Robert Rosen

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Robert Rosen (1934-1997) American mathematician, theoretical biologist and Professor of Biophysics, worked first between 1964 and 1973 at the Center for Theoretical Biology at Buffalo, New York, and after 1974 at Dalhousie University. He completed his PhD studies in Mathematical Biophysics with Professor Nicolas Rashevsky, the Founder of Mathematical Biophysics and Mathematical Biology at the University of Chicago in the Committee for Mathematical Biology. During this very productive period he developed a categorical representation of Metabolic-Repair systems or (M, R)–systems for organisms, their relational structure and biodynamics. His last books entitled *"Life Itself"* and *"Essays on Life Itself"* address the fundamental question "What is Life?", biological complexity and logical-mathematical foundations of theoretical biology. He served as President of the Society for General Systems Research, (now *ISSS*), during 1980-82. Rosen's *abstract relational biology* approach focuses on a definition of living organisms, and all complex systems, in terms of their internal "organization" as open systems that cannot be reduced to their interacting components because of the multiple relations between metabolic and repair components that govern the organism's complex biodynamics. He deliberately chose the 'simplest' graphs and categories for his representations of Metabolic-Replication Systems in small categories of sets endowed only with the discrete topology of sets, envisaging this choice as the most general and less restrictive. It turns out however that the categories of (M, R)-systems are *Cartesian closed*, and may be considered in a very strict mathematical sense as subcategories of the category of sequential machines or automata, in a somewhat ironical vindication of the French philosopher Descartes' supposition that 'all animals are only ellaborate machines' or mechanisms. The latter, mechanistic view prevails even today in most of general biology, but not in sociology or psychology.

On the other hand, Rosen's metabolic-replication systems– when extended to generalized, variable (M, R)-systems– that were endowed with unique algebraic and variable topological structures, are different from any type of classical automaton, with the possible exception of *quantum automata*. Rosen's relational approach to Biology is an extension and amplification of Nicolas Rashevsky's treatment of n-relations in, and among, organismic sets that he developed over two decades as a representation of both biological and social 'organisms'.

Robert Rosen's contributions to abstract relational biology as well as theoretical biology are however much more numerous and substantial than the concise, outline presentation of his work provided in this brief biography. The reader may find many more interesting details in the following bibliography related to Robert Rosen's contributions to Mathematical Biophysics, Mathematical and Theoretical Biology.

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