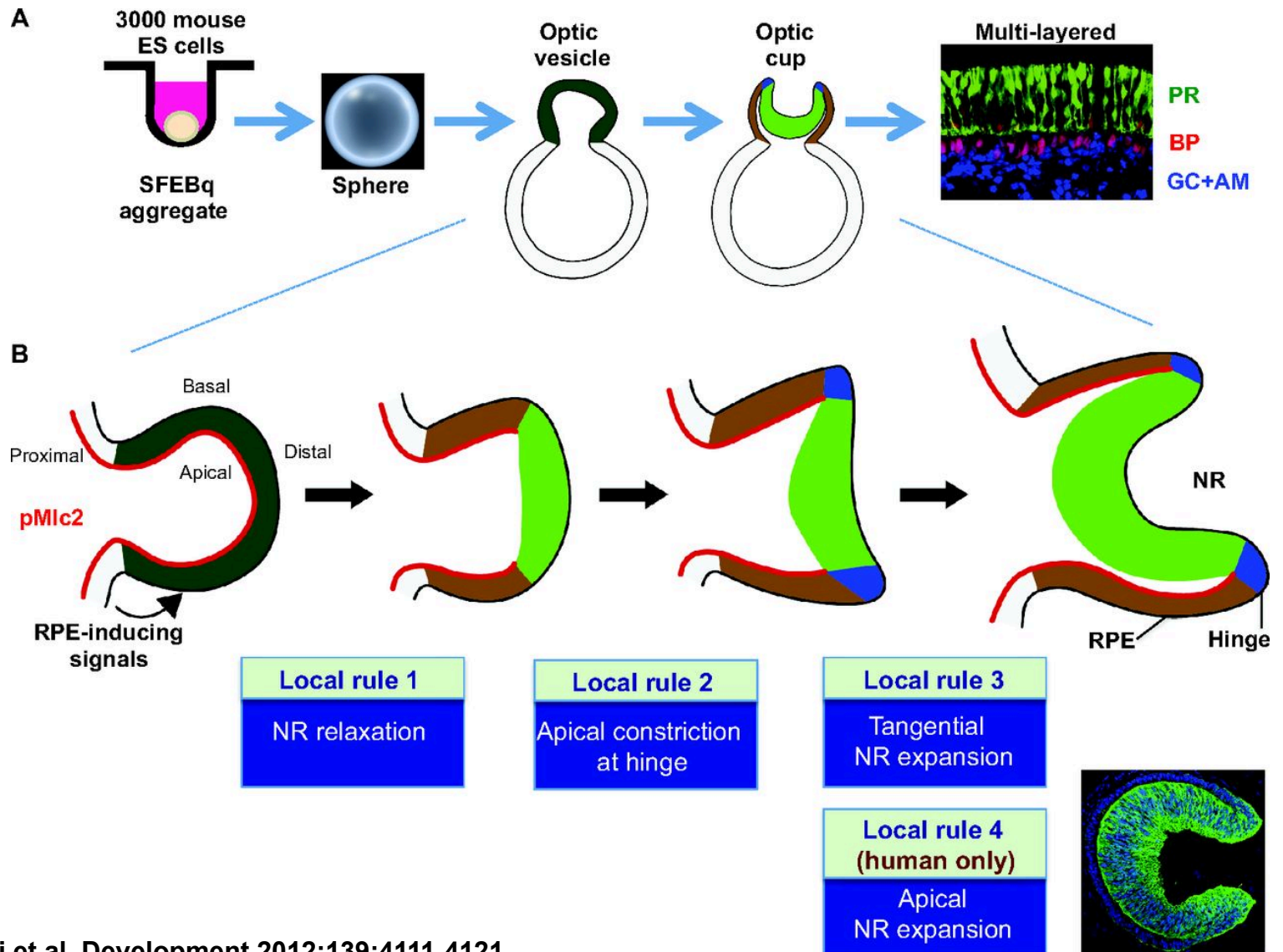
Making an eye: self-assembly required



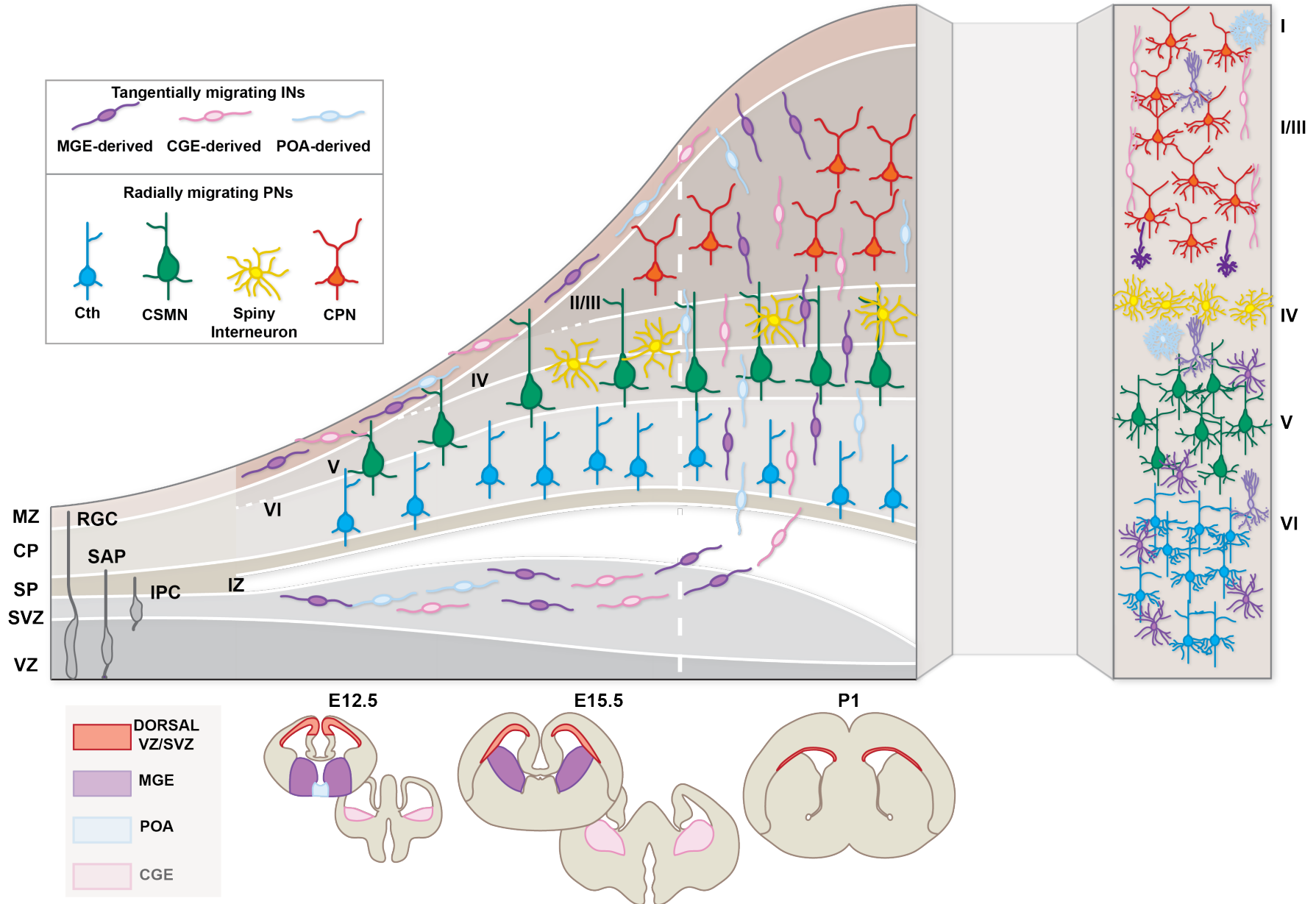
