Reflections on 30 Years of Duality Theory Research: Integration with Hierarchy Theory

Dr. Len Troncale
Professor and Chair, Biological Sciences
Director, Institute for Advanced Systems Studies
California State Polytechnic University
Pomona, California 91768
Phone: (909) 869-4040
E-mail: lrtroncale@csupomona.edu

This SIG was one of the original Special Integration Groups initiated by the ISSS. There have been >30 papers on Duality in past ISSS Proceedings, and additional papers in the *General Systems Yearbook*. An Endnote bibliography of these papers will be distributed to participants. We would expect Duality Theory to be a field characterized by considerable progress. The purpose of this summary review is to measure the magnitude of the effort expended over the last three decades, and contrast that effort with different measures of progress achieved. Some of the measures of progress cited will be the number of papers and abstracts produced, sessions sponsored, percentage of internal cross-referencing, key discriminations identified and decided, amount of consensus achieved, agreement on the key research questions that need to be addressed, and evidence of some method of empirical testing, refinement, or selection among theories advanced by practitioners.

The second part of this presentation will present a specific and empirically testable mechanism for the process of systems emergence. This process requires dualities as an important part of the mechanism. First, we will discriminate between the many different classes and types of emergence found in the literature. Many workers regard all types of emergence as the same. We will try to show why this makes it impossible to discover an emergence mechanism. We will show how discovery is enabled by restricting the study of emergence to only those cases where there is strong empirical evidence for emergence of an entirely new scalar level of natural system. We will then show how focusing on natural systems allows empirical testing of the model as well as limited predictions about the next scale in the hierarchy produced by emergence. We will make the model for this systems theory of emergence less abstract by illustrating how real dualities at one level resulted in emergence of the next level in nature. We will conclude this portion by describing the special relationship between duality theory and hierarchy theory, especially for formulating and testing an empirically-based theory of emergence.

If there is time, the third part of the presentation will explore several specific "linkage propositions" between duality phenomena and several other widely recognized systems processes. The purpose of this exercise would be to illustrate the need for and power of a "system" of interconnected systems processes to development of the field. Finally, we hope this SIG group as a whole can decide how to better organize to work and publish together throughout the year to increase the level of understanding and consensus in duality theory and stimulate its essential role as part of a general theory of systems.