

## **Fifty years of citation indexing and analysis**

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September 2005

*Dr. Eugene Garfield, pioneer in the field of bibliometrics, celebrates his 80th birthday this month (September 16). We look back on his transforming contribution to research, and on his 1955 groundbreaking research that led to the creation of Web of Science®.*

### **Introduction**

Fifty years ago, on July 15, 1955, Eugene Garfield, Ph.D published his groundbreaking paper on citation indexing, "Citation Indexes for Science: A New Dimension in Documentation through Association of Ideas." This innovative paper envisioned information tools that allow researchers to expedite their research process, evaluate the impact of their work, spot scientific trends, and trace the history of modern scientific thoughts.

Three years later, in July 1958, Eugene Garfield laid the foundations for ISI (Institute for Scientific Information) by borrowing \$500 from Household Finance. He hired his first full-time employee and began to build an organization that included more than 500 people when it was acquired by The Thomson Corporation in 1992.

### **Creating the Science Citation Index**

Before Garfield's innovation, searching through published scientific papers for relevant information was a long and difficult process that often did not yield the desired results. Garfield realized that, since scientific indexes were discipline-oriented, researchers weren't finding all the information relevant to their work. Researching a scientific area solely by its subject or keywords limited findings by ignoring relevant papers from other disciplines.

"Traditionally, indexing was done within each scientific discipline," said Garfield. "*Science Citation Index*®—now available via *Web of Science*, the core database in *ISI Web of Knowledge*<sup>SM</sup>—integrated the data by taking an interdisciplinary approach. Researchers in one field often create work relevant to researchers in another."

The *Science Citation Index*, Garfield proposed, would also be helpful to researchers when tracking down the origin of a scientific idea.

In 1964, almost 10 years after making his proposal, Garfield introduced the first *Science Citation Index* as a five-volume print edition indexing 613 journals and 1.4 million citations. Two years later, *Science Citation Index* became available on magnetic tape.

### **The path to the Web of Science**

Initially, data retrieval from the printed *Science Citation Index* was time consuming, but access via magnetic tapes expanded use of the product, especially by researchers, bibliometricians and those interested in studying the quantitative aspects of science publication and library science. The *Science Citation Index* was later released on CD-ROM, along with the *Social Sciences* and *Arts & Humanities* citation indexes. These were later combined in a Web environment, and *Web of Science* was born.

As Garfield envisioned, researchers enthusiastically embraced cited-reference researching. "Garfield's vision was ahead of its time," said Henry Small, chief scientist of Thomson Scientific. "He saw the potential of citation searching for researchers, but it took 40 years for the technology to advance to the point that allowed his vision to be fully realized."

"Eugene Garfield's contributions to information science have strongly influenced me," said Professor Les Lane, plant pathologist from the University of Nebraska. "Indexing articles by their bibliographies sounds trivial, but creates profoundly useful networks and statistics."

### **Measuring influence: ensuring quality**

By indexing scholarly work by citation, Garfield allowed researchers to track what other works a paper has referenced, and how many times others have cited a paper. And by counting citations, the "Impact Factor" could be measured, assigning an indicator of quality to more influential works.

"Even if there were no other use for a citation index than that of minimizing the citation of poor data, the index would be well worth the effort required to compile it," Garfield wrote in his 1955 paper.

"Citations are an acknowledgement of intellectual debt," said Small. "*Web of Science* lets researchers instantly recognize works that are well regarded by their peers. That way, they know they are basing their work on quality research."

### **Putting "Association of Ideas" to work**

The Internet has made citation data more accessible and navigable than ever before. *Web of Science* provides access to current and retrospective bibliographic information, author abstracts, and cited references found in 8,700 of the world's leading scholarly science and technical journals covering more than 100 disciplines and going back to 1900.

*Web of Science* is a major component of *ISI Web of Knowledge*, which supports all levels of scientific and scholarly research within academic, corporate, government or non-profit environments. The platform combines high quality, evaluated content with the tools needed to use, analyze and manage that content.

Today, countless researchers worldwide are able to further their studies and evaluate their work thanks to the process of citation indexing. And it all began with one influential paper published in 1955.

Everyone at Thomson Scientific wishes Dr. Garfield a happy 80th birthday, which we hope to celebrate with him, and our customers, later this year.

### **Additional information**

Citation Indexes for Science: A New Dimension in Documentation through Association of Ideas: [http://www.garfield.library.upenn.edu/papers/science\\_v122v3159p108y1955.html](http://www.garfield.library.upenn.edu/papers/science_v122v3159p108y1955.html)

History of citation indexing:

<http://scientific.thomson.com/knowtrend/essays/citationindexing/history/>

Beverly Bartolomeo – the first ISI employee:

<http://scientific.thomson.com/newsletter/2005-04/8272930/>

Science Citation Index:

<http://scientific.thomson.com/products/sci/>

Web of Science:

<http://www.thomsonscientific.com/products/wos/>

ISI Web of Knowledge:

<http://isiwebofknowledge.com/>