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# Language and multilingualism in scientific communication

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Throughout history, mankind has striven to acquire knowledge. As Aristotle stated in his introduction to *Metaphysics*, Man by his nature needs to know.<sup>(1)</sup> This quest for knowledge has naturally led mankind to contact and communication with foreign cultures and the need for a *lingua franca*. At different times and places, this need was fulfilled by languages such as Arabic, Chinese, French, German, Greek, Latin and Persian. Today, that need is mostly filled by English.

## AN INTERNATIONAL LANGUAGE OF COMMUNICATION

Scientific knowledge is universal and therefore needs an international language of communication. In our current interconnected world, it is not possible to produce relevant original research without knowing what others have done and are doing in the same field. Communication in the current *lingua franca* of scientific research therefore becomes imperative. English has evolved to fit this role, but as ever-increasing numbers of scientists whose mother tongue is not English undertake research, the strain on the language is beginning to show.

The languages of English literature and of scientific communication are diverging. For scientific articles, an array of editors (language editors, author's editors, copy editors, technical editors and manuscript editors) is valiantly bridging the gap by trying to harness the output of scientists, whose mother tongue is often not English, within the syntax and grammar of the English language. They often succeed brilliantly, but the demand is so great and is increasing so quickly for the small and stagnating number of editors, that change needs to occur.

While some editors working in this field edit the manuscript to a simplified language that they believe can be widely understood, others take a more literary approach because they believe this makes the manuscript more interesting and readable. There is no international standard for scientific English. English has many features that favour its international use, in particular its eager and tolerant assimilation of foreign words and expressions and the

flexibility and concision with which it can convey ideas. The limited number of verb forms, as well as the general lack of declensions and gender in nouns and adjectives, facilitate its learning. There are, however, sufficient peculiarities in its grammar and spelling to provide plenty of pitfalls for the non-native speaker.

A possible solution would be a standard scientific English with simplified grammar lacking in irregularities and with phonetic spelling (similar to Esperanto's). It would need to maintain a rich and evolving vocabulary to allow the expression of complex scientific ideas. Such an international auxiliary language for science would facilitate teaching, learning and editing. In this respect it would be different to some of the simple English languages, such as Basic English<sup>(2)</sup> and Simplified Technical English,<sup>(3)</sup> which have been proposed. It would be better to give this standard scientific English a neutral name, such as Scientish,<sup>(4)</sup> both to distinguish it from literary English and from the English of everyday written communication, and to diffuse nationalistic and xenophobic passions. In fact, about half the words in a typical modern scientific article written in English are not of Anglo-Saxon origin.<sup>(5)</sup> Such a standard language for scientific use would not only reduce ambiguity and improve comprehension, but would also make human translation faster and more cost-efficient. Furthermore, machine and computer-assisted translation would be facilitated.

## KNOWLEDGE TRANSFER

There is, however, another aspect to scientific communication besides the publication of original research. This is the translation of research results into policies, practice and actions. In our digital interconnected world, access to the corpus of research information is increasingly available, yet this increase in access has not been matched by a decline in barriers for its utilisation. As a result, a large gap has developed between the knowledge obtained from basic research and its effective utilisation in policy and practice.

For knowledge to be effectively applied, it has to be

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contextualised to local conditions and culture. Among the most important barriers to the localisation of knowledge is language. Although many professionals can read and understand English even though it is not their native language, research has shown that people assimilate and retain information far better in their mother tongue.<sup>(6)</sup> Consequently, articles whose goal is not to report primary research but to transfer knowledge (i.e. to inform professionals, influence policy, foster debate or express expert opinion) should preferably be written in the mother tongue of the target audience.

