An Overview of Development and Mapping of Human Brain

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Commentary

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DESCRIPTION

A group of neuroscience approaches known as "brain mapping" are based on the spatial mapping of (biological) variables or features onto representations of the (human or non-human) brain, producing maps. Brain mapping is specifically defined, in summary, as the study of the anatomy and function of the brain and spinal cord using imaging, immunohistochemistry, molecular and optogenetics, stem cell and cellular biology, engineering, neurophysiology, and nanotechnology, according to the definition established in 2013 by the Society for Brain Mapping and Therapeutics (SBMT).Brain mapping is regarded as a component of all neuroimaging. Brain mapping can be thought of as a more advanced type of neuroimaging, creating brain pictures that are supplemented by the results of extra data processing or analysis (either imaging- or non-imaging-related), such as maps that project (measures of) behavior onto different brain regions (see fMRI). A connectogram, a type of such map, shows cortical areas arranged in a circle according to their lobes. Different common neurological metrics, such as cortical thickness or curvature, are represented by concentric circles inside the ring. The connections between cortical regions are represented by white matter fibers in the centre of the circles, weighted by fractional anisotropy and degree of linkage. Brain maps with higher resolution are referred to as connectomes.

The creation and improvement of image acquisition, representation, processing, visualization, and interpretation techniques is essential to the ongoing evolution of brain mapping techniques. The core of the brain mapping component is functional and structural neuroimaging. Some scientists have criticized the claims made using brain images in academic publications and the media, such as the identification of "the part of the brain responsible" for emotions like love or musical talent or a particular memory. A single voxel can contain hundreds of thousands of neurons, however many mapping approaches have a limited resolution. This type of assertion is likely both unverifiable with the tools used and often based on an inaccurate assumption about how brain activities are separated because many processes also involve several areas of the brain.

It's possible that the majority of brain processes won't be accurately defined until they've been quantified using far finer-grained measurements that focus on many countless tiny individual brain circuits rather than on vast regions. Many of these studies also have technical issues that prevent them from being replicated, such as small sample sizes or inaccurate equipment calibration. These issues are occasionally disregarded in favor of producing sensational journal articles or press headlines. The use of brain mapping methods for commercial gain, lie detection, or unreliable medical diagnosis has occurred in several instances.The first connectome that demonstrates how a brain changes over the course of a lifetime in an animal was published in 2021. Later that year, researchers used brain bow imaging and electron microscopy to demonstrate for the first time how a mammalian neuronal network develops. They published the detailed wiring diagrams of ten different mice's CNS and muscles. The MICrONS program's researchers released a functional connectomics dataset in August 2021 that "contains calcium imaging of an estimated 75,000 neurons from primary Visual Cortex (VISp) and three higher visual areas (VISrl, VISal, and VISlm), that were recorded. In 2022, a first spatiotemporal cellular atlas of axolotl brain growth and regeneration known as the interactive Axolotl Regenerative Telencephalon Interpretation *via* Spatiotemporal Transcriptomic Atlas provided important new information regarding axolotl brain regeneration.