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## English Spoken Here

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English has very nearly become the universal language of science. Whether for publication or for international conferences and symposia, English now dominates scientific communication. By what degree is apparent from the contents of the journals indexed in ISI's *Science Citation Index*. This group of journals, selected by both peer judgment and the citation patterns of the world's scientists, represents the most important portion of the scientific literature. Although this is only a portion of the whole universe of scientific publications, it has long been established that a small number of core journals accounts for the lion's share of important articles and citations.

Of the 700,000 articles indexed in the 1986 *SCI*, 87.8 percent are in English (of which 3 percent comes from translation journals), 4 percent in Russian, 3.7 percent in German, 2.5 percent in French, 0.8 percent in Japanese and 0.6 percent in Spanish. Articles in all other languages amount to only 0.6 percent of the data base. Data from 1978 and 1982 offer an almost identical profile of articles indexed in the *SCI*.

Citation data, furthermore, prove that in use, even more than in output, English is pre-eminent: the 88.6

percent of 1978 articles in the *SCI* in English attracted 96.4 percent of all citations during the period 1978-1982. On the other hand, the 3.9 percent of 1978 articles in Russian received only 1.0 percent of 1978-1982 citations. The numbers for German are 3.8 percent of 1978 articles and 1.5 percent of the 1978-1982 citations, and for French 2.6 percent of the articles and 1.0 percent of the citations.

What does this predominance of English in scientific communication mean?

It means that a scientist who does not know English faces two large obstacles in communicating with colleagues worldwide. The first is difficulty in using the scientific literature, whose important journals contain largely English language articles. While indexing, abstracting and translation services will help identify and deliver summaries or full-text translations, the time, effort and expense involved are not trivial. Secondly, articles not written in English will attract fewer readers. By not writing in English, a scientist may be building a fence around his or her work that keeps colleagues away.

I showed this to be true in a study of French scientists who publish in

English or French. Their English language articles were cited considerably more often than those written in French. Moreover, approximately half of their French language articles were uncited in a four-year period (1973-1976) following publication, whereas only a quarter of their English language articles were left uncited. The average number of citations to an English language article turned out to be more than twice that for a French article. ("Do French scientists who publish outside of France and/or in English do better research?," *Essays of an Information Scientist*, vol. 3, 1979, p. 499.)

A more recent study corroborated and amplified this point. Joan K. Swinburne compared the citation practices of a group of French and a group of British researchers in the same field (the endocrinology and biochemistry of lactation and reproduction). "The percentage of self-citations to their own French language papers by the French group," she wrote, "suggests that they themselves value more highly their English language than their French language papers (29 percent of their publications from 1976 to 1980 were in French but only 11 percent of their self-citations in 1979 and 1980 were to French language papers.)" ("Information use and transfer by British and French scientists: a study of two groups," *Journal of Information Science*, vol. 6, nos. 2-3, 1983, pp. 75-80.)

Such findings caused a furor in France in years past. But now only a minority of French scientists is

affronted by the suggestion that to publish exclusively in French is an anachronism. Most concede that English is the chief language of their field and have for some time published their articles in English. In Swinburne's sample, 71 percent of the articles published by the French group from 1976 to 1980 were in English. This constitutes a radical change since the late 1960s when virtually all the group's articles were published in French. Members of the French Academy and President Mitterrand, who is a forceful advocate of French as a functional language of scientific and technical communication, would seem to be fighting a losing battle against "linguistic imperialism," as they see it. But native languages will continue despite the position of English as a lingua franca of scientists.

In any case it is not imperialism, I think. In the past when I have suggested that scientists whose first language is not English should consider publication in English, I was not attempting to advance my own language as the one best suited to or of the best quality for scientific communication. I suggested it because English is clearly the *most understood* language; its use ensures the widest possible audience of readers. I would not dare to argue the qualitative merits of any one language. But considerations of utility and practicality seem only wise. The Japanese science community, for example, has clearly followed a practical route.

In an upcoming essay for *Current Contents*, I will analyze the extent to which Japanese scientists publish in languages other than Japanese. In fact, of the articles indexed in the *SCI*, 90 percent are in English. These articles receive much more attention than if they had been published in the relatively inaccessible Japanese language. Their 1978 English articles were cited at three times the rate of their 1978 Japanese articles during the period 1978 to 1982. A journal like the *Japanese Journal of Applied Physics*, which has devoted much space in recent months to articles on superconductivity, publishes almost exclusively in English, although it accepts manuscripts in French and German as well.

Soviet scientists still publish predominantly in Russian in their own journals. But their English language contributions to international journals are increasing (an educated guess is that they have doubled since 1974) and that's a healthy sign. Soviet science has not prospered in its impact or image by insulating itself from the rest of the world. While many translation journals render Russian journals into English, the time delay in publication is anywhere from six months to over one year. This schedule does

not make for timely communication. One day electronic publishing and machine-aided translation may speed up the process considerably, but for now MT is not sufficiently developed or economically practical enough to arouse much anticipation.

While I urge non-English scientists and journal editors to consider carefully the advantages of publishing in English, I would also urge scientists whose first language is English to learn to read other languages.

The Book of Genesis (11:1-9) tells us of a multitude of ancient peoples who, by speaking a single language, could attempt to build an unequaled city and a great tower that would reach to the heavens. Is there any doubt that use of a single language improves communication in any endeavor? Language, however, being bound up with culture, heritage and national identity, is not easily laid aside. And when laid aside, there is a genuine loss, for language clearly shapes thoughts, even creative processes. Nonetheless, as a practical matter, scientists risk oblivion when they avoid the reality of English as the international and nearly universal language of science. ■