

The Mystery of the Transposed Journal Lists--
Wherein Bradford's Law of Scattering is Generalized
According to Garfield's Law of Concentration

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Some readers of CC[®] may not have heard of Bradford's "law of scattering." It is well known to documentalists and librarians, for whom its original exposition demonstrated nicely what must have been intuitively obvious. Bradford, in his classic *Documentation*¹, put it this way: "Articles of interest to a specialist must occur not only in the periodicals specialising in his subject, but also, from time to time, in other periodicals, which grow in number as the relation of their fields to that of his subject lessens and the number of articles on his subject in each periodical diminishes." In other words, no matter what the specialty, a relatively small core of journals will account for as much as 90% of the significant literature, while attempts to gather 100% of it will add journals to the core at an exponential rate.

Bradford modestly considered that his law conformed "to the mathematician's criterion of being of no possible practical use whatever." But that's not quite the case. Any abstracting or indexing service that ignores Bradford's law in attempting to realize the myth of complete coverage does so at its great financial peril. The law likewise tells us that no special library can gather the complete literature of its subject *without becoming a general scientific library*. (Bradford's law, by the way, also explains why a multi-

disciplinary index like the *Science Citation Index*[®] is generally more effective than any discipline-oriented index, no matter what the specialty.)

Since Bradford's exposition of his law, numerous studies have shown that within reasonable limits it holds true for various fields of scientific specialization.²⁻⁵ At ISI[®], we are completing a study which has resulted in a generalization of Bradford's law which, in a sense, "unifies" the demonstration of its validity in studies of individual fields. Allow me the eponymic shorthand of calling this unified theory or generalization "Garfield's law of concentration". The name is intended to suggest that, in opposition to scattering, a basic concentration of journals is the common core or nucleus of all fields.

The significance of this law can be illustrated by imagining the meeting of a group of librarians, each representing "unrelated" fields like plasma physics, pharmacognosy, electrical engineering, experimental medicine, metallurgy, veterinary pathology, inorganic chemistry, ecology, toxicology, entomology, etc. Each librarian is carrying a list of 500-1000 journals which, after much study, he is going to order to satisfy his special library's journal needs. There occurs suddenly some seismic disturbance which results in much tossing about of librarians and lists. In the confusion, each librarian ends up with someone

else's list, believing it to be his own.

Subsequently the separate journal collections are established—but each in some other library than the one it was meant for. What happens? Surprisingly, *nothing at all*. Oh, some electrical engineer may wonder which of his pharmacognostically minded colleagues has pressured the librarian into including *Lloydia*; but rarely in any of the libraries are there complaints about the journal collection. In fact, each librarian finds that “his” list has produced a collection admirably suited to the needs of his special library. The law of concentration would have predicted just that result in the scene imagined.

Bradford first demonstrated the “scattering” phenomenon in his study of electrical engineering,⁶ and as has been noted, numerous studies have shown similar scattering in other special fields. So it is generally accepted that, for any field, a collection of 500-1000 journals will cover as much as 95% of the significant journal literature. It has also been accepted that there are as many different journal cores as there are special fields. However, ISI's studies of journal citation patterns have disproved that—and may have at the same time laid to rest the “obvious” assumption that there must, therefore, be anywhere from 60 to 100,000 scientific

and technical journals being published. The eternal vagueness of so important a number should long ago have caused experts to question it more closely than it has been.

Our studies at ISI have shown that a list of 1000 journals will contain all the leading journals on any specialty list, as well as account for a large percentage of all articles published in that field. In other words, what Bradford's law postulates for single disciplines, Garfield's law postulates for science as a whole. And it holds no matter how one considers the journals—as a source of citing articles or as a collection of cited articles. We have found, for example, that only 25 journals account for 20-25% of the 4 million citations processed for the 1969 *Science Citation Index*. In addition, at least one of those same 25 journals is cited in more than 50% of all articles published. Thus, in all “special” Bradford distributions, Garfield's law holds that a basic list of 500 to 1000 journals will account for 80 to 100% of all journal references.

In future editorials and papers, this will be substantiated by analysis of citation patterns in various special fields. The implications of this finding for establishing future libraries, especially in developing countries, should be quite obvious.

1. Bradford, S.C. *Documentation*. (Washington, D.C., Public Affairs Press, 1950, 156 p.)
2. Daniel, R.S. & Louttit, C.M. A Survey of Psychological Literature. In *Professional Problems in Psychology*, pp. 35-66. (New York, Prentice-Hall, 1953).
3. Brown, C.H. *Scientific Serials: Characteristics and Lists of Most Cited Publications in Mathematics, Physics, Chemistry, Geology, Physiology, Botany, Zoology and Entomology*. Association of College and Reference Libraries Monograph No. 16, Chicago, 1956.
4. Coile, R.C. Periodical literature for electrical engineers. *Journal of Documentation* 8:209-226, 1952.
5. Hall, A.M. *The Use and Value of Citations: a state-of-the-art report*. The Institution of Electrical Engineers, Report No. R70/4, London, 1970.
6. Bradford, *op. cit.* p. 108ff.