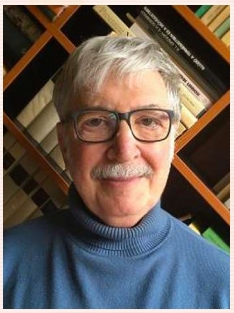
FRIEDRICH ENGELS, THE GREAT-GRANDFATHER OF SCIENTOMETRICS



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SUMMARY:
It is argued that Price's thesis about the exponential growth of science can be traced back to Engels' 1844 work, thereby, due place is to be credited to him among the ancestors of scientometrics.

The query "father of scientometrics" is responded by Google just over half a second: Derek John de Solla Price (see Figure 1).

On the other hand, one receives the message: «No results found for "grandfather of scientometrics"». It's not as if grandfathers would be totally absent from scientific genealogy. It is interesting to note that one of the authors proposing the above honoring title to Price, Eugene Garfield [Merton & Garfield, 1986], was credited as the "grandfather of Google" [Rumsey, 2010]. Quite intricate family relationships.

The recognition and consistent pursuit of exponential growth in scientific endeavor is considered one of the most prominent contributions of Price to the discipline of scientometrics. He first published on the topic in 1951 [Price, 1951], later he expounded his notions in his milestone books [Price, 1961; 1963; 1975; 1986]. Remarkably, in none of these works Price refers to any direct precedent of his exponential growth concept, although a vast literature is cited by him containing supporting data for his analyses way back to the 19th century.

Nicholas Rescher, the doyen of contemporary American philosophy, recurrently deliberated on the origin and consequences of the exponential growth of science and knowledge [Rescher, 1978; 2006]. He heavily relied upon the works of Price, but he

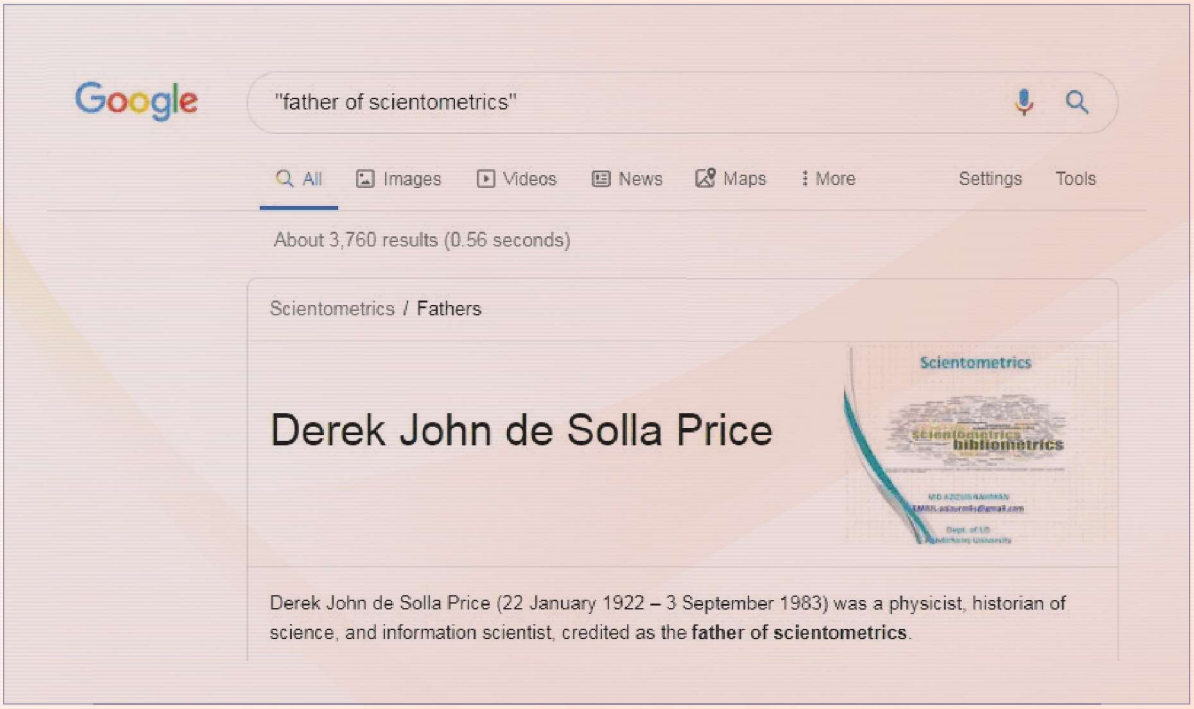

Figure 1 Google's response to the query "father of scientometrics"

definitely refrained from calling him the "father" of the concept. He even stated that by 1946 the idea of exponential growth became commonplace [Rescher, 2006, p. 54, "Bibliographical Apppendix"]. He attributed the idea to Henry Adams, and even eponymized the phenomenon of exponential growth of science as Adams's Law [Rescher, 1978] or later as Adams's Thesis [Rescher, 2006].

