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Global Workspace Theory, LIDA and IDyOT

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The Global Workspace Theory (GWT) of Bernard Baars (1988) provides a now widely accepted general theory of consciousness. The conceptual and computational cognitive architecture LIDA (Franklin et al., 2016; Franklin, Strain, McCall, & Baars, 2013) is a systems level cognitive model that implements major portions of GWT and adds much structural detail. IDyOT is an integrative predictive-processing cognitive model as described in Wiggins' paper entitled *Creativity, Information, and Consciousness: the Information Dynamics of Thinking* (2020). As asserted in Section 7.3 of that paper "IDyOT was partly inspired by, and is, to a degree, an implementation of ... Global Workspace Theory..." The present article is comprised of a sequence of brief comments on that Wiggins paper. Each of these comments is intended to clarify some assertion in that paper about one or more of these three systems. All references to sections herein will be to sections in that Wiggins paper, and, unless otherwise identified, any quotes will be from it also.

The first paragraph of Section 6.2.4 asserts that "Any cognitive architecture must have an intrinsic function to make it do anything. This is generally called the *cognitive cycle*..." LIDA's cognitive cycle is not produced by a function built into the architecture of a LIDA agent. Rather, a LIDA cognitive cycle is one of a sequence of overlapping cycles each emerging from the joint operation of LIDA's several modules, each of which runs asynchronously.

In Section 6.3 we find "The LIDA architecture, introduced above, explicitly implements GWT..." Yes, the LIDA cognitive architecture not only implements large portions of GWT, but fleshes it out, importantly adding all sorts of structural detail (Franklin, et al., 2016). In addition to GWT, LIDA also implements and fleshes out parts of several other psychological and neuropsychological theories (Baddeley & Hitch, 2007; Barsalou, 1999; Conway, 2001; Ericsson & Kintsch, 1995).

The third paragraph of Section 6.3 says that "The agents *compete for access* to a *Global Workspace* ..." This is in agreement with Baars' early writing on the subject. However, in the LIDA implementation of GWT, the competition for inclusion in the conscious broadcast is held in the Global Workspace itself, which then broadcasts the contents of the winner (Franklin, et al., 2016). Later in this section the Wiggins paper says that "The Global Workspace can be read by all the agents..." In the LIDA implementation of GWT, the contents of consciousness is broadcast globally to each of LIDA's modules, hence the term "Global Workspace

Theory". Each of these clarifications is quite minor in terms of the operation of GWT or of LIDA.

In Section 7.2.2. Declarative vs. implicit memory, we find "... information transduced from the environment may be stored without attracting attention, and hence without being processed via IDyOT's Global Workspace: this constitutes implicit learning in these terms." Here IDyOT differs significantly from GWT and its LIDA implementation, in both of which learning, except very short term, must occur via a conscious broadcast (Franklin, et al., 2013). Consolidation in LIDA is also quite different from that in IDyOT (see Section 7.2.6). In LIDA consolidation moves any memories, that have not yet decayed away, from Transient Episodic Memory to Declarative Memory. The pruning function of consolidation in IDyOT is accomplished in LIDA by the continual decay function in each of its modules. (Franklin, et al., 2016)

The first paragraph of Section 7.3 states that "A key aspect of GWT is competition between Baars' agents-generators for access to the GW. The proposal here is that this is controlled by information content ..." In LIDA this information content plays a role in the competition for attention, but is only one of four factors (Franklin, et al., 2016; Madl & Franklin, 2012).

The second paragraph of Section 7.3 discusses IDyOT's version of attention. The GWT and LIDA version is quite different, both taking attention to be the process that controls access to consciousness. Baars asserts that "... attention involves metacognitive processes that guide the stream of consciousness." (Baars, 1988, p. 301) The second phase of each LIDA cognitive cycle is devoted to attention (Franklin, et al., 2016).

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Declaration of interests

X The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.