

THE XXI CENTURY CHALLENGES AND COMPLEXITY

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ABSTRACT

Scientific knowledge and technologies confer humans the power of perturbing the fragile stability of climate, ecosystems, and societies, and the delicate psychophysical well-being of every human. Humanity has to make smart and wise choices to get through the coming period of peril and opportunity. The challenges of the XXI century are global, and they regard Complex Systems. Examples of Complex Systems are living beings, ecosystems, macro-economy, societies, and the climate of the Earth. Current science is unable to describe the properties of Complex Systems exhaustively. In other words, it is not possible to predict the behavior of Complex Systems, especially in the long term. Why? There are different reasons:

- First, Natural Complexity is linked to Computational Complexity: many of the computational problems regarding Complex Systems are solvable but intractable.
- Second, Complex Systems exhibit variable patterns: variable patterns are hard to be recognized because their features depend on the context. In these situations, a Descriptive Complexity emerges.
- Third, the predictive power of science has intrinsic limitations.

Our limitations in predictions make many ethical issues highly disputable. In particular, we can now manipulate life, but we ask ourselves if it is always fair to do what technology makes doable. These kinds of questions create a Bio-ethical Complexity. How can we win the XXI century challenges that regard Complex Systems? In this contribution, we propose a promising path to answer this compelling question.

Keywords: complex systems, thermodynamics, self-organization, natural and social sciences

References

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