Editorial

Editorial: The complexity of change and adaptation

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The new paradigms of dissipative structures, synergetics and complexity have emerged from the study of open systems with qualitatively evolving dynamical regimes concerning inherently non-equilibrium situations. The older traditions of natural science had, through the use of either mechanical or equilibrium assumptions, divorced themselves from history. The complex intertwining of processes and events in an emergent historical evolution, and the consequent interplay of chance and necessity, was missing from traditional views of scientific explanation, and so ecology, economics, organizational science and much of social science was seen in terms of equilibrium solutions representing post-evolutionary optima.

But of course, in the real world, evolution is on-going, and the changes that are produced are driven by an emergent selection process that operates on partially incoherent lower level structures, and we see that there is a remarkable property that it is the partial separation of time-scales that allows us to define entities and discuss structures even within an overarching, evolutionary context.

The very idea of an "understanding" implies some overarching stationary framework within which some observed change or movement is "explained". Indeed, the idea of understanding or sense-making is dependent on finding or creating a suitable framework within which we can order apparent changes and "explain" them within some seemingly unchanging concept. In a universe that is really evolving over time, where structural changes will continue for billions of years, we see that complete explanation is really an illusion and that our understanding and explanations rely on the acceptance of a hierarchy of nested temporal and spatial scales. We are faced with fact that the things they regard as true and fixed are really not completely so. This implies that in an evolving universe there can never be a completely satisfactory explanation of all things, and that our interpretive frameworks are really created because we find them useful. When we find them inadequate, then we try to modify or add to them in order to reflect some perceived evolutionary emergence in the real world. This therefore also tells us that our interpretive framework will always be a post-rationalization with some lag behind the world. We are forced to "boldly go" and therefore face inevitable uncertainties to some degree. Fortunately, as products of evolution we have evolved naturally to do just this, and to live with some level of uncertainty in our personal lives. We run into trouble when we are dealing with the artificial worlds of financial, political and legal institutions where it is often difficult to introduce methods that allow for the unavoidable uncertainties of reality.

In this issue of *E:CO* we find some interesting discussions and research related to the problems of change, the limits to knowledge and the need to have hidden adaptive capacity if we are to respond to the real uncertainties of living. Instead of looking at change in terms of successive "equilibria", complexity tells us that we create interpretive frameworks, perhaps of successive dynamical systems with qualitative changes occurring over time, as a lagged response to our experiences. Post-rationalization is the rule, and this is necessarily the case in an evolving world. This in turn allows us to accept that "intelligence" is more about how we can develop our interpretive frameworks in the face of what we don't know, than it is about what we think we know. In some ways then, introducing successful change, the meaning of intelligence and adaptive capacity are really discussing the same central issue – can we improve on simple heuristics? The world mostly works through the exploratory processes that occur, often unintentionally, retaining what is not eliminated, and eliminating what does not work. But this simple approach is very costly as is shown in the data concerning the creation and destruction of firms in markets. The average lifetime is falling, and over the last 55 years only 17

firms of the original S&P500 still existed, and only 2 of these had returns on investment better than the overall market. Start-ups have an even higher mortality rate, and it is clear that the whole structure of the economic system is really an expression of non-rational behavior, in the sense that if one looked at the data rationally, no-one would start a business. But people do, thank heavens! And in reality this can only be based in a non-rational self-belief that the ideas, technology or intelligence of the start-ups are above average and so the chance of success are greater than that of others.

The fundamental impossibility of predicting outcomes means that we drive forward into the unknown, discovering and shaping the emergent future as we go. For me this captures the meaning of Prigogine's phrase concerning complexity – "From Being to Becoming" – which contrasts the difference between an understanding of reality as a dead, fixed mechanical representation, rather than as the unpredictable, emergent living reality that we actually experience, and which we also partially create - that is a continual "becoming". This issue of *E:CO* takes us further in our journey into this new and important territory.