Making an eye: self-assembly required



Making an eye: self-assembly required

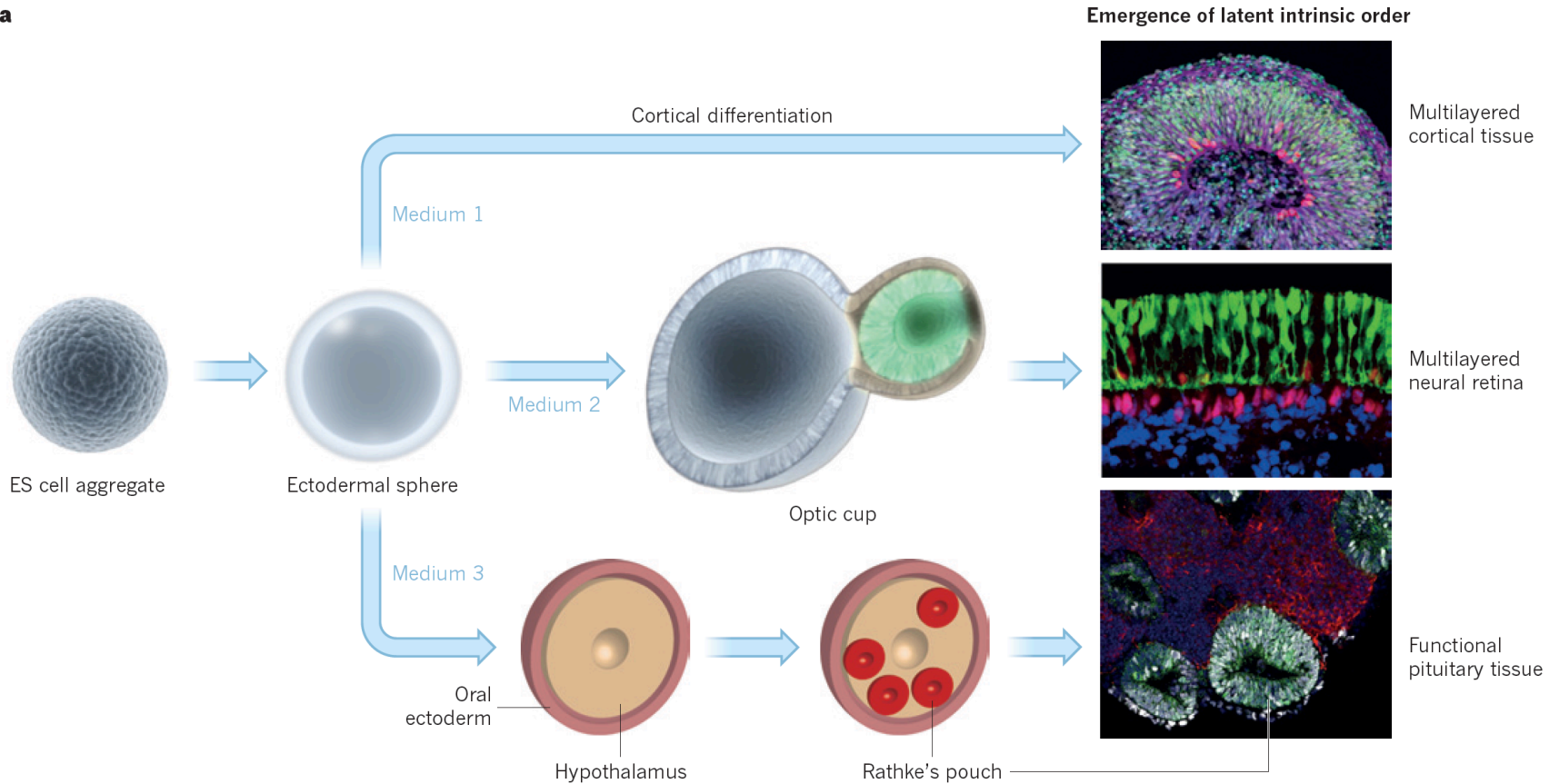


How about brain? How about cortex?

