Mind over Molecule: Activating Biological Demons

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ABSTRACT: The new vogue for Systems Biology is an important development. It is time to complement reductionist molecular biology by integrative approaches. But this welcome development is in danger of losing its way. Many of the early implementations of the approach are very low-level, in some cases hardly more than an extension of genomics and bioinformatics. In this paper I outline some general principles that could form the basis of Systems Biology as a truly multi-level approach. We need the insights obtained from a higher-level analysis in order to succeed at the lower levels. Higher levels in biological systems impose boundary conditions on the lower levels. Without understanding those conditions and their effects we will be seriously restricted in understanding the logic of living systems. Sydney Brenner has insisted that 'the cell is the correct level of abstraction'. I would go further and insist on the value of abstraction at even higher levels than the cell, while recognising the cell as a landmark level of biological organisation. The principles outlined are illustrated with examples from cardiac and other aspects of physiology and biochemistry.

KEYWORDS: Systems Biology, Computational Physiology, Human Physiome Project, Genetic Determinism.

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