

Language Imperialism in Science

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"One concludes that, nowadays. American scientists quote only themselves; the process is dangerous. Languages other than English are discouraged. Young (or not so young) scientists elsewhere in the world publish in English, but sometimes in broken English, missing the opportunity to be clear. This does not help, however, as American scientists do not quote them."

"This kind of parochialism is spreading, and it is leading to a new form of American intellectual colonialism: only Americans do well; American science is exported or good scientists are imported from abroad, where they are transformed into American scientists; foreign science is good only when submitted to American leadership. . . . in the present situation, I see severe threats to the universality of science and to the independence of non-American scientists in their choice of a language, a subject, and a channel for publication." (Pecker, 1981)

This French scientist's concerns were at least partially confirmed in a responding letter in *Science* by a cellular biologist from U.C.-Irvine: ". . . The language and citation problem could easily be solved if scientists around the world recognized that English has become not only truly international (and probably more so than any other language in the history of the world) but also irreplaceable, since many modern scientific terms are in it. A true universality of science can be achieved only when all scientists learn to communicate in one language. For the present this language is English." (Arditti, 1981)

Many of us can brush aside concerns of "ugly American" provincialism because we do not journey outside the U.S. for fieldwork, or are supremely conscientious when we do. But every systematist faces the task of assembling and digesting the relevant literature in his/ her field, and that almost certainly includes non-English articles. If the international community of scholars is truly international, then we will be paying a proportional amount of attention to the available papers in Spanish, Polish, Chinese, Japanese, etc.

Whether it is due to the extra effort and expense of securing translations, or whether it is due to outright intentional disregard, biologists definitely cite proportionately more articles in their own language. This applies to both zoologists and botanists. At the end of his important summary on spider ecology, Turnbull (1973) ". . . was struck by the fact that the authors of spider research usually cited as references other papers in their own language. . ." and he provided an analysis of paper citations (Table I). Lewin and Jordan (1981) found the same strong bias in phycology and marine biology journal articles (Table 2).

Citation bias is beyond dispute and appears to be more the rule than the exception. In looking at my own publication citations (note this article's citations are all in English) I could claim that my literature search led back through

Table 1. Distribution of citations in spider ecology papers by language. (After Turnbull, 1973)

Nationality of Author	Percentage of references in native languages
German	87% German
Polish	62% Polish (I thank recent Polish workers for publishing in English)
French	85% French
British	72% English (21% American source)
American (USA)	93% English (82% American source)
Canadian (Non francophone)	85% English (52% American source)
Spanish (South American)	34% Spanish (35% German, 31% English)

Table 2. Distribution of Citations across Languages in Selected Phycology and Marine Biology Journals (After Lewin & Jordan, 1981)

Journal and country	Number of articles	Number of citations	Number of articles in various languages						Percent in English	
			Eng.	Fre.	Ger.	Rus.	Jap.	Chi.		Latin
Journal of Phycology, 1979.	77	2,041	1,867	58	101	2	1	0	8	91.5
Revue Algologique, 1979.	22	321	184	94	33	0	1	0	4	57.3
Algological Studies edited at the Czechoslovak Academy of Sciences, published in German	20	514	299	27	140	18	0	0	3	58.2
Nova Hedwigia, 1979	25	614	321	80	136	4	1	0	24	52.3
Phykos, 1979. (India)	21	412	369	11	24	0	0	0	5	89.6
Bulletin of the Japanese Society of Phycology, 1976	24	243	129	16	32	0	61	0	4	53.1
Okeanologiya, 1979 (USSR)	26	325	92	7	4	218	0	0	0	28.3
Studia Marina Sinica, 1978. (China)	25	1,030	762	73	54	14	29	59	28	74.0

Small numbers of articles in other languages, not listed in this table, prevent the totals being equal to the sum of the listed citations. Some of these languages are Dutch, Spanish, Italian, Czech, Serbo-Croatian, Polish, and the Scandinavian languages, including Icelandic.

authors who were themselves English-biased. . . therefore my provincialism is "their fault." But since location of just one foreign article will generally lead to a cascade of non-English references, this excuse does not hold. Any scientist at any time has the opportunity to survey the worldwide literature . . . it just requires effort. Just as in political imperialism, laziness and not malevolence is sufficient to maintain the language imperialism proclaimed in Arditti's reply.

It is perhaps important to note that the concept that all scientists should communicate in one language is espoused by a cellular biologist and not a whole-organism evolutionary biologist. The latter generally recognize the great advantage held by species that maintain the greatest possible diversity. In the development of new concepts, a "monolanguage" holds the same dangers as a monoculture.

Because westerners who learn a second language usually learn a "sister species" in the Indo-European group, we often assume that everyone breaks down reality into similarly perceived "chunks"—different names, different syntax, but generally a one-to-one correspondence of world parts perceived by humans universally. However, languages do partition reality differently, and the following two brief examples show that this is an important pool of diversity.