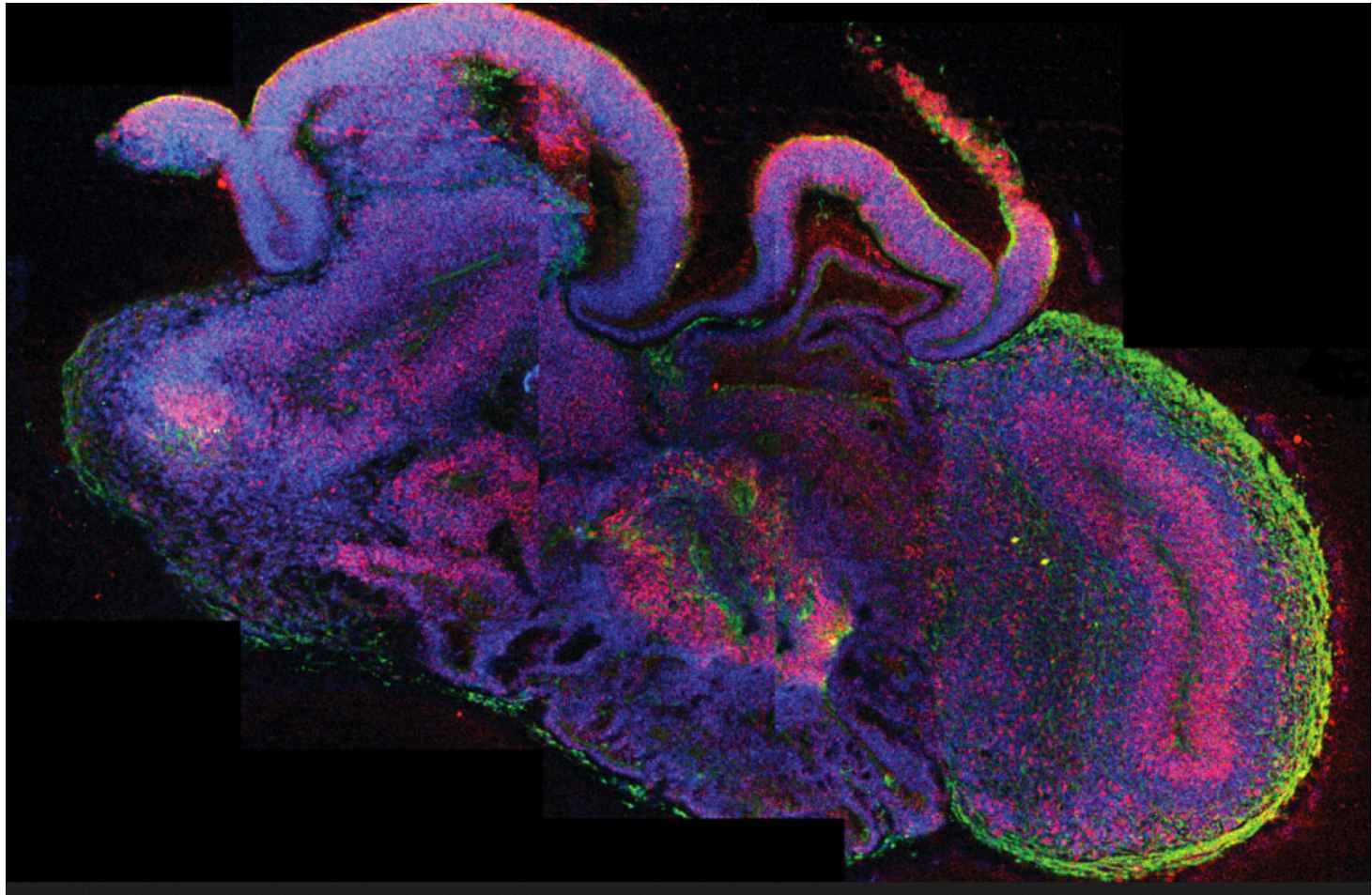


Self-assembly of the “brain”

