Artificial Ingenuity, LLC
'Intelligent and social systems'

Artificial Ingenuity
Discussion forum for ArtIngen products and research

Ontological fault in brain philosophy

Author	Message
Bernhard Mitterauer Joined: 07 Jun 2005 Posts: 20	Posted: Mon Dec 15, 2008 11:43 am Post subject: Ontological fault in brain philosophy

Ontological fault in brain philosophy

Bernhard J. Mitterauer

A fundamental philosophical distinction in brain theory is that of ontic and epistemic description. This distinction emphasizes whether we understand the state of a system (and its dynamics) "as it is in itself" (ontic) or "as it turns out to be due to observation" (epistemic) (Atmanspacher and Rotter, 2008). If we scan the brain on the microscopic level we see a cellular structure composed of neurons and glia with their pertinent networks. That is our brain "as it is in itself". Therefore, from a cellular point of view the brain embodies at least two distinct ontological realms.

As a consequence, a pure neurophilosophical approach to brain theory is based on an ontological fault exclusively referring to the neuronal system in the sense of a monoontology. However, the distinction of two ontologies only makes sense if we have strong arguments for a special role of glia in their interactions with the neuronal component. My core argument is this: the glial system is essentially responsible for the working of the brain as a subjective system generating intentional programs (Mitterauer, 2007).

There is also an epistemic argument for glial generation of subjectivity, the concept of complexity. Reichenbach and Pannicke have given "a new glance at glia" (2008) focusing on the evolution of the complexity of the nervous system. To clarify the role of glial cells three different stages of complexity are distinguished. In the single-cell stage, single sensory and ganglion neurons are scattered throughout the tissue, without any associated glia-like cells. This is the case in "primitive" animals such as polyps. The evolution of more complex animals (e.g. nematodes) is characterized by the oligocellular stage of complexity of the nervous system. Here specialized sensory organs are developed that usually contain glia-like cells as well, but ganglion neurons are only touched by a glial cell process.

In vertebrates, mammals and humans the multicellular stage embodies the highest complexity of the nervous system. At this stage the evolution results in a multiplication of the number of glial cells per neuron accompanied by increasing brain size. Most important, the development of glial-neuronal synaptic units or glial-neuronal compartments involves glia directly in neuronal information processing, both by controlled modification of functions (Oliet et al, 2001) and feedback mechanisms via the production of gliotransmitters (Araque et al, 1999). I speak of

an intentional spatiotemporal glial boundary-setting function (Mitterauer, 2007; Mitterauer and Kopp, 2003).

If one relates the glial determined complexity to subjective capabilities, the degree of the complexity of a brain may correspond to the capability to produce subjective behavior from primitive biological needs to self-consciousness or even philosophical issues.

At least what the human brain concerns, a decisive ontological question arises again. Does self-reflection and the reflection of the many others (subjects or objects) of the environment occur on preferred ontological loci in the brain? The concept of tripartite synapses in the sense of glial-neuronal units and the building of glial-neuronal compartments allow the interpretation that our brain is composed of many specialized places capable to reflect ontic realms of the environment within itself. Surprisingly, the pure cellular ontological distinction between the neuronal system and the glial system generates in their interaction many distinct ontological loci, called polyontology (Mitterauer, 1998). If one accepts this ontological approach to brain theory, the ontological fault of present brain philosophy may have significant consequences not only for brain research but also for our self-understanding.

Finally, allow me a critical remark on the present pure physical brain theory. It is exclusively based on the physical principles of the universe, where the brains are parts of it (Laughlin, 2005). Since this approach whether refers to the classic philosophical distinction between subject and object, nor to the cellular ontological distinction between the neuronal system and the glial system, all observations and epistemic descriptions concern a general physical monoontology.

For example, the emergence of new phenomena based on state transitions may create a new physical reality within the general ontology of the universe (Werner, 2007), but not a new ontology of a subjective system. Therefore, interpreting large-scale brain processes as critical state space transitions cannot contribute to a comprehensive brain philosophy of subjective systems.

From a philosophical point of view, my minimal argument is that "neurophilosophy" is an inappropriate term ignoring not only the glial system but also ontological issues of individuality. Therefore, the first modest step must be to speak of brain philosophy.

References cited:

Araque A. et al (1999) Tripartite synapses: glia, the unacknowledged partner. Trend Neurosci 22: 208-214.
Atmanspacher H. and Rotter S. (2008) Interpreting neurodynamics: concepts and facts. Cogn Neurodyn DOI 10. 1007/s 11571-008-9067-8.
Laughlin R.B. (2005) A different universe: reinventing physics from the bottom down. New York, Basic Books.
Mitterauer B. (1998) An interdisciplinary approach towards a theory of consciousness. BioSystems 45: 99-21.
Mitterauer B. (2007) Where and how could intentional programs be generated in the brain? A hypothetical model based on glial-neuronal interactions. BioSystems 88: 101-112.
Mitterauer B. and Kopp C. (2003) The self-composing brain: towards a glial-neuronal brain theory. Brain Cogn 51: 357-367.
Oliet S.H. et al (2001) Control of glutamate clearance and synaptic efficacy by glial coverage of neurons. Science 292: 923-926.