

The Unintended and Unanticipated Consequences of Robert K. Merton

Eugene Garfield

Using the *HistCite* system of algorithmic historiography, we have created a series of online databases available to the public, which contain bibliographic records and citation links to a series of Merton's publications. These include the 'Matthew Effect' (1968), *Technology and Science in Seventeenth-Century England* (1970), *On the Shoulders of Giants* (1965), and his classic 1936 paper 'The Unintended Consequences of Purposive Social Action', which has been cited in more than 160 journals. We intend to create additional *HistCite* collections for his other works. While commenting upon his worldwide scholarly influence, the present paper calls particular attention to Merton's impact on information science and scientometrics.

It took me several months to find the will to write this memoir about Robert K. Merton. His death left me in an enervated state of funk. I am grateful to Steve Turner and Harriet Zuckerman for having patiently urged me to take my place in this memorial issue. Over the 40 years of my association with Bob Merton, he became not only a mentor, teacher, and advisor, but also a surrogate father. Indeed, when my youngest son was born in 1985, my wife Catheryne and I named him Alexander Merton Garfield. In the 18 years that ensued, Bob and Harriet regularly followed Alex's development from infant to teenager. One of the most memorable of many occasions was the time that Alex played a violin solo for Bob in New York City. It is a source of great comfort that we all were able to dine with Bob and Harriet just a few months before Bob died. And in his last days, I was able to visit him in the hospital, kiss him on the forehead, and inwardly wish him goodbye.

How did it all begin? As I scanned the *New Scientist* for 2 November 1961, I came across an article on the 'Role of Genius in Scientific Advance' (Merton, 1961). I remember being particularly struck by the fact that the author was a professor at Columbia University from which I had received both my BSc and MS degrees. The paper's subtitle stated that:

Discoveries by Great Scientists are so often duplicated, independently, by lesser men that it has been argued: these discoveries would inevitably have

been made, and thus the individual of genius is superfluous to a sociological concept of scientific progress. The author's researches have led him to propound a broader view.

The 'multiples' in scientific discovery had been one of the motivating factors in my pursuit of citation indexes for information retrieval, as reflected in my 1955 and 1964 papers in *Science*, and in several others thereafter (Garfield, 1955, 1964). A stated goal of the *Science Citation Index (SCI)* was to prevent or identify unwitting duplication of scientific discoveries. I often found examples of such duplication through bibliographic coupling (Garfield, 1971) or by 'cycling' references that were cited by bibliographic plagiarists, as Merton might have described them.

I recall reading Bob's 1961 article several times. It appeared at a critical period in the development of the ISI as we were then at the mid-point of our National Institutes of Health-sponsored *Genetics Citation Index* project. We had just completed the first large-scale prototype of the *SCI* and were able to provide printouts to various individuals in order to test its potential usefulness. However, it wasn't until 1 March 1962, that I wrote to him as follows:

Dear Prof. Merton:

I read with great interest your paper in the *New Scientist*. I think it has an interesting relationship to some of the work we are doing on Citation Indexing (See attached reprints). Recently I had a discussion with Prof. Kusch and he commented that citation indexes ought to be invaluable research tools for the sociologist. I would be interested to have your confirmation or refutation of this notion. A former colleague, G. Bedford, was a sociologist and often commented on how she might use a citation index to advantage, but never had a chance to spell this out for me. I would also be interested to know what you might consider to be the 'critical mass' of a citation index before it could really be useful to a sociologist. For the working scientist anything he finds through citation indexes may be useful. I enclose some recent samples of our experiments.

Sincerely, yours,

Eugene Garfield

Polykarp Kusch was one of four Nobel class scientists who formed a consulting firm named Quadri Science that also included Harold Urey, James van Allen, and Joshua Lederberg, who first made me aware of the group. They became early advisors to ISI. So I must thank Poly Kusch for having introduced me to sociology and the *New Scientist* for my first contact with Bob Merton.

Six weeks after writing him, I heard from Merton on 19 April 1962. His response follows:

Dear Dr. Garfield:

I just returned to find your note, and I did want to get a reply off to you before I leave on another leg of a research trip. (I should probably explain

that I am on sabbatical leave this year.) As is so characteristic of him, Professor Kusch once again demonstrates his capacity to scent a good problem. After having read the offprint you were good enough to send me, I am persuaded that your materials should be a rich source for the sociologist of science. As it happens, I am now in the midst of working on a problem in this field which needs precisely the kind of evidence you are putting together in your Citation Indexes. Perhaps we can get together on my return from the Pacific Coast in a few weeks. What would you say to that?