a

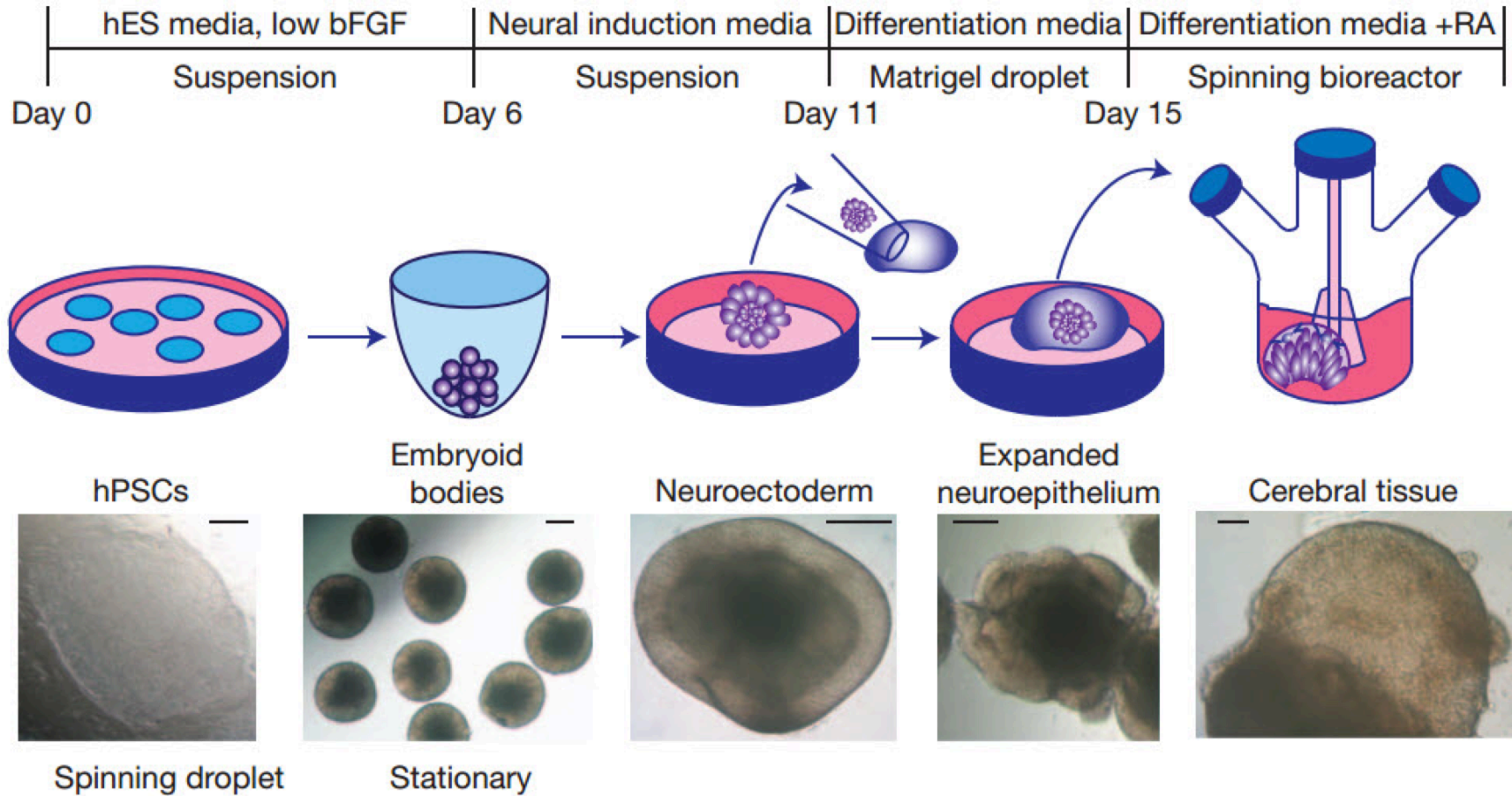


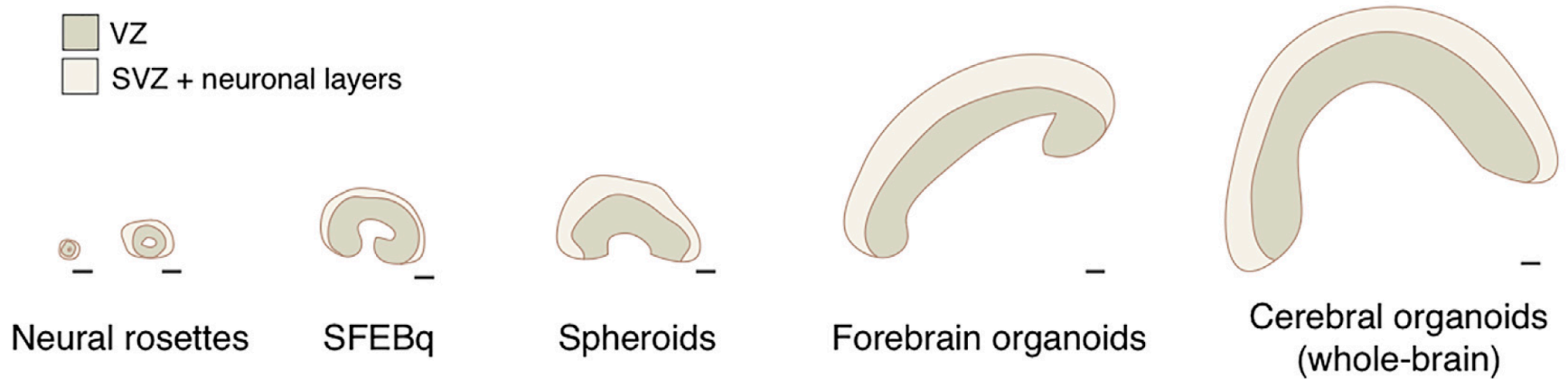
