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# The world's lingua franca of science

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A survey of English as the universalizing language of chemistry

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IN RECENT decades the use of English has extended greatly in various fields, including both science and engineering, where it is now more widely used than in any other scientific fields. However, only a few papers have been published (cf. Sano, 1986) to demonstrate the trend in a quantitative manner. In order to discuss this trend here, a bibliometric approach has been adopted in order to retrieve the relevant information from a large scientific database.

## The CA file

The database used in this approach is the CA file, one of the largest scientific databases in the world and the largest in the field of chemistry. The file is an electronic version of Chemical Abstracts (CA), an abstracting journal published in print form since 1907, with an electronic version that has been in use since 1967. The print and electronic versions are both produced in the United States by Chemical Abstracts Service (CAS).

The retrieval of information from the database was undertaken on the World Wide Web through STN, an international network for scientific and technical information, which is collaboratively served by CAS, Fiz Karlsruhe in Germany, and the Japan Science and Technology Corporation (JST).

## File size

The CA file is published in two volumes a year, and the following is a search formula for the number of journal papers published in the file in 2000:

$$(132? \text{ OR } 133?)/\text{VI AND J/DT} \quad (1)$$

Here, the letters VI, DT and J respectively denote volume and issue, document type, and journal, while 132 and 133 indicate the volume numbers of the file published in 2000. The time lag between the appearance of a paper in an original journal and its inclusion in the CA file is several months at the most.

In 2000, the file collected 725,000 documents in all, among which journal papers amounted to 531,000 (73%). The remaining documents were patents (20%), conference papers (4%), doctoral theses (1.4%), books (0.7%), and technical reports (0.26%). Every year, journal papers occupy about three-quarters of the file's content. Such papers are the object of this study because they are considered to reflect the language used in writing scientific papers particularly well.

In addition to major world languages, the CA file covers not only such languages as Arabic, Basque, Persian and Thai but also artificial languages such as Esperanto and Interlingua, and the total number of languages treated in the file exceeds 70. The next section indicates the

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**Table 1: Percentage shares of major languages in journal papers**

	1961	1965	1970	1975	1980	1985	1990	1995	2000
English	43.3	52.0	54.2	58.3	63.3	70.2	74.2	80.0	82.1
Russian	18.4	20.0	21.7	23.2	18.3	13.4	11.7	5.0	2.9
German	12.3	9.8	7.4	5.1	4.2	3.4	2.9	2.1	1.0
French	5.2	5.1	4.8	3.2	2.2	1.4	0.8	0.7	0.4
Japanese	6.3	4.0	3.7	3.4	5.4	5.0	4.3	4.6	4.3
Chinese	–	–	–	–	–	2.6	3.6	4.8	7.1

trends in the use of languages among authors in the chemical field, as clarified through the retrieval of information from the CA file.

### The results of the bibliometric study

The following is a search formula for the number of journal papers, written in English and published in the CA file in 2000.

(132? OR 133?)/VI AND J/DT AND EN/LA (2)

Table 1 shows the shares achieved during these 40 years by six major languages: English, Russian, German, French, Japanese, and Chinese. It should be noted, however, that only the data after 1970 are results specifically achieved by the search, that those for 1961 and 1965 are the data given in a paper written by a CAS staff member (Baker, 1981), and that Chinese data before 1980 are omitted because of insufficient data.

Remarkable changes are seen in the shares during the period. While all the other languages except Chinese have decreased their shares, English has significantly raised its share. In these 40 years, the share of English has almost doubled, from 43% in 1961 to 82% in 2000.

A graph presenting the data for the period 1970–2000 is provided in Figure 1, in which G + F + J stands for the sum of the German, French, and Japanese shares. The figure also shows the English share in conference papers, because in conferences English is even more readily used than in journals. The share reached 96% as early as 1990. See Panel 1

### Contributions from non-English-speaking countries

This increased use of English is thought to be because of increased contributions from non-

English-speaking countries where English is neither a mother tongue nor an official language. The situation was investigated in the CA file by using CYA codes which indicate the countries of origin of the authors. The countries below (with their codes in parentheses) were chosen as major English-speaking countries:

The United States of America (USA)  
Canada (CAN)  
The United Kingdom (the UK, England, Scotland)  
Ireland (IRE)  
Australia (AUSTRALIA, AUST)  
New Zealand (NZ)  
India (INDIA)  
Israel (ISRAEL)  
South Africa (S AFR)

A search formula for the number of journal papers written in English by contributors from English-speaking countries, and included in the CA file published in 2000, is expressed by AND combination of formula (2) with OR combination of these country codes. The difference between the number for formula (2) and the number for the above-mentioned formula gives the number of journal papers which are written in English but contributed from non-English-speaking countries.

