Mapping the Developing Human Brain

By YAN Fusheng

Scientists created the most detailed map so far of the growing brain. This new map is like a construction plan for understanding how the human brain is built. It shows how the brain grows and changes from infancy through adulthood.

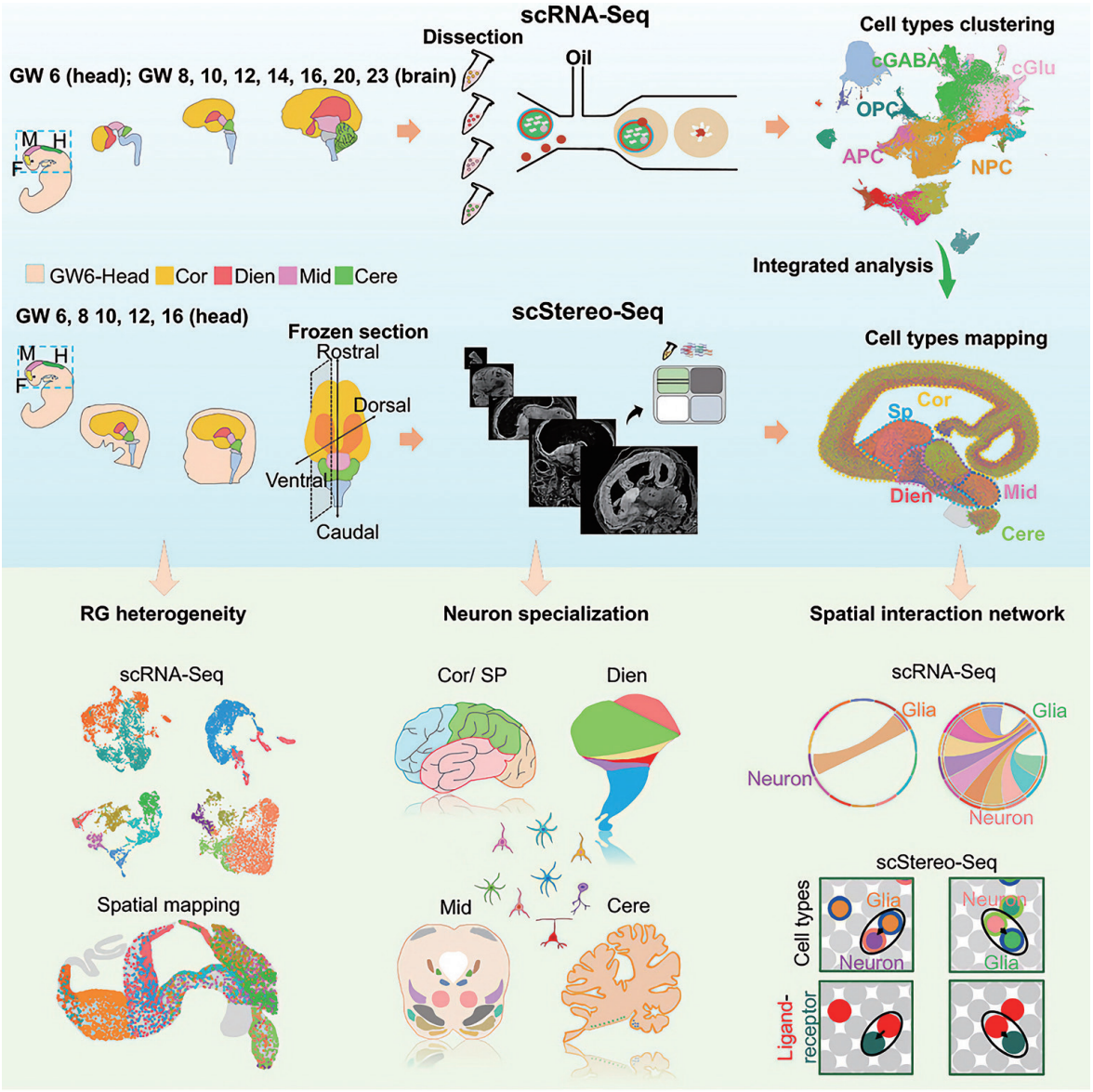
Scientists seek to understand how the human brain's 86 billion neurons shape and function, a long-standing enigma. (Image created with DALL-E by YAN F.)

In 1665, Robert Hooke peered down his microscope at a piece of cork and discovered little boxes that reminded him of rooms, or "cells", in a monastery. Little did Hooke know but he was witnessing the genesis of modern biology.

Now, the field Hooke founded is embarking on its next mega-endeavor – to map and scrutinize every single cell using today's most powerful genomic technologies. Hooked would be amazed at how far scientists have gone in unraveling one of biology's greatest mystery – the genesis of the human brain.

In a breakthrough study published in *Cell* on December 12, a joint team led by scientists from the Institute of Zoology (IOZ) of the Chinese Academy of Sciences, Guangzhou Institutes of Biomedicine and Health, Peking University, and Tsinghua University reported the most intricate atlas of the developing brain to date.

Just as Hooke discovered an unseen microscopic realm, this new atlas illuminates the hidden dynamics behind the construction of our complex brains. It reveals the hidden choreography behind the genesis of our 86



Overview of spatiotemporal brain developmental atlas analysis that aims to unravel the intricate choreography of the developing brain. (Image by CAS)

billion brain cells, providing an unprecedented look at how distinct brain regions and cell types emerge and specialize over time.

Using cutting-edge techniques, the scientists took snapshots of gene activity patterns in brain samples from over a dozen fetal specimens. This allowed them to identify shifting pools of progenitor cells, the origin of our neurons and glia.

In the cortex, for example, they discovered radial glia that give rise to specialized neuronal subtypes found only in this wrinkly outer layer. Different radial glia blueprints were also discovered underlying the midbrain, diencephalon and cerebellum – explaining how diversity and structure emerge.

It's like they have traced how stem cells in the early brain take on more defined roles over time and become expert builders that help construct the complex circuitry of our senses, movements and thoughts.

By mapping brain development at an unprecedented scale, this work represents a major leap forward for the field of spatial neuroscience. Unraveling the intricate choreography of the developing brain may also pave the way for new therapies and treatments for neurological disorders.

Reference

Li, Y., Li, Z., Wang, C., Yang, M., He, Z., Wang, F., . . . Jiao, J. (2023). Spatiotemporal transcriptome atlas reveals the regional specification of the developing human brain. *Cell, 186*(26), 5892-5909.e5822. doi:10.1016/j.cell.2023.11.016