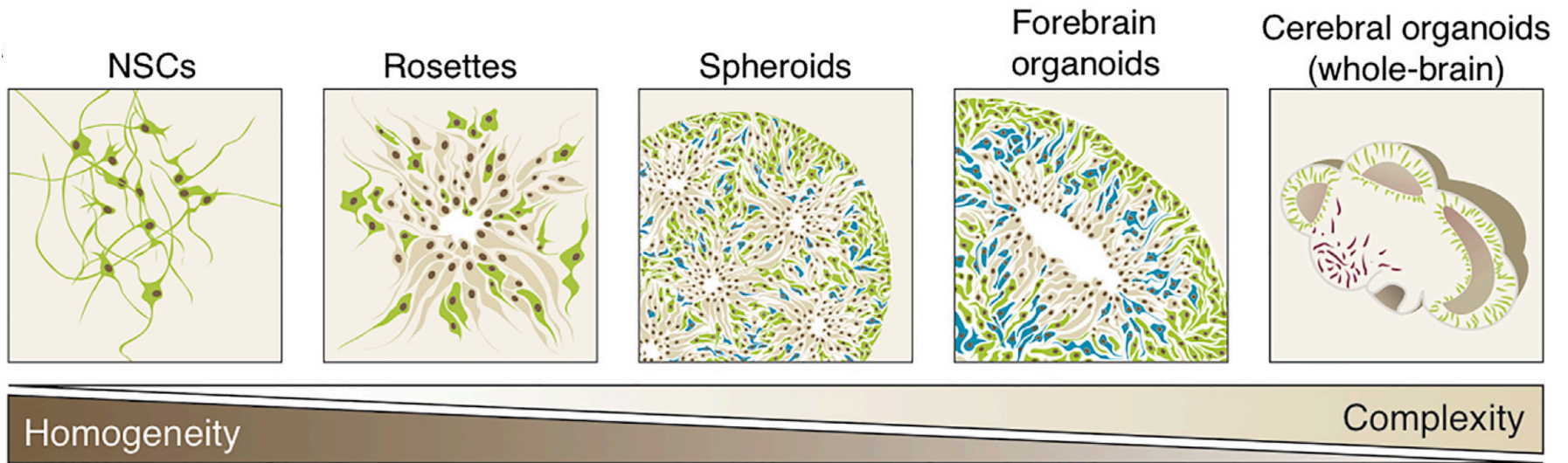
Human Brain Organoids



