

Which times matter to write history? Time as a causal factor

Matteo Valleriani, Kim Pham, Maryam Zamani, Hassan el-Hajj

Corresponding author: Matteo Valleriani

valleriani@mpiwg-berlin.mpg.de

When Georg J. Rheticus decided to organize the publication of N. Copernicus' *De revolutionibus orbium coelestium* (1543) by making use of its own institutional and private social network, he did so because he believed in the relevance of this work as a scientific contribution. Copernicus was old and died just after the book was published and this aspect certainly played a role concerning Rheticus' timing of action. But historians' privilege is to have the chance to see the general picture by looking backwards. 1543 was indeed at the beginning of a new era concerning astronomical culture. It was just a few years after a completely new dynamic of circulation of astronomic knowledge had begun. Starting in 1538 new textbooks—namely core knowledge (Cole 1983)—were produced in Wittenberg and they became models imitated all over Europe prompting a process of homogenization of scientific knowledge (Valleriani et al. 2019; Zamani et al. 2020; El-Hajj et al. 2022; Valleriani et al. 2022b; Zamani et al. In press). Both the time intervals between successive publications became shorter and the distances between centers of book productions adopting the Wittenberg model became longer. Speed of spread increased and Rheticus, well established in this context (Valleriani et al. 2022a), must have perceived this as an acceleration, a time compression or perhaps even a time pressure and have therefore been more prone to action (Wu et al. 2022). In this respect, time also is a cause of Rheticus' work for the publication.

How can we consider and quantify this aspect in the framework of historical network studies?

First, the concept of historical time as distinguished from natural and social time will be described (Sorokin and Merton 1937; Koselleck 2004; Rosa 2013). In particular, it will be distinguished between historians' and historical actors' perspective. By re-interpreting Fernand Braudel, historians' perspective is divided into "Time of Agents," "Time of Environment," and "Time of Institutions" (Braudel 1972–1973) as parallel, stratified but temporally not synchronized processes (Bloch 1973).

By focusing on "Time of Agents" it will be shown what can be actually quantified in the frame of historical network research. It will be shown how the historian perspective results of an interplay between a holistic view about the entire process of knowledge circulation and the time perspective of the historical actors. The latter, in turn, will be analytically distinguished into three interdependent forms of time perception and expectations of the actors. The forms reflect the future expectation of the societal group to which the individuals belong, the sense of the past characterized by a variable degree of stability of the society in turn expressed in terms of strength of tradition, and the present, in which the actors take action as based on both their future and past perspectives on one side and on their present perception of speed of events on the other.

Besides the holistic view, currently the actors' present perception can also be quantified. The holistic view represents the temporal dynamics of the spread of knowledge based on a network that connects editions based on numerous parameters, known to historians today,

but unknown to actors at the time of the events. Concerning the present perspective of the historical actors, it will be shown how their own perception of speed of events is calculated with different methods using a visualization tool developed for this purpose (*visTime*)(Fig. 1).

