Chapter 12
The Arrival of the Fittest:
Evolution of Novelty from a Cybernetic Perspective

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ABSTRACT

Organizations and organisms are both complex systems exposed to evolutionary changes. The authors challenge the perspective of mainstream evolutionary theory, according to which evolutionary progress is accomplished in terms of blind variation and external selection. Instead, they present a perspective that complies with Bateson's emphasis on the "negative" character of cybernetic explanation, which offers explanations in terms of constraints rather than causes or forces. His concept of "pathways of viability" is aligned with the work of evolutionary theorists such as Waddington, von Bertalanffy, Riedl, and Kauffman, who reject external physical causation in favor of internally-driven "stimulus-and-response" and therefore move the focus from external selection to epigenetic mechanisms. Such a cybernetic evolutionary theory responds to various open questions in biology and management theory, including the dispute between homogenists and heterogenists as well as "path-dependence" in companies. The authors conclude that the strongest players are not those who adapt to the economic environment but those who emerge from it by co-creating it.

It would be disastrous for a company [...] to have to rely only upon its customers to find out whether the engine was properly put into a car or whether the cylinders are equal in size. (Riedl, 1977, p. 362)

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INTRODUCTION

Organizations, like organisms, are complex systems. From the perspective of the observer they need to adapt to their environment: their managers need to react to fluctuations in the environment with appropriate organizational change because, as in nature, the fittest will allegedly survive. In this paper

I point out that if we take the analogy between management and nature seriously, certain reservations have to be taken into account. They cast doubts on the common sense idea that evolution takes place in terms of natural selection and that it consequently amounts to progress (Riegler, 2001, 2008). The arguments presented here are based on the cybernetic insight that it is not external selection that determines the evolution of novelty in a complex system but the interdependences of elements within the complex system itself.

In his 1967 paper *Cybernetic Explanation*, Gregory Bateson stresses the peculiar "negative" character of cybernetic explanation. That is, in cybernetics phenomena are accounted for in terms of constraints rather than causes or forces. What Bateson referred to as "pathways of viability" must be considered a key concept in accounting for evolutionary phenomena that cannot be explained by the "positive" mainstream evolutionary theory, which adheres to a causal – and in the sense of Bateson – non-cybernetic explanation. Based on the work of evolutionary theorists such as Waddington, von Bertalanffy, Riedl, and Kauffman, whose results provide support for the present systemic account, I shall outline a genuinely "Batesonian" account for evolution, which, due to its cybernetic character, is applicable to both nature and management organizations.

The paper first reviews the basics of current mainstream evolutionary theory and discusses its shortcomings. Bateson's rejection of external physical causation and acceptance of internally-driven "stimulus-and-response" justifies moving the focus from external selection to epigenetic mechanisms proposed by Waddington and von Bertalanffy. They are identified as the driving force for evolutionary progress as they implement canalization based on the hierarchical interdependencies among genetic components. The paper continues with the formulation of the cybernetic theory, which receives support from Kauffman's observation that in complex systems order arises "for free" in the absence of external influences. Finally, the implications for management theory are discussed.

CURRENT EVOLUTIONARY THEORY

The current synthetic theory of evolution features two main factors in evolution: variance in terms of *genetic* mutation (in order to generate "blind" variation) and elimination of *phenotypic*[1] variants in terms of environmental selection. This paradigm has been shaped over several decades. First, by merging Darwin's original theory with Mendelian genetics resulting in "Neo-Darwinism", and later, with population genetics and ecology resulting in mainstream synthetic evolutionary theory.

The inclusion of genetics shifted the attention from the macroscopic level down to the level of genes, thus providing a new basis of explanation that was at the time not available to Darwin himself. One of the main achievements was the formulation of the "Weismann-Doctrine" or "central dogma" of molecular biology, according to which nucleic acids act as templates for the synthesis of proteins, but never the reverse. This makes it impossible that characteristics acquired during the development of an individual organism (*ontogenesis*) can be passed on to the next generation (as Lamarckism claims). Therefore, the dogma lays down the flow direction of genetic information during gene expression, i.e., the process by which the genetic sequence is converted into the structures and functions of a cell: deoxyribonucleic acid (DNA) → ribonucleic acid (RNA) → proteins → organism.[2] Evolutionary changes only occur due to mutations that modify the structure of DNA or errors in the transcription process. Mutations are saltatory and non-directional and they can be artificially triggered, e.g., through chemical or thermic stimuli. However, this only increases the *probability* of their occurrence but does not bias the *direction* of their impact.