Advances in Complex Systems
Vol. 24, Nos. 3&4 (2021) 2102001 (2 pages)

DOI: 10.1142/S021952592102001X

World Scientific
www.worldscientific.com

FOREWORD TO THE SPECIAL ISSUE ON SUCCESS IN SCIENCE

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Published 6 December 2021

Science represents a significant human achievement, and has been a force for technological and societal change. It is also a complex social enterprise with many interacting stakeholders, which has given rise to a complex academic ecosystem. Within this ecosystem, scientists, universities, funding bodies, publishers, governments and many more interact to support its advancement. It is necessary to look at science through the scientific lens to help these stakeholders understand, shape and guide the development of this system. The present Topical Issue looks precisely at this meta-science, more commonly known as the "science of science".

Science is a social endeavour and is carried out by many scientists — both cumulatively and simultaneously. This observation is illustrated by the fact that the number of references and co-authors per paper has increased over the past decades. Hence, scientists rely more and more on their collaboration network, which is a natural extension into the present as well as the past, to synthesize and integrate research findings. Understanding these networks and their evolution helps us identify the knowledge-generating process in science and correct for biases affecting the efficient allocation of resources. Specifically the paper "Reaching to the top: The gender effect in highly-ranked academics in computer science" by Jaramillo *et al.* published in this issue, discusses the gender gap among top computer scientists.

At the same time, science is also global, with many essential breakthroughs resulting from cross-institutional and international collaborations. Scientists may earn their doctorate in one country, pursue research in a second country, and take on

a professorship in a third country. Thanks to fine-grained data tracking a scientist's location over time, it is now possible to address the global nature of science by studying scientists' international collaborations and careers. In particular the work of Edet *et al.* "Global Cities in International Networks of Innovators" identifies cities which are pivotal for international collaborations.

Understanding the complex interplay of established and emerging topics is a contemporary challenge for researchers and policymakers. For researchers it represents an opportunity to identify research gaps or exploit their accumulated expertise; for policymakers it is necessary to identify and support novel and promising research areas. By distilling metadata from large open publication repositories for developing detailed taxonomies for characterizing the research topic landscape, deep insights about the structure of scientific progress can be revealed. Plachykov *et al.* leverages the massive bibliometric ArXiv repository to reconstruct the structure of knowledge in science in their paper "Network of scientific concepts: Empirical analysis and modelling". Also in this issue, Alvarez *et al.* leverages Scopus to investigate how different scientific protocols are used in economics in the paper "ABM documentation and ODD Protocol in Economics: a bibliometric analysis".

Moreover, critical boundary-spanning problems at the frontier of the research topic landscape are often ill-defined, a result of their social and cognitive complexity. A better understanding of how communities of researchers form coherent problem-solving strategies may help to address the wicked problems that have emerged in coupled human and natural systems. The work of Arroyave *et al.* "On the Social and cognitive dimensions of wicked environmental problems characterized by Conceptual and Solution Uncertainty" proposes a framework for understanding how scientists tackle wicked problems.