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A Systems View of Life: A Grander Order in the Complexity of Life

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and theological message. Only by applying all three can we know: what means this text?

P3. A Systems View of Life: A Grander Order in the Complexity of Life

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Design has been a key and yet elusive word in the areas of science and philosophy for many years. It seemed to reach its apex in 1802 with Paley's *Natural Theology*. However, in the wake of Darwin's *Origin* the recognition of design as part of a biological research paradigm has been greatly undermined. Design as expressed in Natural Theology is equivalent to that of a highly tuned machine. The parts are idealized and their relationships are synchronized and static. Although we see design of this type in nature, it has limitations when dealing with dynamic, complex interactions between components of a system. Component interaction can range from that of an organism within a biosphere to that of an organelle within the cell. Could there be a broader definition of design that can provide useful insights into the study of the creation and in turn become part of a fruitful research paradigm?

Here systems theory is used to develop a framework for defining design in a broader fashion. General systems theory, developed in the 1930s by Ludwig Bertalanffy, proposes the existence of properties or laws that describe the interactions between systems. These laws of interaction apply not only to biological systems, but also to social, political and mechanical systems. Cybernetics, a subdiscipline of systems theory, treats each component of a system as a black box. The black box interacts with its environment through inputs and outputs. Although the outputs of a component are dependent on its environment and internal state, it is possible to study component interaction without knowing the internal function of the component. This is a more holistic approach and provides a context from which to study adaptation, complexity and optimal design.

In recent years computer scientists have gained experience working with the design of complex systems. One fruitful approach to software design is Object Oriented Programming (OOP). In this approach complex programs are broken into smaller interacting components. By restricting the amount of interaction between components, the programmer is able to better anticipate the complexities of the system's behavior and, therefore, control and hopefully eliminate errant behavior. Out of OOP came the concept of design patterns, which are rules of "best practices" when solving certain software problems. Gamma et al. (1995) identified twenty-three such design patterns. Assuming these patterns capture the essence of design in a broader sense, a comparison can be made to biological systems.

From this comparison there is at least an analogous correspondence between OOP and biological systems. This gives confidence that design patterns provide a starting point for developing an inter-disciplinary language of design. As a research paradigm, a design language provides potential solutions to classes of biological problems. Although it does not prescribe the particular solution, it does restrict the number of viable solutions for a well behaved system. As biologists are able to recognize and communicate design concepts effectively, new patterns can be discovered, which can benefit the OOP community as well as others.

As a specific application, systems theory and design patterns can be applied to the study of limits of variability in the creation. Thinking of an organism as a collection of interacting components, it is possible to differentiate between components exercising global control and those exercising only local control. Likewise a distinction can be made between components of interdependent function and components of peripheral function. Although the loss of a peripheral component is not lethal, it may reduce the ability of an organism to adapt to its environment. Assuming there has been a systemic degradation of each holobaramin since the fall, it may be possible to restore some of the adaptive capabilities of an organism by comparing current members of a particular holobaramin.

Gamma, E., et al. 1995. *Design Patterns: Elements of Reusable Object-Oriented Software*. Addison-Wesley, San Francisco.

P4. A Grander View of Nature: Creation and Evolution in the Galápagos Islands

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Despite the reputation of the Galápagos Islands as nearly "sacred ground" to evolutionists, creationists have largely ignored them. Darwin's visit to the islands led him to reject species stasis and accept common descent, but the widespread belief that Darwin developed his ideas about natural selection from observations at Galápagos are false. Natural selection as an explanation of, for example, Darwin's finches came only in the mid-twentieth century. I recently completed a major review of Galápagos biology with particular attention to common ancestry and natural selection.

I analyzed eight groups of animals and plants, each with at least one species endemic to Galápagos, using baraminic distance and classical multidimensional scaling. The eight groups consisted of the cormorants (family Phalacrocoracidae), lava lizards (genus *Tropidurus*), a sunflower tribe (Astereae), the boobies (family Sulidae), the weevils (family Curculionidae), the penguins (family Spheniscidae), the iguanid lizards (family Iguanidae), and the turtles (order Testudines). Based on the results of these studies, I found that most groups contained at least one monobaramin, and I also identified seven holobaramins (the penguins, iguanids, and five turtle groups). At lower taxonomic levels within families, I did not find conclusive evidence of discontinuity using baraminic distance correlation. Only when examining families and their outgroups were discontinuities apparent (except for the curculionids which did not show evidence of discontinuity with outgroup taxa). These initial findings suggest that the baraminic distance correlation method does not indiscriminately identify any difference as a discontinuity.

Although adaptive radiation is frequently used to describe Galápagos organisms, it is poorly defined. To remedy this, I adapted five criteria from Carlquist (1974), two of which identify evidence of adaptation and three of which identify evidence of