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## Professor Leo Egghe

DEREK DE SOLLA PRICE MEDAL WINNER, 2001



# How de Solla Price influenced my work

I was fortunate enough to meet Derek de Solla Price at a lecture he gave in Brussels in 1981. At that time, I was at a crossroads in my career: after my Ph.D. in mathematics in 1978, I became chief librarian of the Limburgs Universitair Centrum (now Universiteit Hasselt), a position I still occupy. In 1983, together with the then chief librarian of the University of Antwerp, Prof. H. Vervliet, I prepared the foundation of the degree in library and information science. In that year, I became part-time professor in this field and still teach courses on Quantitative Methods in Library and Information Science and Information Retrieval. After finishing a book on mathematics in 1984 (1), I switched to informetrics research. When I met de Solla Price, I was not yet an informetrician and had no idea of the influence he was going to have on my future career.

### The science of science

It was not so much de Solla Price's mathematical work that influenced me, as his universal philosophy on the science of science. His book *Little Science, Big Science* (2) describes growth distributions and size- and rank-frequency distributions of very different phenomena in information science, the physical world, linguistics, econometrics and so on. This book showed me that many of those phenomena have common laws and can be described in one framework, which I called Information Production Processes (IPPs) (3, 4). IPPs can be constructed far beyond information science, as de Solla Price explained (2). I defined an IPP as a system where one has 'sources' that have or produce 'items'.

A classic bibliography is an example of an IPP. Authors have papers, yielding another example. But papers can also be sources, producing or receiving items as references or citations. Books are sources of their borrowings: words are sources (known as 'types' in linguistics) and their occurrences in the text are the items ('tokens' in linguistics). Beyond informetrics, as de Solla Price describes, we have communities (cities and villages) as sources and their inhabitants as items (demography), and in econometrics one can consider employees as sources and their production or salary as items (2).

This universality is not the only remarkable thing. De Solla Price notices that all these phenomena (or IPPs) also satisfy the same sociometric (informetric) laws:

- exponential or S-shaped growth functions;
- size-frequency functions (expressing the number of sources with a certain number of items) of power-law type, such as Lotka's law (5), and;
- rank-frequency functions (expressing the number of items in the source on rank  $r$  – sources are arranged in decreasing order of the number of items they have) also of power-law type but with another exponent than in the size-frequency case, such as Zipf (linguistics) and Mandelbrot and Pareto (econometrics).

Essentially, these are all the same laws and are equivalent to Lotka's law.

### Success breeds success

It is remarkable that while rank-frequency functions are studied in informetrics, linguistics and econometrics, informetrics only studies size-frequency functions via Lotka's law. De Solla Price introduced Lotka's law into informetrics and – although equivalent with the rank-frequency laws – the size-frequency function (Lotka's law) is easier to work with since it does not use source-rankings.

De Solla Price even introduces the econometric principle 'success breeds success' (SBS) into informetrics based on the earlier work of Nobel Prize-winner Herbert Simon (6, 7). SBS is the principle that (in my terminology): the probability is higher that a new item is produced by a source that already has many items, than the probability that a new item is produced by a source with only a few items. This leads de Solla Price to a partial explanation of Lotka's law (7).

More recently, de Solla Price's work (8) has lent itself to research I am currently undertaking on the relation between productivity (number of papers) and collaboration (co-authorship). He indicates (in my terminology) that for a certain author (the IPP) for whom sources are his or her papers and items are the co-authors of each paper, you may find that researchers produce

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more papers if they collaborate more, a finding that seems to be confirmed in my recent work (in progress).

The universality of de Solla Price's view of the science of science has influenced my entire informetrics career. Since 1985, I have worked so much with IPPs and Lotka's law that I published a mathematically-orientated book [9] in which Lotka's law is used as an axiom that many mathematical results in all subfields of informetrics follow.

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## Professor Wolfgang Glänzel

DEREK DE SOLLA PRICE MEDAL WINNER, 1999



## De Solla Price and the evolution of scientometrics

Wolfgang Glänzel is Professor of Quantitative Science Studies in the Faculty of Business and Economics at Katholieke Universiteit Leuven, Belgium. He is also the Director of the Steunpunt O&O Indicatoren, which is housed within the Faculty of Economics and Applied Economics. This is an inter-university consortium of all Flemish universities. Its mission is the development of a consistent system of indicators for the Flemish Government to quantify R&D efforts at Flemish universities, research institutes and industry.

Prof. Glänzel answers our questions about his memories of Derek de Solla Price and the changes that have taken place in bibliometrics over the last two-and-a-half decades.

### RT: What are your memories of de Solla Price?

WG: I didn't meet him personally. I studied mathematics in Budapest and joined Tibor Braun's team in 1980. De Solla Price passed away in 1983, so there was unfortunately little opportunity to meet him. Everything I know about him originates from the literature and the anecdotes of people who personally knew him. I was shocked by his unexpected passing and felt like that day signified the close of an important chapter in the field.

### RT: What elements of de Solla Price's work were the most influential in the field of scientometrics?

WG: He was one of the founders of scientometrics and he paved the way for future scientometric research. He published books and important papers that addressed fundamental issues for our field, such as how to get away from methods and models adopted from other fields towards the development of a scientometric-specific methodology.

De Solla Price proposed the growth model and studied scientometric transactions, i.e. the network of citations between scientific papers. He found that a paper that is frequently cited will probably get more citations than one cited less often and created a model for this phenomenon. He also conducted scientometric studies for policy implications and research evaluation, thus opening the door for the present-day evaluative bibliometrics.

### RT: How did de Solla Price's work influence your own?

WG: His career as a scientist was an example to me of how to approach and conduct interdisciplinary research. De Solla Price had a Ph.D. in experimental physics, and then gained a second

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