Λανχαστερ et al., Nature 2013

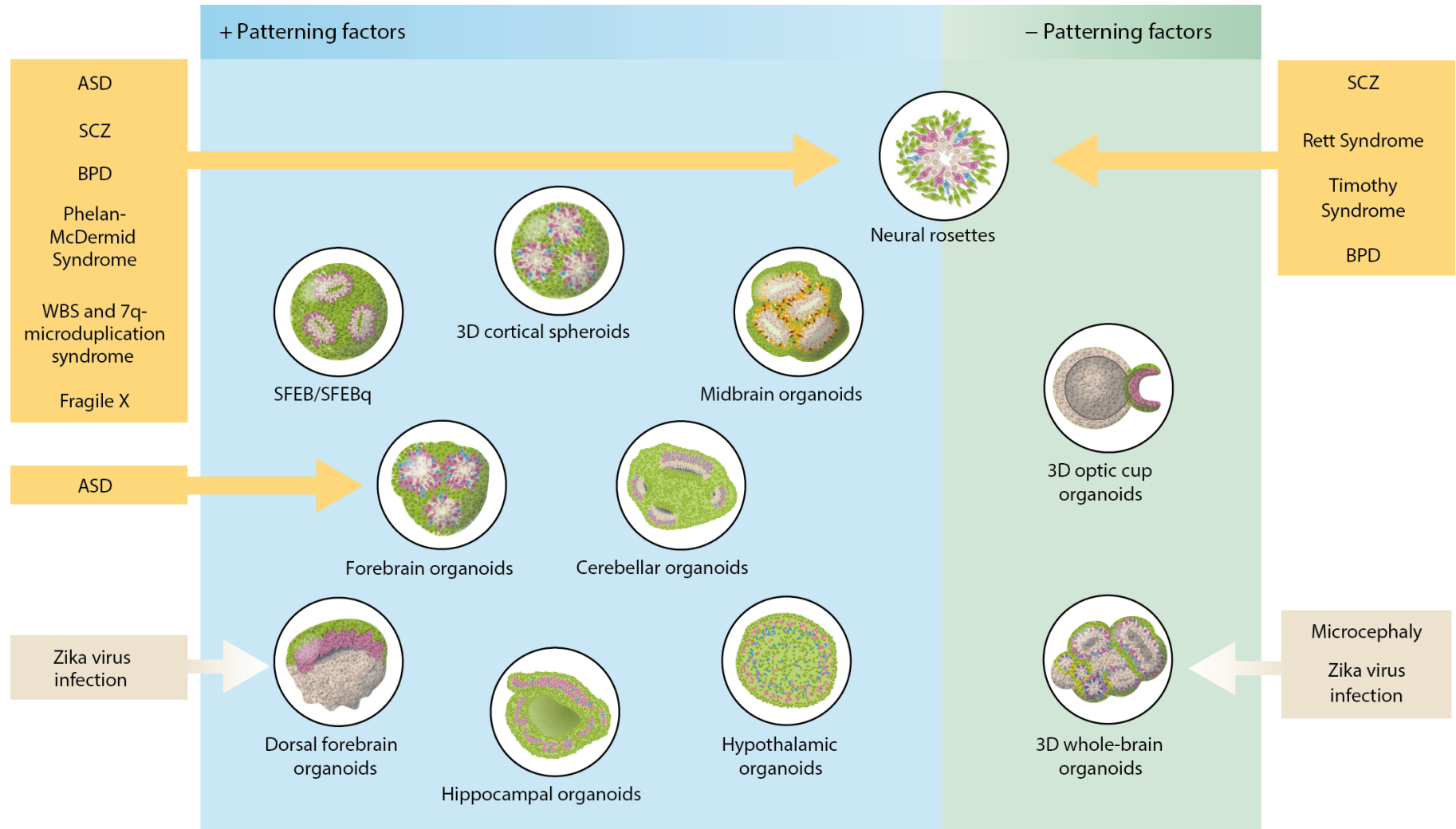
3D Human Brain Organoids