Sincerely yours,

Robert Merton

It is not clear when and if that meeting occurred. There was no record kept of our telephone conversations, but Harriet Zuckerman tells me she attended my *SCI/Social Sciences Citation Index (SSCI)* seminar in New York in 1965.

We did meet in person at an American Association for the Advancement of Science (AAAS) meeting in Dallas, TX, in 1969 where we both were presenting papers, as Bob noted in his foreword to the fifth volume of my *Essays of an Information Scientist*, in which he included the text of the two letters quoted earlier (Merton, 1983).

The theme of multiples recurs again and again in Bob's work in the 1960s and 1970s, but he returned to it once more when he wrote a gracious foreword to *Citation Indexing* (Merton, 1979). It was a pleasant surprise to learn that this foreword has been cited explicitly by several dozen authors.

A comprehensive evaluation of a scholar the likes of Robert K. Merton requires the dedication not only of a lifetime but also a team effort. Indeed, that kind of collaborative evaluation is an ongoing process involving the entire scholarly community. Twenty years ago my colleagues and I at ISI produced a citation analysis of Bob's work that required a prodigious effort (Garfield, 1980, 1983). Others, like Piotr Sztompka (1986), have more expertly codified Merton's work (see also Miles & Haritos, 1990). The bibliography of Merton's books and papers as well as his interviews and reviews of his books are too numerous to cover here.¹ Indeed, that bibliography will continue to change as his works are reprinted, and the definitive bibliography will have to include his *Travels and Adventures of Serendipity*, now already published in Italian and in English by Princeton University Press (Merton & Barber, 2004). However, his curriculum vitae and most up-to-date bibliography are available at <<http://www.garfield.library.upenn.edu/merton/list.html>> .

So I pondered how I could uniquely contribute to this special issue. By chance I began by looking at his earliest papers. In spite of 40 years of exposure to his work, I realized for the first time that at the age of 26, Bob

had already published his seminal paper 'The Unanticipated Consequences of Purposive Social Action' (Merton, 1936). It occurred to me that a brief historiographic–bibliometric analysis of that 66-year-old paper might be appreciated. Space does not permit me to list the more than 240 papers reported in the ISI Citation Indexes that have cited this 1936 work by the then budding sociologist/historian of science. The complete bibliographic collection is included in a *HistCite* database posted on my web site, which also has a similar analysis of Bob's 'Matthew Effect' and other works including 'Science and Technology in the 17th Century'.²

HistCite is a bibliographic management system that accepts the output of an online search of the *SCI/SSCI/Arts and Humanities Citation Index (AHCI)* and sorts the data chronologically as well as by author, journal, and citation frequency, both within the collection as well as outside the collection. The program creates a virtual citation index of everything cited in the collection. The system also creates a matrix of citation links that helps generate various mappings, including a topological historiograph of the most-cited works.³ In this connection, it is important to note that Bob Merton made me acutely aware of the role that historiography plays in scholarship. It is not surprising that the 'Matthew Effect' became an early guinea pig in the development of the *HistCite* system.

Apart from the explicit citations to the 'unanticipated consequences' paper, there are countless other implicit references to this work to be found not only on the Internet, but also in books in great abundance. Since this topic is also discussed in various sections of his *Social Theory and Social Structure* (Merton, 1949), the impact of the early-1936 paper is partially reflected in citations to this classic book as well as to his other work. It is important to note that the *SSCI* begins its coverage with 1956 literature. Therefore, there is a 20-year hiatus in the citation history of this paper. The paper itself is reprinted in his *Sociological Ambivalence* (Merton, 1976). Not surprisingly, citations to that chapter are also to be found – an example of citation synonymy. We have merged such synonymous citations into the *HistCite* file. A search of DialIndex on Dialog identified no less than 60,000 papers using that term, which occurred in over 550 different databases.

That Bob Merton was one of the most-cited scholars of the 20th century is a truism. His influence in sociology is obvious, but his impact outside that domain is less obvious but also quite significant as the data illustrate. Some of this effect was noted in the festschrift for Merton (Coser, 1975).

I observed this more recently for the field of information science. When we analyzed the history of bibliographic coupling,⁴ and the closely related phenomenon of co-citation (Small, 1973), the significance of his collaboration with Harriet Zuckerman on the sociology of refereeing as reflected in the papers of Zuckerman & Merton (1971, 1986) became apparent.