Non-English-language journals, which are on the decline for both basic and applied science, are vital for knowledge transfer at the national level. In research fields where local traditions, culture and experience are important to a study, native language journals are especially important. For example, in Japan, a tradition of review publications written by experts for Japanese-speaking researchers and engineers has driven technology transfer.<sup>(7)</sup> Obviously, the communication of scientific advances and information for the general public should also be contextualised and presented in native languages. The medical writer, Langdon-Neuner, has stated that “whether they like it or not, scientists who do not publish their work in English exclude their work from the World’s pool of knowledge, cut themselves off from discourse with fellow scientists internationally and run the risk that their careers in their own country will be stunted”. For these reasons, English has been called the *super language*.<sup>(8)</sup>

Gallagher, editor of *The Scientist*, has pointed out that besides the blatant unfairness this implies, there is also an impact on efficiency.<sup>(9)</sup> For example, journalists in non-English-speaking countries have to overcome both the barriers of language and the complexity of the science in order to present scientific concepts to their audience, and inevitably mistakes are made. Policy-makers are handicapped in accessing research results. Non-Anglophone scientists have a more difficult time assessing research. Teaching is complicated by the use of English terms instead of the native language. The time supervisors spend revising the English language of manuscripts could be devoted to the promotion of research.

English proficiency, together with research spending by countries, have been shown to be highly correlated with publications in highly-ranked medical journals.<sup>(10)</sup> This has been corroborated by research in Brazil, which has shown a strong association between good English writing skills on the part of researchers and a greater number of publications. This suggests that the ability to write in English could influence the international visibility of Brazilian research.<sup>(11)</sup>

## WHAT CAN BE DONE?

The phenomenon of English as a super language thus has advantages for facilitating scientific communication in certain areas but creates difficulties in other spheres. The problem is multifaceted and has to be tackled in its different aspects. One might, for instance, take steps to help authors with poor English writing skills so that they can be empowered to contribute to the international scientific discourse, or assist readers who have very limited or no knowledge of English. The first task, however, is to acknowledge the existence of the problem and raise awareness within the community of scientific, medical and technical publishing. As Goethe said, “a man who is ignorant of foreign languages is also ignorant of his own”.<sup>(12)</sup>

Publishers could provide more training in English writing and facilitate the polishing of the language of submitted articles by contracting with specialised professionals. In the competitive world of academic publishing, this could be an important advantage to attract authors with a non-native knowledge of English. Publishers could also make their websites machine-translation friendly.<sup>(13)</sup> This would allow non-native readers to quickly understand the gist of the site, even if the translation is sometimes crude. Better still would be to download a device (*widget*) on the website that would allow readers to translate articles into their mother tongues without leaving the webpage. A prototype of such a device has recently been made freely available.<sup>(14)</sup>

Journal editors can provide more support by providing more leeway in the presentation of research and being more tolerant of shortcomings in the writing style. Peer reviewers should never use substandard language as a reason to reject a paper and editors should monitor this. Conference organisers could provide more language services at scientific meetings.

Some countries are experimenting with increasing the use of English in higher education. Although the intention is good, there are many pitfalls in this approach. It penalises both students and professors whose linguistic talents do not match their scientific abilities: students are often unable to completely understand what they are taught or to fully participate in discussions, and professors are limited in their creativity to teach and capacity to explain subjects in depth.<sup>(7)</sup> In addition, the native language could gradually lose its ability to depict new concepts and phenomena alongside their subtle differences.<sup>(6)</sup> It can become so influenced by English usage that its syntactical characteristics begin to disappear.

Various sites exemplify different approaches to

presenting information in multilingual form. One of them is the James Lind Library (available at: <http://www.jameslindlibrary.org/>),<sup>(15)</sup> which has been created to help people understand fair tests of treatments in healthcare. The principles of fair tests—those in which bias and the play of chance are minimised by the use of scientific methods—are explained in essays that are available in many languages. It is a good example of how multilingualism can be achieved on a website through voluntary work. In addition, much of the documentation and illustration comes from a variety of language sources depicting the rich diversity in medical traditions. Another such site is SciELO in Latin America,<sup>(16)</sup> which employs methods that allow and encourage multilingual publication for journals. An example of a multilingual scientific journal is the *Bulletin of the World Health Organization* (WHO).<sup>(17)</sup> Although the full text of the journal is in English, the print version has abstracts in four languages while the electronic version is hosted on the WHO multilingual website, which offers the possibility of translating selected articles into all six official languages of the United Nations.

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