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BOOK REVIEW

Network Science
Complexity in Nature and Technology

edited by

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This book consists of 11 chapters, that were written in connection with a seminar "*Complex Networks across the Natural and Technological Sciences*", held in 2009 at the Institute for Advanced Studies, in Glasgow, Scotland. According to a contemporary definition, a network is a large system consisting of many similar parts that are connected together to allow movement or communication between or along the parts or between the parts and a control center. Typical networks, of relevance for the present book, are the networks formed by proteins and their interactions, by Hollywood actors and their co-appearances in movies, of web pages and their hyperlinks, of cities and direct airline flights between them, of social network users and their friendships, of brain regions and their anatomical connections, etc. etc. The curious fact is that certain properties of completely unrelated networks are identical.

The first chapter (written by the four editors) is an introduction to the basic concepts of network science.

For readers of *MATCH Communications in Mathematical and in Computer Chemistry*, the second chapter, entitled "*Resistance Distance, Information Centrality, Node Vulnerability and Vibrations in Complex Networks*", written by E. Estrada and Naomichi Hatano, might be most interesting. There a number of graph theoretical concepts are

discussed, some relevant for mathematical chemistry: resistance distance, Kirchhoff index, distance matrix, Wiener index, Laplacian matrix and its eigenvalues, ...

Of chemical significance should be also the third chapter, written by Nataša Pržulj, dealing with protein–protein interaction networks.

Epidemiological, urban–design–based, financial, ecological, biological, and neuronal networks are considered in chapters 4, 6, 7, 8, 9, and 11, respectively.

In chapter 5 is described the NESSIE web-based facility, an acronym coming from "*Network Example Source Supporting Innovative Experimentation*". NESSIE contains a variety of networks, by means of which researchers in network science may test and evaluate new algorithms, concepts, and models. The networks in NESSIE are: European economic regions, Guppy social interactions, Classifications of whiskies, Scottish football transfers, metabolite, Benguela marine ecosystem, US marine ecosystem, etc.

Chapter 10 is concerned with dynamics and statistics of extreme events in networks.

Each chapter ends with an exhaustive list of references, a total of 754 quotations.

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We may ask here about the relevance of "*Network Science*" for chemists and/or mathematical chemists.

The fact is that only two articles published in the *Journal of Mathematical Chemistry* and one in *MATCH Communications in Mathematical and in Computer Chemistry* are quoted, and that Trinajstić's seminal *Chemical Graph Theory* is quoted two times. The famous Estrada index is not mentioned at al. These details show that networks and their theory play little role in contemporary mathematical chemistry. This, however, may not be so in the near future, especially in view of the ever increasing interest in problems of mathematical biochemistry, which are just one step away from metabolic networks, and zero steps away from protein–protein interaction networks.

Therefore, those who want to be prepared for the anticipated conceptual challenges in mathematical chemistry, should get the book and read, at least, its first three chapters.

Because of vast variety of areas the book covers, it should be a must for any decent science library.

Ivan Gutman