

Eugene Garfield

(1925–2017)

Inventor of the Science Citation Index.

“I think you’re making history, Gene!” So said Nobel laureate and molecular biologist Joshua Lederberg to his friend Eugene Garfield in 1962. They were building the Science Citation Index (SCI), now the Clarivate Analytics Web of Science, with long-sought grants from US funding agencies. Today, we cannot imagine research without indexes that reveal how articles are cited. Garfield enabled an entire field: scientometrics, the quantitative study of science and technology.

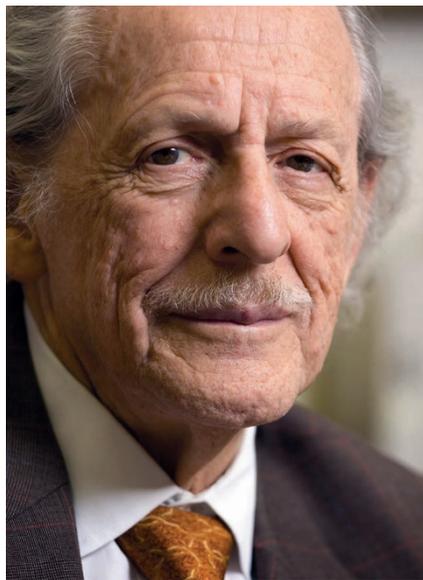
Garfield died on 26 February. We met in 1992, when I was writing a history of the index. That was a few months before he sold the Institute for Scientific Information (ISI), the company he had founded (initially named Documation) in 1956 in Philadelphia, Pennsylvania, to Thomson Reuters. He stayed on as chairman emeritus, a bomb of energy, still coming up with ideas for applying citation indexes.

Garfield also launched *The Scientist* — a monthly magazine for life scientists — together with indexes in the social sciences and humanities, and services that alert researchers to new relevant publications. The ISI’s flagship product was *Current Contents*, which compiles the tables of contents for recent scientific journals. He built a host of services to summarize, filter, index and classify articles. His tools allowed scientists to learn how publications were used in later research and to find related ones — an ability now so crucial that it is hard to imagine that it had to be invented. Garfield was also a prolific letter-writer; he developed his best ideas in communication with scientists, scholars, policymakers and technical experts. This correspondence and his more than 1,000 published essays are gold mines for historians.

Garfield was born on 16 September 1925 into a family of second-generation Jewish immigrants living in New York City’s East Bronx. He and his sisters were raised by their mother and her family, a mix of left-wing labour activists and entrepreneurs. Garfield picked up traits from both.

In 1949, he graduated from Columbia University in New York as a chemistry major. When he went to work there as a laboratory assistant, he discovered that he was not good at the bench. He indexed a closet full of previously synthesized compounds so that he did not have to remake them.

This exercise convinced Garfield that he was more information scientist than chemist.



In 1951, he landed a job at the Welch Medical Library at Johns Hopkins University in Baltimore, Maryland, where almost all information services of the National Library of Medicine were born. He explored new ways to deal with the exploding medical literature, which was outpacing the capacity of human indexing, and developed machine methods for searching and cataloguing using punch cards.

In 1953, the library organized what it billed as the First Symposium on Machine Methods in Scientific Documentation. This introduced Garfield to Shepard’s Citations, a system for legal citations invented in 1873 that tracked how US court cases cited earlier ones. It was a radical departure from subject indexing, which then dominated thinking in science.

Garfield contacted William Adair, a former vice-president at Shepard’s who had expertise in citation indexing, to see whether computers could be applied to the problem. So began a mutual education — Garfield learnt about citation indexing and taught Adair about the scientific literature. While working, Garfield did a master’s degree in library and information science at Columbia University in 1954, and obtained a PhD in structural linguistics at the University of Pennsylvania in Philadelphia in 1961. By 1955, Garfield had developed the concept of a scientific citation index and introduced it to readers of the journal *Science* (E. Garfield *Science* **122**, 108–111; 1955).

It would become one of his most highly cited articles, yet the response at the time was lukewarm. He campaigned relentlessly, presenting

at conferences, making prototype indexes and sending proposal after proposal to the US Patent Office, the National Science Foundation and the National Institutes of Health. Funding finally became available after 1957, when the launch of the Soviet Union’s Sputnik satellite unleashed panic in the United States about the information crisis in science. Funders wanted ways to evaluate their effectiveness. Lederberg and Garfield joined forces to build an automated citation index across science.

Nonetheless, for many years, the SCI made a loss, supported by profits from *Current Contents* and other ISI services. Neither scientists nor librarians saw much use for these expensive books (a ten-year set could cost US\$25,000) with their long lists of code in small print. The exception was the community of historians and sociologists of science. For example, Derek de Solla Price, a science historian at Yale University in New Haven, Connecticut, and sociologist Robert Merton at Columbia University immediately saw the SCI as an instrument for analysing the dynamics and structure of science, and each developed theories about citations in research.

Since the early 1970s, the SCI’s influence has extended. Quantitative analyses of output and citations have been used to evaluate funding programmes, research groups, individuals and nations. This use increased markedly after the Journal Impact Factor was marketed in the *SCI Journal Citation Reports* starting in 1975 (the impact factor had been computed for selected journals in the SCI from the early 1960s). Garfield came to see the impact factor as a mixed blessing, “like nuclear energy”. Although he felt that citation indexing and the impact factor could be remedies for the limitations of peer review, he was uncomfortable with their misuse as performance indicators.

Garfield was fascinated by art. The former ISI building, designed by architects Denise Scott Brown and Robert Venturi, housed an impressive collection, including striking murals by Huichol artists from Mexico.

Garfield’s enthusiasm was not the bookkeeper’s but the visionary’s. He saw in his creations a better science for society and the ideal of a unified body of knowledge accessible to all. ■

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