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Sociophysics: Social collective behavior from the physics point of view

"Scientific truth is beyond loyalty and disloyalty";
Isaac Asimov, in his novel series Foundation

Could society-related processes be understood in a scientific manner, i.e., solely explained (and eventually predicted) in terms of the actual facts driving the events, without any bias associated with particular points of view or ideological interests? Such a possibility, fictionally imagined by Isaac Asimov in his "psychohistory", is the goal of the relatively new area of sociophysics.

Sociophysics is a strongly interdisciplinary field of research, whose aim is to answer questions about how large groups of human beings behave. Although the individuals of social groups are of course very different from inanimate particles, having their own psychology and free will, the interactions among individuals give rise to collective phenomena, such as the appearance of polarization of opinions or of different regimes in the movement of crowds. Therefore, in many instances social emergent behaviors resemble those arising in physics. Indeed, large social groups can be seen as coupled nonlinear dynamic many-body systems, which can self-organize, accordingly undergoing phase transitions, percolation processes, and other critical phenomena.

Also, the topology of the connectivity network between the agents in the community can drastically change the cumulative global responses, thence playing a fundamental role in determining the "macroscopic" social system dynamics. Moreover, long-range interactions, usually a challenge in traditional problems in physics, are crucial in sociophysics. In fact, social media, efficient transportation, very integrated communication nets, and so on, allow individuals to interact with many others, even if geographically very far apart. Thus, description of political, economic, cultural, and other aspects of the social life may pose interesting questions in a statistical and thermodynamical-like description of society.

In this way, the application of techniques from statistical physics (and other areas, such as complexity) to describe social systems is currently one of the hottest topics in the study of human organization and interaction. Importantly, such an analysis from the point of view of physics – for example, using concepts such as phase transitions, nonlinear phenomena, nonequilibrium statistical mechanics, and thermodynamics – should at least in principle lead to an objective and illuminating understanding of the society dynamics. Since sociophysics assumes that social groups and social relationships evolve according to certain rules and guiding trends, the hope is that it can turn sociology, politics, and other humanities from qualitative to quantitative (and why not, predictive) sciences.

Given the above scenario, this special issue is focused on presenting important topics recurrently investigated in this scientific area that is already two decades old. In fact, this volume covers inquisitive problems related to social organization and social interactions from a quantitative point of view, considering ideas, concepts, and tools normally employed to study natural physical systems. Hence, it is intended to be a very valuable reference for those interested in an overview of the current state of the art in the field, comprising topics such as (but not limited to): opinion dynamics, the role of cooperation, processes of contagion in social networks, terrorist attacks, fake news and spread of rumors, cultural behavior, wealth inequality, among others.

The works in the present special issue offer glimpses of some rather fascinating issues emerging from the extremely rich dynamics of groups of people. Along these lines, we sincerely expect they can inspire the development of theories and methods of analysis to face current queries and bring forth new ones in the comprehension of the most complex human-created organization, the human society itself.

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