Form and Symmetry: Art and Science
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BRIDGE OF FORMS: FROM EMBODIMENT TO INFORMATION

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Abstract: *One intended outcome of ISIS-S and in particular the Congresses is to promote interdisciplinary projects. This paper reports on a research project prompted by past Congresses. It involves symmetry in several facets, including the symmetry of the approaches of the two investigators themselves. They explored the structure of narrative as a basis for a new approach to modelling behaviour in the natural world, as well as providing designs for "artificial" worlds in computers and literature.*

1 COLABORATION

During the 2001 ISIS-Symmetry Congress in Sydney, the research of two participants found a symmetry. This alignment of both approach and subject matter eventually led to a fruitful collaboration. In Sydney, Beth Cardier described the mechanics behind the imagery in her fiction, which depended on the notion of narrative as an emergent system. Ted Goranson had independently been working on the structure of emergent behavior in information as a new foundation for understanding real and artificial worlds.
Cardier and Goranson didn't compare the common features of their research until the

ISIS-Symmetry Congress held in Tihany in 2004, but once they had, a research partnership followed. It resulted in the presentation of two significant papers (Goranson and Cardier, 2006; Goranson and Cardier, 2007). Cardier then developed her contribution into a PhD candidature, supervised by the Departments of Creative Writing and Information Systems at the University of Melbourne, Australia. Goranson is using it to design a radical, agent-based knowledge system for understanding the world.

ISIS-S was the cradle of this project, so it is our pleasure to present the resulting insights to the Society. This paper will give an overview of the ideas, describing how symmetry is the foundation. At the conclusion, Cardier and Goranson will pose a related problem of interest, and invite the forum to discuss possible approaches and solutions.

2 THE EMERGENCE OF PATTERNS

As with many cross-disciplinary endeavors, this one began with a registration of terms. The objective was to map Goranson's formalisms onto Cardier's narrative emergence. It took more than six months of regular email exchange for the collaborators to develop common terms that would enable them to jointly explain their ideas.

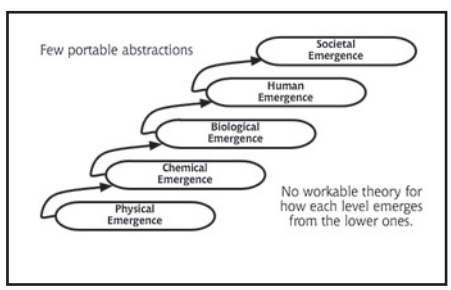

Fig. 1 Emergent scientific models.

Once aligned, they targeted a well-known problem. The various scientific disciplines cannot bridge the threshold of emergent structure without breaking key abstractions *(Figure 1)*. For example, theories exist for chemical and biological emergence but not one leading to another in an ongoing sequence. Each local model employs different basic mechanics, including fundamental laws of causality. Goranson had been pursuing this problem via the idea that a model of information based on causal elements could harmonize these conflicting sciences. For this purpose, he is involved with a community known as the "Foundations of Information Science (FIS)," managed by the Center for Advanced Studies and Research in Information and Communication Technologies & Society, at the University of Salzburg (http://fis.icts.sbg.ac.at/mailings/).

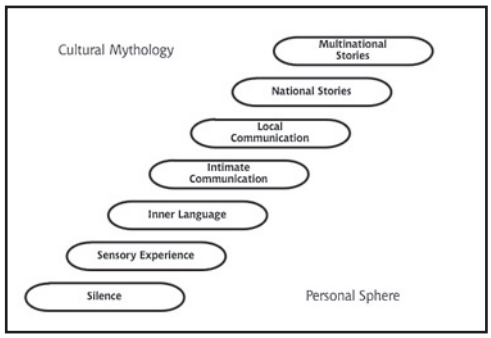

Fig. 2 Cardier's emergent levels of narrative.

Goranson's approach to emergent information was similar to Cardier's in terms of tiers that had differing "codes," "story structure" and resolution of complexity at higher levels. One crucial difference concerned the isolating division between levels. While these exist in scientific models, narrative tiers don't have the same partitions *(Figure 2)*. Narrative depends on versions of the same form being traced from the most basic level – the sweep and pull of experience — to intimate communications, and on up to refined trans-cultural stereotypes and myths. The collaborators mapped the notion of dynamic relations between elements that are integral to story onto scientific fields.

Cardier presented these qualitative factors as 'dynamics' at the 2001 ISIS-Symmetry Congress in Sydney, and Goranson had already identified them as 'functions' in computer science. These terms represented transformative processes in each field, and were the foundations of those systems in the way that *nouns* or *objects* usually are. An exploration of what it would take to build a trans-disciplinary model of emergence - one based on verbs instead of nouns - was presented at the National Science Foundation in Washington DC in March 2006 (Goranson and Cardier, 2006).

3 HARNESSING THE VOID: FORMING STORIES

The next period of research produced both more radical and useful results toward a knowledge representation system that could embrace tools found in the arts. We identified a narrative-specific feature: the absence of key pieces of information as being the driver of the "storytelling" process. This insight is framed as quantum behaviours. A second paper was presented to the Association for the Advancement of Artificial Intelligence at Stanford University in 2007 (Goranson and Cardier, 2007), which described how a narrative system is driven by gaps, incongruities and contradictions. It is the narrative urge to resolve these dissymmetries that causes a 'reader' to search for additional information, to restore symmetry (or coherence). When a new narrative description is assembled, it is composed from qualitative relations, and so it will contain new dissymmetries, which in turn propel further cycles.

Cardier's research is now focused on formalizing the building blocks of narrative for implementation in knowledge systems. In the week before the Buenos Aires Congress she presented another AAAI paper describing these units as a network of roles and relations

that bind according to a qualitative sense of causality and symmetrical 'fit' (Cardier, 2007). Her current research pursues the principles that a knowledge system would use to understand narrative symmetry. It is proposed that narrative symmetry involves coherence of form, as expressed by its metaphoric relations (Cardier, 2007).

4 EMBODIMENT

France falls into a recession. Germany pulls it out. India releases the stranglehold on business (Sowa, 1999). At UC Berkeley, the Institute of Cognitive and Brain Sciences is currently researching the degree of embodied metaphors in language (http://icbs.berkeley.edu/natural_theory_lt.php). The supposition is that the body is a fundamental source of metaphorical imagery, one that might be leveraged in creating computer systems that can knowingly read (Sowa, 1999).

The collaborators have therefore become interested in whether the relational network afforded by the human body informs the models we make of the "outside" world. The interesting problem is that the body has a vocabulary of operation that is not symmetrical in an ordinary sense. It involves hinges, weight and elasticity, the ability of parts to co-operate in tension against each other, or with other bodies. How do we reason about these relationships and forms in terms of symmetry? We invite the attendees of the 2007 Congress to contribute suggestions in relation to these questions.

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