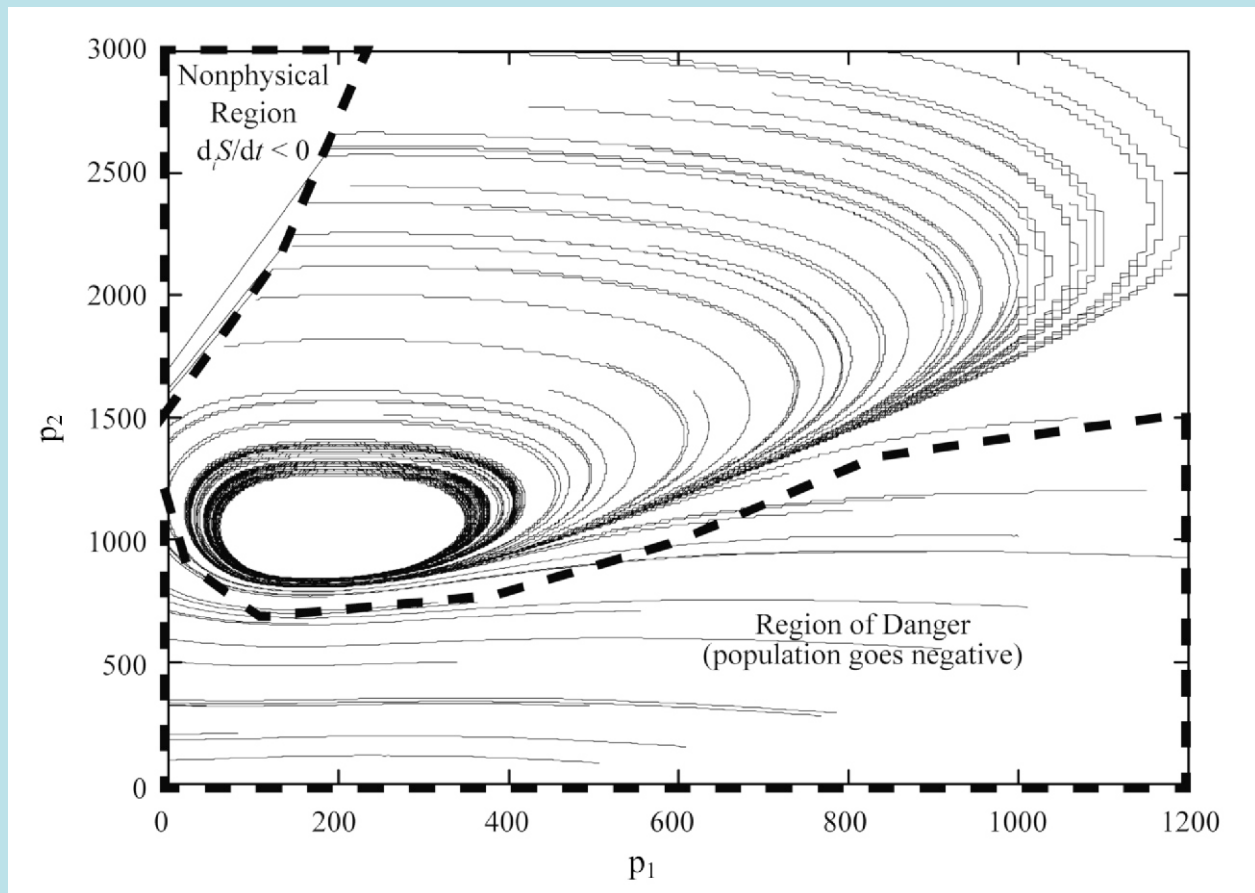


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The figure on the front cover is from the article published in *Journal of Modern Physics*, 2011, Vol. 2, No. 6A, pp. 627-635, by Vasthi Alonso Chávez, *et al.*

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Foreward

The presentation of this special issue “Recent Advances in the Thermodynamics of Life and Evolution” within the Journal of Modern Physics is a really exciting event. It represents the bringing to public view of a number of revolutionary ideas on life and evolution obtained by taking a thermodynamic perspective. Life and evolution, as all out-of-equilibrium thermodynamic processes, are dependent on the dissipation of a thermodynamic potential (*i.e.* on entropy production). The novelty of the articles presented here is that entropy production is considered, not simply as a by-product of life, but rather as its defining characteristic, what gives life its vitality, and what allows us to predict its dynamics.

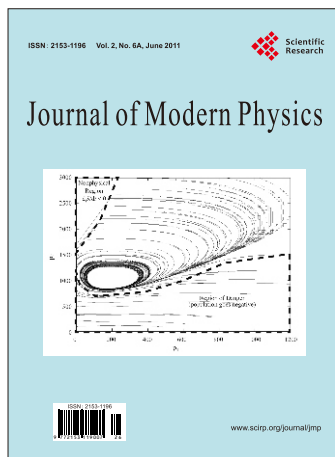
What better way to open this special issue than to discuss the most important thermodynamic potential promoting the origin, persistence, and evolution of life on Earth; the Sun. In the first article, I team up with a former principle researcher on the NASA Apollo missions to the Moon, Oliver Manuel, to discuss evidence from the life sciences suggesting the need for a revision of the standard solar model in favor of a pulsar star centered model of our Sun. In the second article I present my thermodynamic theory of the origin of life. I suggest that 3.8 billion years ago Nature embarked on a program to construct organic molecules to absorb and dissipate solar photons, thereby fomenting the global water cycle while augmenting the entropy production of Earth in its solar environment.

The third article by A. Umantsev presents an interesting idea of how dendritic crystallization may have lent both structure and function to the first living organisms. This “dendritic hypothesis” of the origin of biological function explains similarities in living systems and supports the assumption of a ‘second genesis of life’. The fourth article by E. Izquierdo-Kulich, E. Alonso-Becerra, and J. M. Nieto Villar, presents some very intriguing evidence relating the fractal dimension of a tumour contour with the degree of proliferation of the tumour cells. These authors suggest that the entropy production rate can be used as a measure of tumour aggressiveness and malignancy, providing a possible new tool for cancer diagnostics.

The fifth article by C. G. Chakrabarti and K. Ghosh considers the interrelationship between the dynamical stability and the dynamical complexity of an evolving biological system. These authors suggest that the entropy production rate of such a system can be related to its dynamical complexity which, in turn, can be expressed in terms of the positive Lyapunov exponents of the systems set of deterministic kinetic equations. In the final article, V. Alonso Chávez and I (K. Michaelian) show how non-equilibrium thermodynamic criteria can be used to predict ecosystem response to perturbation. These criteria are based on the entropy production of the system, and, for ecosystems for which the external constraints can be considered constant, they provide new tools for predicting the population dynamics of its component species.

So sit back and relax while reading through this special issue. But don’t stop there, take up some of the ideas presented, criticize and expand on them, or present your own. This open access journal is an ideal forum for developing bold new ideas. The authors of the present special issue are looking forward to your feedback and to reading one of your articles here.

Karo Michaelian, Editor,
Mexico City, June, 2011.



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