Merton's influence on information science is further illustrated through the impact of his 'Matthew Effect' (Merton, 1968). That work has

been analyzed in detail by our mutual friend Manfred Bonitz (1997, 2002; Bonitz et al., 1997, 1999; Bonitz & Scharnhorst, 2001), whose work will be enhanced by examining the *HistCite* file⁵ covering the classic 1968 paper and its sequel (Merton, 1988).

The *HistCite* analysis of the 1936 'consequences' paper simply provides a systematized view of the output of a cited reference search of the *ISI Web of Knowledge*, which includes data from the *SSCI*, *SCI*, and the *AHCI*. The chronologically sorted tabulations provide for each paper hot links to other papers in the list that have cited the Merton paper, as well as its citation frequency both within and outside the collection.

HistCite also provides various analyses by journal and author. Table 1 provides a list of 16 mainly sociological and economics journals in which three or more papers were published by authors who cited Merton's 1936 paper. The complete list involves 161 different journal titles. One should keep in mind that the average sociological paper is infrequently cited. In *ISI's Essential Science Indicators* database⁶ it can be seen that the average paper in the social sciences of the past 10 years is cited less than six times. I estimate that the average paper of the previous 10 years has been cited less than ten times. Considering the difference in the size of the 1930's body of literature compared with that today, one has to be impressed when a paper published over 65 years ago is cited more than 200 times.

Furthermore, from my experience in publishing *Citation Classic* commentaries in the social sciences, most papers cited over that threshold would qualify for that designation. Incidentally, Bob's own published commentary (Merton, 1980) on the 1949 edition of *Social Theory and*

TABLE 1
Ranked Journal List for Papers Citing Merton (1936; Total 161)

| No. | Title | Publications |
|-----|--|--------------|
| 1 | American Sociological Review | 7 |
| 2 | Social Problems | 5 |
| 3 | Annual Review of Sociology | 5 |
| 4 | Kölner Zeitschrift Für Soziologie Und Sozialpsychologie | 4 |
| 5 | American Journal of Sociology | 4 |
| 6 | ISIS | 3 |
| 7 | Law and Society Review | 3 |
| 8 | Sociological Forum | 3 |
| 9 | Social Forces | 3 |
| 10 | Archives Européennes de Sociologie | 3 |
| 11 | International Sociology | 3 |
| 12 | Journal of Institutional and Theoretical Economics Zeitschrift für Die Gesamte Staatswissenschaft | 3 |
| 13 | Social Science and Medicine | 3 |
| 14 | Pacific Sociological Review | 3 |
| 15 | Revue Economique | 3 |
| 16 | Sociological Practice | 3 |

Social Structure qualified, since from 1961–80, the book had been cited 175 times. Since then, it and subsequent editions have been cited in more than 5000 scholarly papers.

Since *HistCite* processes every work cited by the papers in the collection, it is possible to observe the list of so-called ‘outer references’, which gives one an idea of the papers and authors who have been co-cited with the 1936 paper (Table 2). These pairs of co-cited papers or authors form the core of putative research fronts. Not surprisingly the most co-cited work in this collection is Merton’s *Social Theory and Social Structure* (1949). Each edition is listed separately. The other items listed provide some interesting insight on the key players on this ‘topic’. As a non-expert, I was surprised to learn about the 1982 book by the distinguished French sociologist Raymond Boudon (1982) on *The Unintended Consequences of Social Action*. Although it is out of print, it is amazing to find that no less than 25 other book titles include the term ‘Unintended Consequences’.

The widespread impact of this term warrants an investigation by someone like William Safire, *The Oxford English Dictionary* and other etymological works. *The Oxford English Dictionary* does provide a definition of ‘Mertonian’ as being ‘of, relating to, or characteristic of Merton or his theories, especially those relating to the sociology of science’. But the etymology of ‘unintended’ or ‘unanticipated consequences’ is a gap that