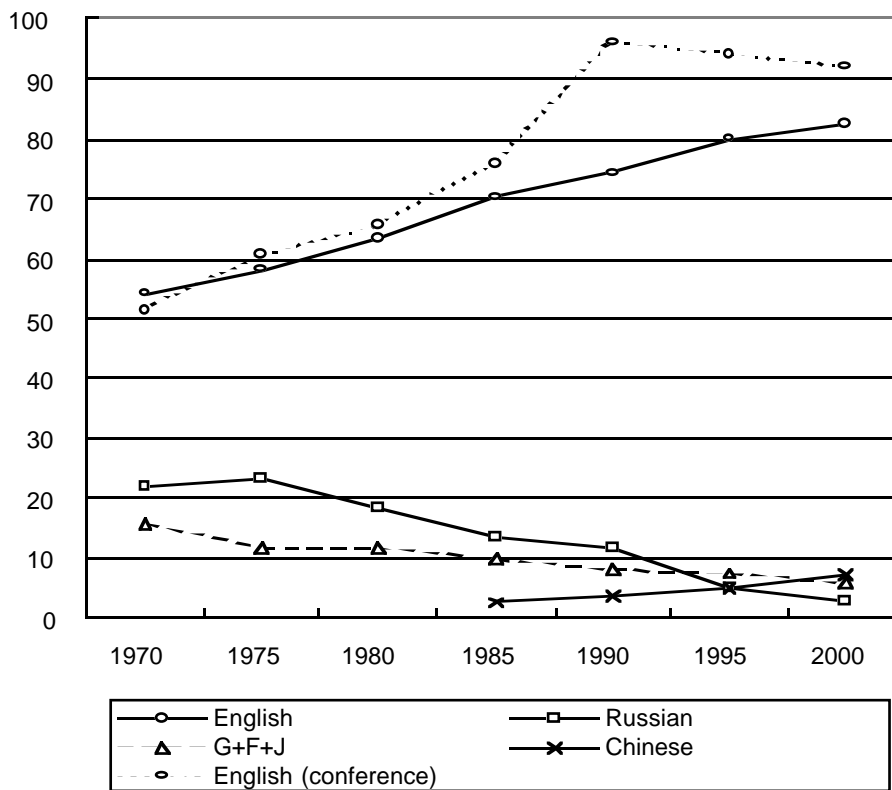
Panel 2 shows the share of English papers from non-English-speaking countries in the total number of English papers during these 30 years. While the share was only 31% in 1970, it reached 58% in 2000.

### Trends in the use of English in typical countries

As noted above, the frequency of the use of English in scientific papers is increasing in countries where the language is not spoken in ordinary life. The trends were studied for the

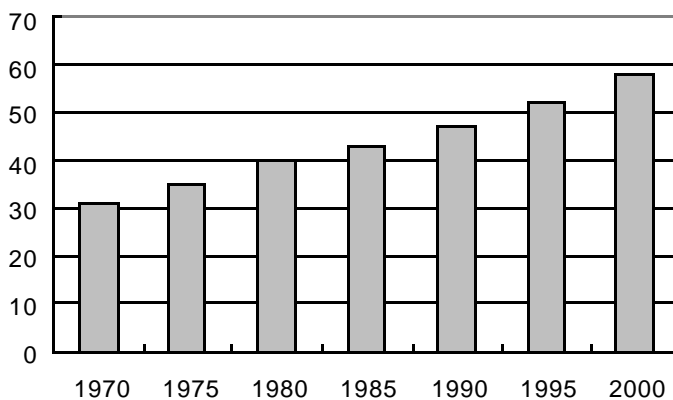
## The percentage shares of major languages in journal papers

