AI + brain organoids = Organoid Intelligence (OI)

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Understanding brain function remains challenging as work with human and animal models is complicated by compensatory mechanisms, while *in vitro* models have been too simple until now. With the advent of human stem cells and the bioengineering of brain microphysiological systems (MPS), understanding how both cognition and long-term memory arise is now coming into reach. We suggest combining cutting-edge AI with MPS research to spearhead organoid intelligence (OI) as synthetic biological intelligence. The vision is to realize cognitive functions in brain MPS and scale them to achieve relevant short- and long-term memory capabilities and basic information processing as the ultimate functional experimental models for neurodevelopment and neurological function and as cell-based assays for drug and chemical testing. By advancing the frontiers of biological computing, we aim to (a) create models of intelligence-in-a-dish to study the basis of human cognitive functions, (b) provide models to advance the search for toxicants contributing to neurological diseases and identify remedies for neurological maladies, and (c) achieve relevant biological computational capacities to complement traditional computing. Increased understanding of brain functionality, in some respects still superior to today's supercomputers, may allow to imitate this in neuromorphic computer architectures or might even open up biological computing to complement silicon computers. At the same time, this raises ethical questions such as where sentience and consciousness start and what the relationship between a stem cell donor and the respective OI system is. Such ethical discussions will be critical for the socially acceptable advance of brain organoid models of cognition. Based on the *Baltimore Declaration Toward Exploring Organoid Intelligence*, a community is forming to realize this vision.