A time for atlases and atlases for time.

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Livneh, Y, Mizrahi A. 2010.

Abstract:

Advances in neuroanatomy and computational power are leading to the construction of new digital brain atlases. Atlases are rising as indispensable tools for comparing anatomical data as well as being stimulators of new hypotheses and experimental designs. Brain atlases describe nervous systems which are inherently plastic and variable. Thus, the levels of brain plasticity and stereotypy would be important to evaluate as limiting factors in the context of static brain atlases. In this review, we discuss the extent of structural changes which neurons undergo over time, and how these changes would impact the static nature of atlases. We describe the anatomical stereotypy between neurons of the same type, highlighting the differences between invertebrates and vertebrates. We review some recent experimental advances in our understanding of anatomical dynamics in adult neural circuits, and how these are modulated by the organism's experience. In this respect, we discuss some analogies between brain atlases and the sequenced genome and the emerging epigenome. We argue that variability and plasticity of neurons are substantially high, and should thus be considered as integral features of high-resolution digital brain atlases.

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