Adams, notwithstanding he was a most remarkable personality of the turn-of-the-century America (not necessarily in a likable and laudable way: among others, he was a ranting anti-semite), contributed only marginally to the topic in question. The reference Rescher used with predilection [Adams, 1918, Chapter XXXIV, "A law of acceleration" written in 1904] contains only rather vague and hardly quantifiable hints about the acceleration of progress in the history of mankind: "theory may assume what it likes — say a fifty, or even a five-and-twenty-year period of reduplication for the eighteenth century, for the period matters little until the acceleration itself is admitted". Rescher considers the word "reduplication" a convincing argument to believe that Adams speaks about an exponential growth.

Rescher himself offers at least two more legitimate candidates for the "grandfather" title [Rescher, 1978; 2006]. The first of them may be somewhat surprising: Sir Arthur Conan Doyle. In a short story entitled "The Great Keinplatz Experiment" [Doyle, 1885] the statement "Knowledge begets knowledge as money bears interest" can be found. Although it is just an inconsequential passing remark in the story, it doesn't appear to be inferior to Adams' assertion, nevertheless, to consider it the first printed formulation of the idea [Tague et al., 1981] seems to be a bit exaggerated.

William Thomson (Lord Kelvin), in his Presidential Address [Thomson, 1871] established: "Scientific wealth tends to accumulate according to the law of compound interest". This is a clear and unambiguous quantitative statement from a most authentic person, all the more since Thomson himself contributed to the accumulation of scientific wealth with about 660 papers. And, as Price remarked with proper admiration, "Almost every one of these could be viewed as a major scientific contribution" [Price, 1975, p. 176].

Tracking back one more generation, we get to our title character. In [Engels, 1844],

one finds: *"Die Wissenschaft [...] vermehrt sich mindestens wie die Bevölkerung; diese vermehrt sich im Verhältnis zur Anzahl der letzten Generation; die Wissenschaft schreitet fort im Verhältnis zu der Masse der Erkenntnis, die ihr von der vorhergehenden Generation hinterlassen wurde, also unter den allergewöhnlichsten Verhältnissen auch in geometrischer Progression"* ("Science [...] increases at least as fast as the population; the latter increases in proportion to the size of the previous generation, and science advances in proportion to the body of knowledge passed down to it by the preceding generation, that is, under the most ordinary circumstances in geometrical progression").

Rescher was aware of Engels' work, and even cited it [Rescher, 1978, p. 124], but did it incompletely, leaving out the passage concerning to the geometric progression. From the truncated statement he concluded: "In this respect, the early Engels would clearly qualify as a precursor of Henry Adams and Co. in the anticipation of Adams' Law. But Engels was not a mathematician, and so, perhaps, we are entitled to construe his 'in proportion to' not literally and technically, but rather more flexibly as 'stands in a fixed positive correlation to'." Obviously, the naming of the geometric progression precludes any alternative interpretation.

Instead of giving due credit to Engels for what credit is due, Rescher coined the eponym Engels' Theory based on what he calls "Engels' quadratic law of progress" [Rescher, 1978, p. 129]. This alleged theory was contrived on the basis of a cursory note in the Dialectics of Nature [Engels, 1883]: *"die Entwicklung der Wissenschaften mit Riesenschritten vor sich und gewann an Kraft, man kann wohl sagen im quadratischen Verhältnis der (zeitlichen) Entfernung von ihrem Ausgangspunkt"* ("the development of the sciences proceeded with giant strides, and, it might be said, gained in force in proportion to the square of the distance (in time) from its point of departure", an idea which, in the words of Rescher was left "in a lamentably undeveloped state." On this shaky foundation, Rescher constructed, and then deconstructed and refuted, the "Communist Theory of Scientific Progress". (In his defense, no other communist theories of scientific progress, of whatever origin, were less unfounded than his.)

Rescher considered Engels' 1844 notion completely overwritten by the four decades later fragmentary note. It is interesting to notice that not forty years, but only two paragraphs after the mentioned "reduplication" argument, Adams wrote: "Or better, one might, for convenience, use the formula of squares to serve for a law of mind; [...] the attraction of one century squared itself to give the measure of attraction in the next." Whatever this metaphor was intended to mean, it is certainly quite far from conforming to an exponential law.

"Pater semper incertus est" (the father is always uncertain) advises the ancient wisdom. What can one say then about grandfathers or great-grandfathers? In family genealogy, DNA tests may help to eliminate doubts. There is no similar aid in scientific genealogy. Citation analysis may be a useful tool in some cases, but as we try to dig deeper, bloodlines become more and more blurry. We are not always happy with what is found, but is not prescribed, either, that we have to be proud to our ancestors. As the present author is concerned, a paternal lineage Price–Thomson–Engels sounds more than flattering.

BIBLIOGRAPHIC ACKNOWLEDGMENT

In collecting historical references, I made great efforts to rely upon trustworthy sources, whenever possible, copies of original documents. Experiencing the difficulties to be encountered even in today's almost unlimited possibilities provided by internet services, I could not help but admire those historians who, even just a few decades ago, could survive and succeed

without such aids. Gratitude and appreciation to them, even if some of their inaccuracies can now be corrected.

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