

Realistic description of causality in truly complex hierarchical structures

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In his recent essay article entitled “Physics, Complexity and Causality” (*Nature* **435**, 743; 2005) George Ellis states that despite well-known successes of physics “we still do not have a realistic description of causality in truly complex hierarchical structures”. Whereas one can only support the author's view that such description is increasingly desirable, the main statement suffers from essential incompleteness, since a realistic, mathematically rigorous and universally applicable description of detailed cause-effect links in truly complex systems does exist and is easily accessible through internet sources. I can refer to several web pages as starting points for further study of these results presented either as a rigorous theory or its popular exposition: <http://arXiv.org/abs/physics/9806002>, <http://arxiv.org/find/quant-ph,gr-qc,physics/1/au:+Kirilyuk/0/1/0/all/0/1>, <http://myprofile.cos.com/mammoth>. Such causally complete concept of dynamic complexity in real systems exceeds qualitatively basically inefficient attempts to analyse complex system behaviour with the help of standard physical models mentioned in George Ellis's essay.

Although huge diversity of complexity manifestations in real systems always leaves much place for a study of details, the theory in question provides a consistent answer to the main challenge of real-system complexity: it specifies the exact origin, universally applicable definition, and evolution law of dynamic complexity at any its level, using truly “nonperturbative” (non-simplified) solution of “nonintegrable”, i.e. “insoluble” dynamic equations written for arbitrary, realistic configuration of underlying interaction processes. As those generically formulated equations for the detailed, real system dynamics do remain unsolved in the same standard approach framework that cannot find a consistent complexity concept, such extension of the existing theory does not look unnatural and finally appears to be the unique possibility to save the fundamental causality of “exact”, mathematically based science considered as a universal method for real world description.

Whereas the details of the proposed causally complete theory of real system complexity cannot be discussed here, it is important to note that its efficiency and universality are confirmed by a vast and growing scope of successful, problem-solving applications to various “difficult” cases, from real quantum systems to the causal mechanism of consciousness and all its products, genome interactions, and autonomic communication networks. As these results have been successfully presented at many international conferences (and sometimes even published!), the true problem is not the absence of realistic complexity description, but its intentional neglect, without any scientific objection, by the same science establishment that insists (rightly) upon the necessity of that “new kind of knowledge” (see also *Nature* **434**, 701; 2005, among many other materials). Occasionally, an article analysing such peculiar “science climate” today appears just several pages before the George Ellis essay (*Nature* **435**, 737; 2005). While the needed transition to more open forms of science organisation and practice is probably a generation-long task, we emphasize here a particular but vitally important aspect of knowledge creation, the basically equal right to know and communicate science results through all its major sources.[†]

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† Urgency of this demand is further illustrated by apparent rejection of this letter by the journal editor because of the standard “limited space” problem. Despite its extremely limited resources, the same establishment science machine that contributes generously to practical complexity destruction by its blind empirical modification can publish, however, practically unlimited number of extended “humanistic” appeals, unsolved problem accounts, and “philosophical” speculations about the importance of real-system complexity, “reinvented physics”, and approaching “our final hour”.