TABLE 2
Papers Co-Cited with Merton (1936)

| No. | LCS | Reference |
|-----|-----|--|
| 1 | 15 | Merton RK, 1957 Social Theory Social WoS |
| 2 | 14 | Olson M, 1965 Logic Collective Act WoS |
| 3 | 13 | Merton RK, 1968 Social Theory and Social Structure WoS |
| 4 | 12 | Pfeffer J, 1978, External Control Org WoS |
| 5 | 12 | Meyer JW, 1977, Am J Sociol V83, P340 WoS |
| 6 | 12 | Granovetter M, 1985, Am J Sociol V91, P481 WoS |
| 7 | 11 | Selznick P, 1949, TVA Grass Roots WoS |
| 8 | 11 | March JG, 1958, Organizations WoS |
| 9 | 10 | Giddens A, 1984, Constitution Social WoS |
| 10 | 10 | Merton RK, 1949, Social Theory Social WoS |
| 11 | 9 | DiMaggio PJ, 1983, Am Sociol Rev V48, P147 WoS |
| 12 | 9 | Mead GH, 1934, Mind Self Soc WoS |
| 13 | 8 | Hannan MT, 1989, Org Ecol WoS |
| 14 | 8 | Merton RK, 1938, Am Sociol Rev V3, P672 WoS |
| 15 | 8 | Williamson OE, 1975, Markets Hierarchies WoS |
| 16 | 8 | Nelson RR, 1982, Evolutionary Theory WoS |
| 17 | 8 | Thompson JD, 1967, Org Action WoS |
| 18 | 8 | Parsons T, 1951, Social System WoS |
| 19 | 7 | Blumer H, 1969, Symbolic Interaction WoS |
| 20 | 7 | Crozier M, 1977, Acteur Systeme WoS |
| 21 | 7 | Boudon R, 1982, Unintend Consequen WoS |

Notes: Cited references outside of this network. Total 13,778 (21 shown).
Sorted by Local Citation Score (LCS).

needs to be filled. The Mertonian definition of the term and its sociological and scholarly nuances is essential. Rob Norton (2002), the former economics editor of *Fortune*, provides an extensive discussion in the *Concise Encyclopedia of Economics*.

As a lasting tribute to Bob, I have assumed the mission of making bibliometric data on the work of Robert K. Merton conveniently available as a collection of *HistCite* files. I hope this will make it easier for future scholars to interpret his impact and significance for the social studies of science.

Bob Merton was a constant source of positive reinforcement. And he was always gracious and generous in offering his expert editorial skills to help find the best way to express an idea. But I will remember him most for the sheer pleasure of his intellect and the joy of his acquaintance. I take great satisfaction in knowing that I did not wait until his death to tell Bob of my admiration for him. Thanks to the miracle of the Internet, I can refer you to the full text of my first tribute to him. The following quote from that piece best expresses my feelings:

It has often been the case that we neglect to pay tribute to those for whom we have the greatest love and respect until it's too late for them to hear it. It is also somehow not fashionable for scientists to express such emotions publicly. When I first saw the recent festschrift [Coser (1975)] in honor of Bob Merton I felt excluded, but my frustration was lessened when I realized I would have an opportunity to confirm the Mertonian 'law' called 'the Mathew Effect', by which scientific recognition is bestowed upon one who already has it. So I am delighted to pay homage to a real giant on no particular occasion but just for the pleasure in doing so. (Garfield, 1977: 8)

Notes

1. See partial bibliographies prepared by Mary W. Miles and Rosa Haritos in Clark et al. (1990: 451–60), and by Mary W. Miles in Coser (1975: 497–522).
2. For Eugene Garfield's web site, see <http://garfield.library.upenn.edu/histcomp/merton_unanticipated/> (accessed December 2003). For an analysis of Merton's (1968) 'Matthew Effect' see <http://garfield.library.upenn.edu/histcomp/merton_m-effect/> (accessed December 2003).
3. For a detailed explanation, refer to the *HistCite* Guide at <<http://garfield.library.upenn.edu/histcomp/guide.html>>. A further explanation of *HistCite* will be found in a recent paper (Garfield et al., 2003), available at <[http://garfield.library.upenn.edu/papers/jasist54\(5\)400y2003.pdf](http://garfield.library.upenn.edu/papers/jasist54(5)400y2003.pdf)>.
4. See Eugene Garfield, 'From Computational Linguistics to Algorithmic Historiography', Lazerow Lecture held in conjunction with panel on Knowledge and Language: Building Large-Scale Knowledge Bases for Intelligent Applications, at the University of Pittsburgh on 19 September 2001. Available at <<http://garfield.library.upenn.edu/papers/pittsburgh92001.pdf>>.
5. <http://garfield.library.upenn.edu/histcomp/merton_thomas-m-effect/> (accessed December 2003).
6. <<http://www.isinet.com/products/evaltools/esi/>> – *ISI Essential Science Indicators* Description.

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