

*Editorial by Maximilian Schich, Isabel Meirelles and Albert-László Barabási*

## Arts | Humanities | Complex Networks

In the last decade, the science of complex networks [1] experienced a remarkable success story, driven by never-before-seen amounts of data and an ever-increasing interest in understanding complex properties and dynamics. More and more physicists, computer scientists, engineers, mathematicians, biologists, economists and social scientists are tackling similar problems with methods borrowed from each other or, increasingly, developed by teams working across disciplines.

The Leonardo satellite symposium Arts | Humanities | Complex Networks, at NetSci2010 (Boston, 10 May 2010), strives to expand and foster cross-disciplinary research on complex networks within, or with the help of, arts and humanities. Up to this point arts and humanities have usually not been included in the list of relevant disciplines featured in the standard network science literature. Given the wealth of arts and humanities data, as well as the growing role of visualization and other perceptualizations in network science, we are sure that lessons can be learned by network scientists as well as specialists in arts and humanities.

The study of networks and network visualizations complement each other, as studying the represented always presupposes the study of representation. Network science can help to explore complex structures and dynamics in areas ranging from literature, art and archaeology to music, film and image science. At the same time, specialists from the arts and humanities can help to develop visualizations and other perceptualizations using expertise that draws on a broad historical corpus of works. Beyond that, other collaborative intersections can certainly be identified and explored. The convergence of arts, humanities and network science has the potential to bring new insights and foster knowledge that none of these fields can achieve on their own.

We find complex network structure wherever we look in the arts and humanities, including bibliographies, museum inventories and research databases. Every conceivable link relation in these datasets forms a complex network in a larger “network of networks” between objects, people, places, times, events and concepts [2].

Interesting sub-networks in the arts and humanities include multimodal networks of features and meta-data in art, film and literature; implicit citation and the transmission of motifs (including Aby Warburg’s Mnemosyne); as well as networks of cultural exchange and trade, from the Neolithic to modern supply chains. Relevant network dynamics include the emergence and evolution of canons in art, music, literature and film, as well as the evolution of communities of practice in art and science.

Dealing with the growing role of data visualization, network researchers benefit from cross-disciplinary collaboration. Ten years ago, leading protagonists of network science and information visualization pointed out that, visualizing a complex network, one should be able to reduce it to a simple tree or one should not try it at all, pointing to the alternative of pure numerical measures. Since then, an impressive number of examples, driven by increasing processing power and new layout methods, continue to disprove this opinion.

Scientists develop new ways of visualization, such as “edge bundling,” that bring more clarity to complex network structure. Artists have developed convenient visualization tools, such as the Processing programming language, benefitting not only fellow artists but also increasingly the sciences. And humanities researchers are using tools from cell biology such as Cytoscape, visualizing their own complex network data.

As a part of NetSci2010, Arts | Humanities | Complex Networks will foster interdisciplinary communication and collaboration, effectively adding arts and humanities to the expanding list of fields associated with complex network research. We will be happy to present the results in a forthcoming issue of *Leonardo*.

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### References

1. “Science Special Issue: Complex Systems and Networks,” *Science* **325**, No. 5939, 357–504, 2009.
2. Maximilian Schich: “Revealing Matrices,” in *Beautiful Visualization: Looking at Data through the Eyes of Experts* (Sebastopol, CA: O’Reilly, 2010).