Consider that your shoes are "brown." Any western child would recognize the color, and in

sorting color crayons, would place brown with the tan and other earth colors. Those shoes are

sorting color crayons, would place brown with the tan and the other earth colors. Those shoes are *not* yellow. Any western child knows yellow, and yellow belongs with the orange and red crayons. But in Chinese, these "brown" shoes translate as the color hwang. Your shoes are "dark hwang". What we call "yellow" is "light hwang." Any Chinese child would arrange colored crayons with yellow-to-brown as a series with yellow totally unrelated to the orange-reds. Westerners have two names. . . Chinese have one. Who is correct? The loess soils of China, grading from yellow to dark brown, provide a natural basis for their color spectrum. Jade justifies a similar green-to-black spectrum. This is one of many ways Chinese breaks reality into different "chunks" compared to English.

In addition, words gain different associations in different cultures, and therefore a word does not carry the same full meaning even when translated with correct one-to-one correspondence. In an English lecture, the word "cobra" not only denotes a poisonous snake, but it also (thanks to Saturday morning TV) suggests power, speed, and a degree of "badness." Hence, American carmakers have used the name cobra for a car. In China, the word "cobra" translates with complete one-to-one correctness into "faahn-chaan tauh". Unlike the un-descriptive word cobra, this term describes the snake: "faahn chaan" is a ladle-shaped cooking

instrument used in a wok; "tauh" is "head." A cobra, with its head raised and its hood spread, resembles such a device. No Chinese carmaker would ever name a car "food-stirrer head." These different ways of breaking apart and representing the real world, and different associations, lead to different ways of perceiving the world and to different metaphors for scientific models. This is demonstrated by one experiment where various flat geometric figures were presented to both western and oriental students with the directive "compare!" The western students pointed out the differences in numbers of edges, angles, points, *etc.* the oriental students noted that all the figures were flat, the same texture, the same color, *etc.* Neither are wrong. Indeed, the mindset that probes for hidden similarities is probably critical to generating future breakthroughs in fields like ecology.

Scientists need the diversity of metaphors found across all languages in order to understand and represent the increasingly complex concepts yet to be unraveled. Arditti's proposal that *the sooner scientists adopt a universal language, the better* would have stagnating consequences.

Nevertheless, the battle to maintain multilingualism in science is being lost and it is being lost due to conscious decisions made primarily by scientists at the university level. Over the last two decades, the foreign language or research skills requirements (often called FLORS) have dramatically shifted, with many biologists securing their Ph.D. with research skills in electron microscopy and computer to the exclusion of *any* foreign language training at all. Often, it is the science faculties themselves who promote elimination of foreign language requirements, contending that there are too many newly-discovered basics to cover to allow a graduate student the luxury of foreign language study. The result is that students now find that only the oldest faculty, nearing retirement, can identify the language of a non-English publication, let alone translate it.

Second, the initial development of computers has been primarily a western development, again forcing non-Western scientists to learn and use western languages in order to conduct computer analyses. However, recent strides in computer input output systems in Chinese, Japanese and Arabic languages will soon minimize this forced westernization.

Third, major professional organizations, even when they have "International" in their name, are primarily western societies and due to affluence and origin of schooling, are made up of a higher proportion of English-speaking scientists. The next meeting of the World Congress of Herpetology, for instance, will require all talks to be presented in English with audience discussion translated to English. Why must we make this a one-way street? The University of Singapore solves the multi-lingual academics problem in a less biased fashion. Serving a community that includes Malays, Indians and Cantonese Chinese, all entering students must speak two languages, English and any of the other three. True, English is dictated as the common tongue. Nevertheless, there are no English-only academics forever forcing others

to translate their articulate and rich concepts into less than accurate English equivalents.

Another facet of the same issue is membership in our own "open" scientific societies. As lesser-developed countries begin to support their scientists to the level that they could *begin* to afford membership in our societies, western societies survey their affluence with a provincial eye and hike membership dues, some by as much as double (Entomological Society of America, 1986). This elitism excludes many non-western scientists from major society directories and presents them from publishing in member-only journals!

Finally, the scientific community has tailed to move toward the 20-year-old recommendations of the International Organization for Standardization (ISO) which would lead to: ". . . a single method of drafting authors' summaries, a single code for the abbreviation of titles of scientific periodicals, a single code for the manner and order in which numerical bibliographical references are to be made, a single code for symbols and abbreviations of technical terms, a single system for the transliteration of the characters of one alphabet into those of another, and lastly, common rules for the compilation of technical glossaries and for their correspondence in the various languages." (ISO, 1965) In the twenty years since these recommendations, it is in non-U.S. journals that we find some steps toward abstracting in a second major language, *etc.* The U.S. scientific community seems as oblivious to the advantages and savings of standardized scientific and technical documentation as the U.S. public is oblivious to the advantages of metrication.

In summary, there is a good case for indicting ourselves on charges of language imperialism. Our colleagues have tabulated our selective citations. We have voted in college committees to abandon foreign language requirements. We have relied on our tentative superiority in computers and other technologies to force foreign scientists to learn English while we ignore their languages. We remain elitist by escalating membership fees and requiring translations in English. And for 20 years we have ignored ISO recommendations concerning scientific publications.

As scientists, we cannot afford to remain ethnocentric, to hold tight to the advantages of history and affluence. Monolanguage is monoculture; in this case a monoculture of ideas. Without a diversity of languages, science will evolve much slower.

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