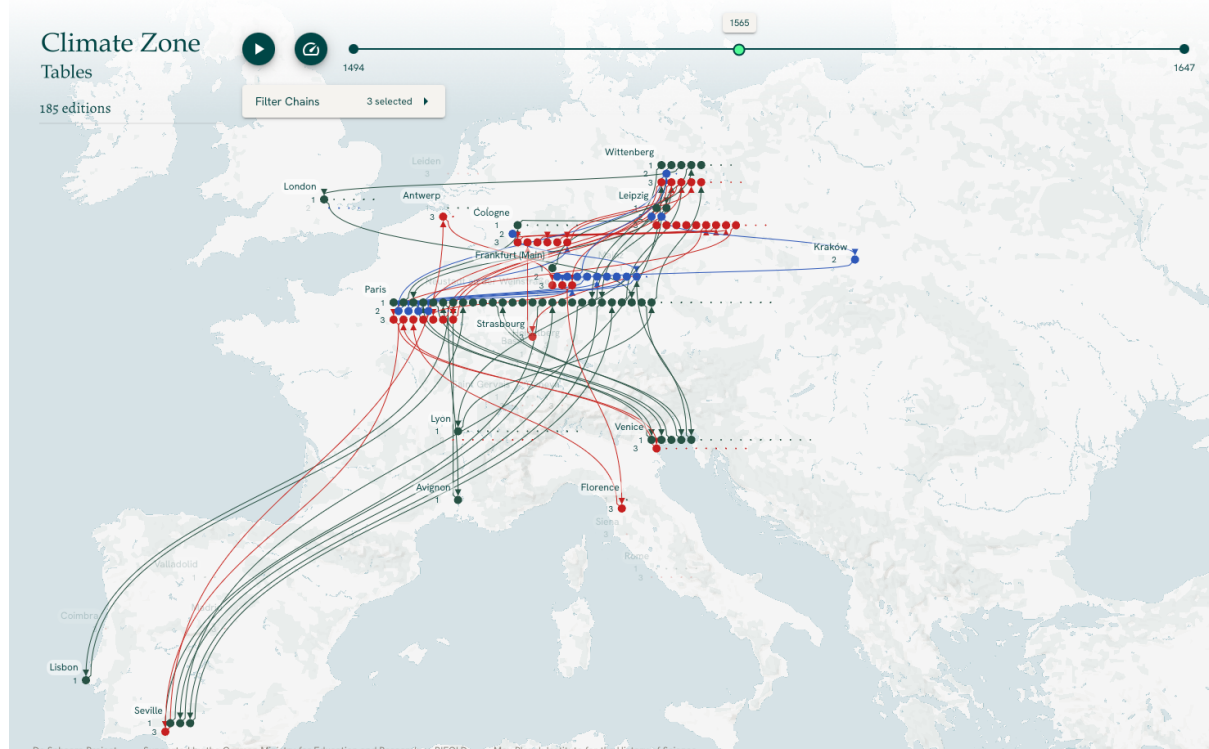


Figure 1. *visTime* visualization while it calculates the speed of events (publication of three different types of computational tables to determine climate zones on Earth's surface) for both individual historical actors and from historians' perspective

This geographic and temporal mapping of the collected data demonstrates the development of areas of activity and the relative speed and momentum to which it aggregates there. These time and space values provide an examination of both the immediate present events around individuals and also a way to move back to a historian's view to give an overview of the entire process.

By moving from a general conception of historical time, the presentation will also discuss further steps toward a general integration of time as inherent causal parameter in historical network studies.

The demonstration will make use of data collected in the frame of the project "The Sphere. Knowledge System Evolution and the Shared Scientific Identity of Europe"

(<https://sphaera.mpiwg-berlin.mpg.de>) which now includes four different collections of textbooks used all over Europe between 1472 and 1650. The data are modelled in a multiplex network, where published editions are the nodes connected on the basis of multiple parameters of semantic nature (textual and visual apparatus) and matched with metadata and fingerprints of the editions as well as data expressing relationships of economic and social nature between the historical actors involved (authors, printers, and publishers).

Reference List

- Bloch, Ernst. 1973. *Erbschaft dieser Zeit*. Berlin: Suhrkamp.
- Braudel, Fernand. 1972–1973. *The Mediterranean and the Mediterranean World in the Age of Philip II*. Trans. Siân Reynolds. First. ed. 1949, 2 vols. New York: Collins.
- Cole, Stephen. 1983. The Hierarchy of the Sciences? *American Journal of Sociology* 89(1): 111–139.
- El-Hajj, Hassan, Maryam Zamani, Jochen Büttner, Julius Martinetz, Oliver Eberle, Noga Shlomi, Anna Siebold, Grégoire Montavon, Klaus-Robert Müller, Holger Kantz and Matteo Valleriani. 2022. An Ever-Expanding Humanities Knowledge Graph: The *Sphaera* Corpus at the Intersection of Humanities, Data Management, and Machine Learning. *Datenbank-Spektrum: Zeitschrift für Datenbanktechnologien und Information Retrieval*. <https://doi.org/10.1007/s13222-022-00414-1>.
- Koselleck, Reinhart. 2004. *Futures Past. On the Semantics of Historical Time*. Trans. Keith Tribe. First ed. 1979. New York: Columbia University Press.
- Rosa, Hartmut. 2013. *Social Acceleration. A New Theory of Modernity*. New York: Columbia University Press. 2005.
- Sorokin, Pittirim A. and Robert K. Merton. 1937. Social Time: A Methodological and Functional Analysis. *The American Journal of Sociology* 12(5): 615ff.
- Valleriani, Matteo, Beate Federau and Olga Nicolaeva. 2022a. The Hidden Praeceptor: How Georg Rheticus Taught Geocentric Cosmology to Europe. *Perspectives in Science* 30(3): 407–436. https://doi.org/10.1162/posc_a_00421.
- Valleriani, Matteo, Florian Krätli, Maryam Zamani, Alejandro Tejedor, Christoph Sander, Malte Vogl, Sabine Bertram, Gesa Funke and Holger Kantz. 2019. The Emergence of Epistemic Communities in the *Sphaera* Corpus: Mechanisms of Knowledge Evolution. *Journal of Historical Network Research* 3: 50–91. <https://doi.org/10.25517/jhnr.v3i1.63>.
- Valleriani, Matteo, Malte Vogl, Hassan El-Hajj and Kim Pham. 2022b. The Network of Early Modern Printers and Its Impact on the Evolution of Scientific Knowledge: Automatic Detection of Awareness Relations. *Histories* 2(4): 466–503. <https://doi.org/10.3390/histories2040033>.
- Wu, Charley M., Eric Schulz, Timothy J. Pleskac and Maarten Speekenbrink. 2022. Time pressure changes how people explore and respond to uncertainty. *Scientific Reports* 12, 4122. <https://doi.org/10.1038/s41598-022-07901-1>.
- Zamani, Maryam, Hassan El-Hajj, Malte Vogl, Holger Kantz and Matteo Valleriani. In press. Modeling the Accumulation of Scientific Knowledge in the Early Modern Period. *Humanities & Social Sciences Communications*.
- Zamani, Maryam, Alejandro Tejedor, Malte Vogl, Florian Krätli, Matteo Valleriani and Holger Kantz. 2020. Evolution and Transformation of Early Modern Cosmological Knowledge: A Network Study. *Scientific Reports - Nature* 10: 19822. <https://doi.org/10.1038/s41598-020-76916-3>.