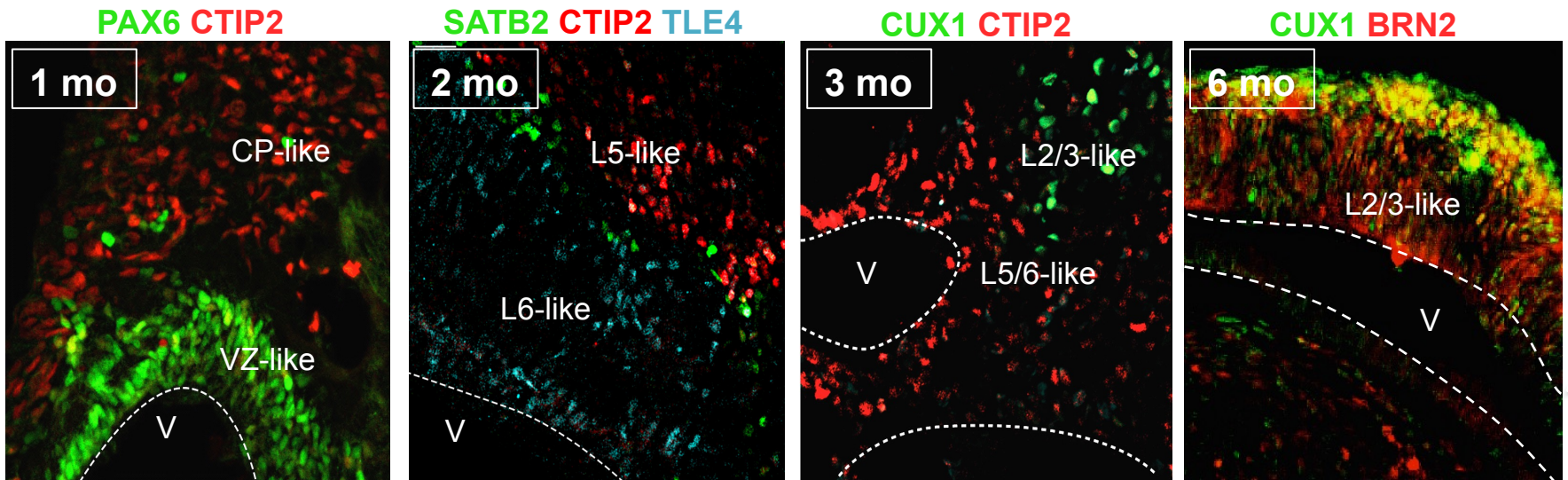
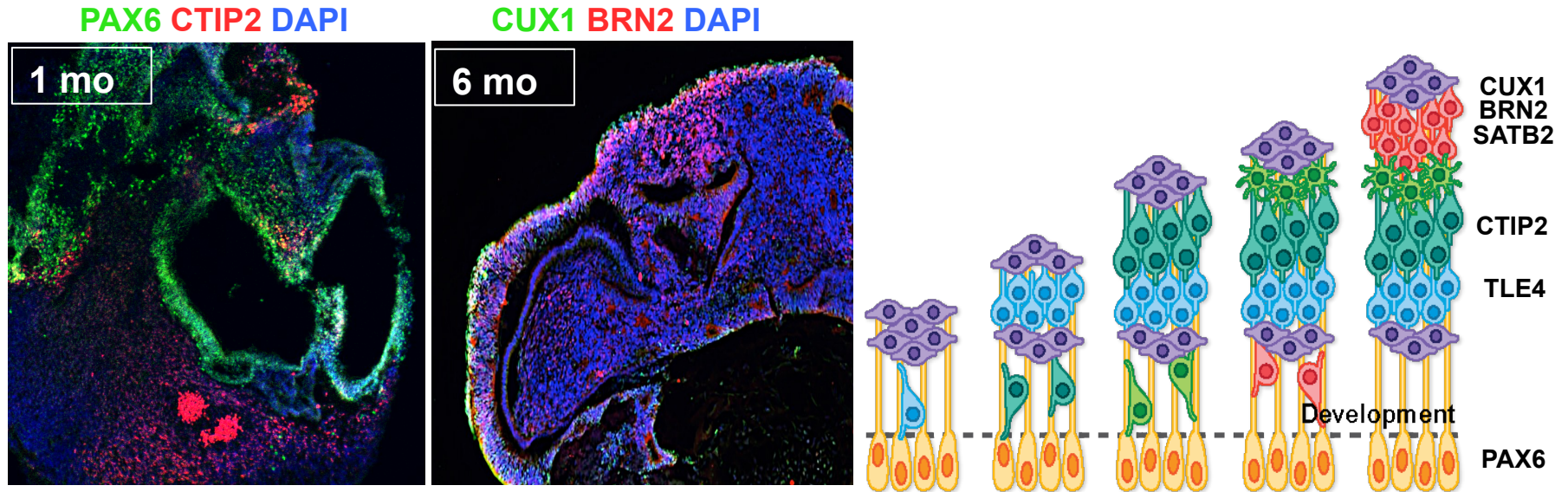


