

RESEARCH SPOTLIGHTS

In this issue, Research Spotlights features two exciting and topically diverse articles. The authors of the first article introduce the notion of a metaplex and use it to describe and study dynamics of complex systems having both exo- and endostructure. Unlike previous works where both the exo- and endostructures of the complex systems are assumed representable by networks, in “Metaplex Networks: Influence of the Exo-Endo Structure of Complex Systems on Diffusion,” by Ernesto Estrada, Gissell Estrada-Rodriguez, and Heiko Gimperlein, the assumption is that the endostructure can be described by a continuous space. The authors give several important examples of complex networks that exhibit such features: one example is a climate system where the processes inside the regions (a.k.a. nodes) “are well described by aerodynamics and fluid dynamics, while the causal influence between regions is well described by a network of interactions.” The study of the dynamics on the metaplex offers the opportunity to better understand the individual contributions of the endo- and exo-components to the global behavior of the system. The significance of this claim is highlighted through the application to a landscape metaplex in Madagascar and to the visual cortex metaplex of the macaque: the metaplex dynamics shows that different factors are responsible for global behavior in each case. Because the study of metaplexes utilizes tools from a broad range of areas, “suggests the relevance of network theory for old problems in these fields,” and has the potential to become more widely applicable with the aid of computationally efficient methods like model order reduction, the article should appeal to many SIREV readers.

The second article, “Why Are U.S. Parties So Polarized? A ‘Satisficing’ Dynamical Model,” is a timely one. In this work, authors Vicky Chuqiao Yang, Daniel M. Abrams, Georgia Kernell, and Adilson E. Motter develop a mathematical model for the ideological polarity in U.S. political parties. Like the well-known Downsian model, the new model considers voter population distributed in a one-dimensional so-called ideology space. However, unlike the Downsian model that assumes “citizens cast their vote for the ideologically closest party, and parties adjust their positions to maximize votes,” the new, differential equations-based model is based on the concept of voters who make so-called satisficing decisions, i.e., decisions made randomly among positions the voters deem are satisfactory. Thus, while the former method predicts, incorrectly, that both parties should converge to the median voter’s position, the authors’ new model is shown to be better able to fit the empirical data. Indeed, the results for the proposed model suggest that “appealing to an extreme segment of the electorate can be a winning political strategy,” even, perhaps ironically, in the absence of changes to voters’ ideological positions. Readers are invited to explore the supplementary material for some extensions to the model presented in the article and are encouraged to consider future work in expanding their model.

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