

Bibliometrics: History and Institutionalization

To reach the point where scientific information is a measurable entity and the measure itself is a tool for managing the social forces involved in the production of new, allegedly better scientific information, a number of key events and theoretical accomplishments have been falling into place over the past three centuries. The lecture will provide a critical overview of the historical background to the current explosion of (biblio-sciento-infor)metrics across four deeply interconnected domains:

1) The emergence of an “objective” study of social facts in early positivistic philosophies and its subsequent adaptation to the world of documentation and information during the first half of the 20th century.

The main offshoots of this tradition bearing on the evolution of metrics will be shortly reviewed:

- 18th century French scholars’ reductionist attitude toward social studies, including the marquis De Condorcet’s *mathématique sociale* as well as Pierre Cabanis’ and Destutt de Tracy’s physiologic models of human behavior;
- the commitment to an “objective” study of social statics and dynamics through natural science methods in August Comte’s positive philosophy;
- the pursuit of the biological and psychological determinants of human genius by Francis Galton and James McKeen Cattell;
- the extension of mathematical tools to the world of scientific documentation by statistical bibliographers involved in

evidence-based library collection development policies during the first half of the 20th century;

- Paul Otlet's visionary project of a wide-ranging science of bibliology encompassing la *bibliométrie* as a subfield concerned with any possible measure of the social impact of texts.

2) The rise of the social dimension of science in the Marxist tradition, a prerequisite for any planned social control over its actors and products.

A prominent place will be reserved here to the Irish-born scientist John Desmond Bernal, who definitely legitimized science as a complex information system amenable to measurement and political guidance. It will be argued that his book *The Social Function of Science* (1939) triggered a knock-on effect of cross-fertilization between Eastern and Western scientometric traditions reaching its peak in Derek John de Solla Price's "thermodynamics" of science on one side, and the Russian schools of Kiev (Gennady M. Dobrov) and Moscow (Vassily V. Nalimov) on the other side. The Russian contribution to the foundation of a sound analytic framework for quantitative science studies and the key role played by Derek Price in binding together the reductionist, mathematical, and socio-evaluative souls of biblio/sciento/informetrics will be outlined in this connection.

3) The discovery and formalization of the mathematical structure of information processes – the so-called "bibliometric laws" – and their subsequent integration into the mainstream of deterministic and probabilistic modelling.

A qualitative appraisal of Alfred Lotka's, Samuel Bradford's, and George Zipf's pioneering contributions in the first half of the 20th century will provide an insight into the most abstract side of ongoing bibliometric research. Lotka-Bradford-Zipf's original insights into the structural skewness of bibliometric and textual datasets underwent, since the 1960s, a series of confirmations, refutations, corrections and refinements culminating in the derivation of the original formulations from general stochastic models. It will be shown that this evolution aligned the emerging field of bibliometrics with the dramatic shift in the probabilistic structure of human knowledge started in the second half of the 19th century, when the pioneers of modern inferential statistics realized that deviations from the normal distribution arise (and have to be dealt with mathematically) in a surprising number of physical, biological and social datasets. A step further, in the late 20th century, the study and modelling of bibliographic networks would eventually be recognized as a special case of the more general advanced mathematical treatment of complex systems.

4) The birth and rise of a citation culture, which supplied social scientists and technocrats with the missing link between quantity and quality in the pursuit of reliable indicators of scientific research performance.

It will be shown that this historical breakthrough was technically made possible by the invention of the Science Citation Index in the early 1960s; culturally made desirable by the inability of standard bibliographic tools to cope with the Post World War II explosion of scientific and technical information; politically made urgent by the need for quick and unobtrusive tools of research evaluation to complement peer review in the era of big, hyper-specialized science; and philosophically made digestible by functionalist and neoempirist theories of science, most notably Robert Merton's view of scientific research as a norm-driven process.

The field of (biblio-sciento-infor)metrics developed a distinct disciplinary profile during the 1970s and 1980s, at the confluence of the four above-mentioned intellectual domains, and such evolution was prompted by an ever increasing political demand for objective indicators of outcome and impact of R&D spending. In conclusion, it will be contended that the controversies spoiling the day of militant scientometricians over the validity of bibliometric indicators have been there all along, just taking subtly different forms in the recurrent debates on the epistemological status of social sciences.