Knoblich, Lancaster, Song, Ming, Pasca, Kriegstein, Vaccarino laboratories

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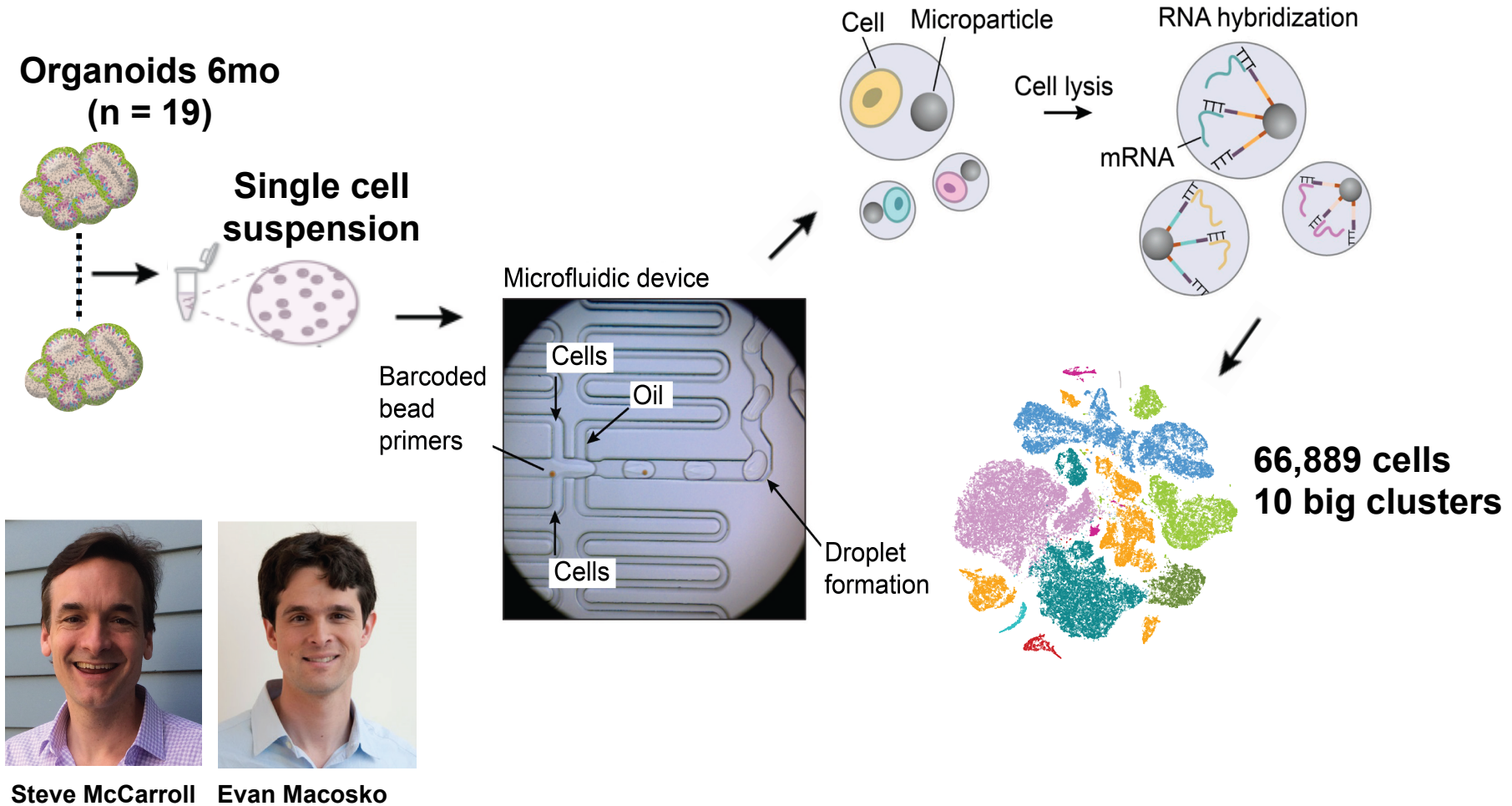


Brain organoids display radially layered structures

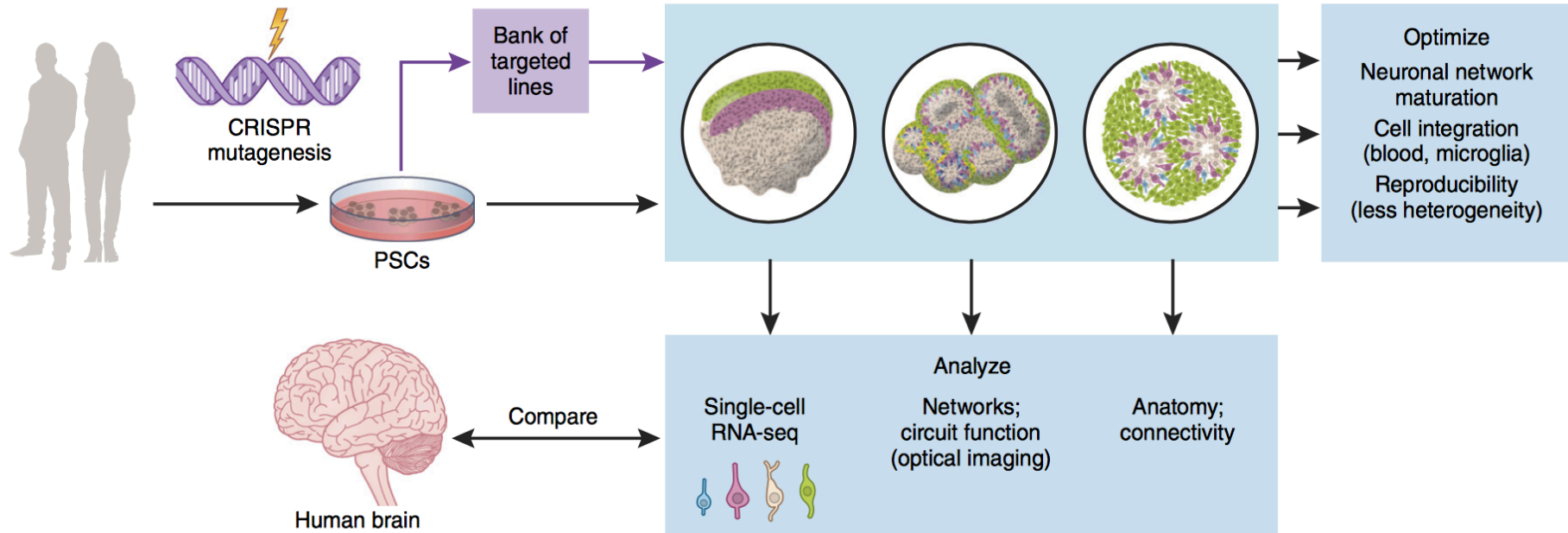


What cells can be made in human brain organoids?

--Drop-seq single cell analysis--



What Next?



Human models of neuropsychiatric disease

