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Introduction to the Special Issue: Fundamental Problems in Biocomplexity

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INTRODUCTION TO THE SPECIAL ISSUE

Welcome to the special issue of NDPLS on the topic of ''Fundamental Problems in Biocomplexity.'' The issue self-organized from contributions to the annual conference of the *Societa Italiana Caos e Complessita* that took place in Rome in October, 1998.

As our readers are probably aware, a complex system is one that contains multiple subsystems with positive and negative feedback flows connecting the subsystems. As soon as we ask, ''How complex is the system?'' we immediately encounter multiple definitions depending on the aspect of the system to which we are attending. Lucio Biggiero's opening article investigates the different taxonomies of complexity. Scientific measurements that are taken on complex systems also become complex with specialized requirements for probability distributions and other properties, according to F. T. Arecchi. Interested readers should also see his companion papers on related themes (Arecchi, 1997, 1998).

Roumiana Nicolaeva-Hubenova addresses a problem that is as old artificial life itself: ''How can we model the flow of information within a living system?'' This question is parenthetically related to another outstanding issue in cognitive science known as the ''binding problem.'' The binding problem denotes inquiry regarding how ideas are associated in a cognitive process. Furthermore, it is concerned with the means by which information flows over time and the medium by which it is bonded to physical neural

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structures. In any case, the answers to some of these challenging questions depend on whether one is observing the flow of information from outside the organism or from inside. Although the articles by Ljubisa M. Kocic and Franco Orsucci address very different topics, they both share a concern for evolutionary development. The literature on fractals frequently shows how the shapes of familiar plan life can be represented by relatively simple mathematical structures. The understanding of fractal life forms is now reaching a new level wherein it is possible to mathematically define a pathway for a morphological transition between two plausible evolutionary forms. The transition mechanism that Kocic defines has not yet extended to discontinuous or punctuated equilibrium phenomena, although we anticipate those extensions in the future.

According to Orsucci, the understanding of human happiness is a goal of psychotherapy since its earliest days. Our potential for catalyzing such a state of well-being is greatly improved by the understanding of a person as an ecological entity and the role of nonlinear self-organizing processes inherent in "deep ecology" (cf. Goerner, 1994). It is auspicious that related ideas about the complex systems nature of happiness have emerged in other parts of the world (Schiepek, 1999; Seligman & Csikszentmihalyi, 2000) since the time of Orsucci's presentation to the Rome conference.

Finally, all good theories are testable in some fashion. Nonlinear dynamics theorists have often worked under the handicap of needing very large data sets to test dynamical principles. To remedy this situation, Simone Giannerini and Rudolfo Rosa explain how bootstrapping techniques can be used to enhance the generalizability of dynamical structure that have been extracted from relatively small data sets.

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