1



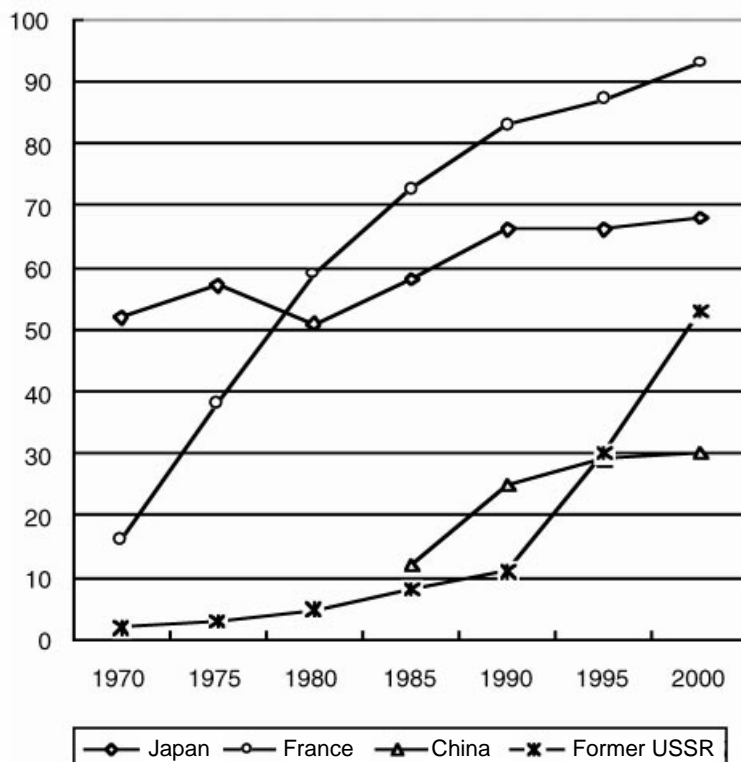
## The percentage share of papers in English originating in non-English-speaking countries

2



## The ratio of papers in English to all papers from each country

3



following countries (with their codes in parentheses):

- Japan (JAPAN)
- France (FR)
- China (PEOP REP CHINA)
- The former Soviet Union (USSR, RUSSIA, UKRAINE)

Panel 3 shows the percentages of English papers in all the journal papers written by scientists in individual countries. The data for China before 1980 are omitted for the same reason as in Table 1.

In France, the use of English has increased remarkably, from 16% in 1970 to 93% in 2000. In Japan, the language has been frequently employed for many years. In the former Soviet countries, where Russian is officially used, there has been an abrupt increase of papers in English since the disintegration of the Soviet Union in 1991.

### The effects of using English

As has been shown through the example of papers relating to chemistry, English is now dominant throughout the world's scientific communities. The effects of this use of English will be discussed from three points of view relating to information transfer:

#### (1) For readers (the receivers of information)

As Table 1 indicates, more than 80% of original journal papers in the world of chemistry can be accessed by readers with a knowledge of English, who can also read more than 95% of conference papers, as shown in Figure 1. The need to understand other languages has therefore significantly decreased in recent years. In addition, even if papers containing original work are written in languages other than English, it is usual nowadays to find English abstracts annexed to them.

## (2) For the circulation of scientific information

Scientific papers are nowadays usually processed so as to provide them with abstracts, keywords, and kinds of classification, so that interested people can search for information more easily. If the original papers have been written in English, their rate of processing will be higher still, contributing to an accelerated distribution of scientific information.

## (3) For authors (the transmitters of information)

English is now the lingua franca of science. If scientific papers are written in the international language, the range of their audience will be significantly increased. For example, the number of readers of papers written in English will be ten- to twenty-fold larger than that of papers written in Japanese. The rate of increase varies with the scientific field. By one means or another, the range of readers of English papers will be extended to the whole world.

Scientists and engineers, whatever the country they live or work in, wish their papers to be widely read and properly evaluated. It is therefore a matter of great satisfaction for them to receive many responses from readers and it is also well known that readers' responses motivate further research and development activities of authors. A universal lingua franca makes this possible.

## English and other languages

In addition to science, English is now a world-wide common language in political, economic, cultural and other arenas (McBee, 1985). Yet there are thousands of languages in the world, each a precious cultural inheritance which provides important materials not only for language research but also for the elucidation of human intelligence.

Unfortunately, however, many of them are facing extinction because of migration, education, assimilation, and the diffusion of the electronic media. The United Nations has issued a report making an appeal for the preservation of these valuable languages. A balance is therefore needed, so that these languages can be preserved and strengthened, while at the same time English is employed as the world's lingua franca for such universal concerns as science and technology. ■

## References

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## Quotations for Sept. 11 and 9/11, continued: 3

*The Sunday Times*, London, July 21 (no byline): 'Born-again patriot rocks back in 9/11 time: Profile, Bruce Springsteen'

'According to the mother of Zacarias Moussaoui, the French-born Moroccan who has admitted helping to plot the September 11 terrorist attacks, her son loved listening to Bruce Springsteen. The prisoner's musical taste might change after hearing the Boss's next musical offering...'