The dominance of English in the international scientific periodical literature and the future of language use in science

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Throughout the 20th century, international communication has shifted from a plural use of several languages to a clear pre-eminence of English, especially in the field of science. This paper focuses on international periodical publications where more than 75 percent of the articles in the social sciences and humanities and well over 90 percent in the natural sciences are written in English. The shift towards English implies that an increasing number of scientists whose mother tongue is not English have already moved to English for publication. Consequently, other international languages, namely French, German, Russian, Spanish and Japanese lose their attraction as languages of science. Many observers conclude that it has become inevitable to publish in English, even in English only. The central question is whether the actual hegemony of English will create a total monopoly, at least at an international level, or if changing global conditions and language policies may allow alternative solutions. The paper analyses how the conclusions of an inevitable monopoly of English are constructed, and what possible disadvantages such a process might entail. Finally, some perspectives of a new plurilingual approach in scientific production and communication are sketched.

1. Introduction. What is at stake in the field?

Even two or three decades ago, this article could have been published in this very journal, the AILA Review, in English or French, AILA's official languages, or even in German or Russian, two languages that were then accepted as congress languages. When AILA was founded and held its first congress in 1964, it was formed overwhelmingly by foreign language and translation experts and it promoted enrichment plurilingualism which meant the daily bread for its members. Its acronym is indeed coined on its name in French, *Association Internationale de Linguistique Appliquée,* the then leading language of the association. Things have changed since, and, at least from 2003 onwards,

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the AILA Review has become an 'English only' publication. The authors' guidelines I received establish that "articles should be written in English". Should? Volume 16 (2003) to 19 (2006) do not contain a single article that is not written in English. This shift represents a trend that has developed over the 20th century as part and parcel of a more global language shift process in the international arena of scientific publication.

In the context of dynamic changes in global multilingualism, present day international and national communication in science can be framed within a sociolinguistic conflict model of asymmetric relationships and shift between languages on specific levels of a hierarchy that represent differentiated power relations in the field of science. De Swaan (1993, 2001) designed a hierarchical model of the global world system as a galaxy of languages: English is today's sole globally dominant language, the "hypercentral" language of the world. On the second level we find less than a dozen "supercentral" languages among which are French, Spanish, Russian, Chinese, Japanese, Arabic, Hindi, German and Portuguese. Many of them represent languages of former colonial or regional empires and are spoken in more than one country. The third level is occupied by approximately a hundred "central" languages, often national or significant regional languages with little or no international diffusion. The vast majority of the world's languages, some 98 per cent, belong to the fourth level of the "peripheral" or vernacular languages, which are the mother tongues of usually small ethnic groups but hold no official status in the countries where they are spoken. No wonder vernacular languages almost never appear in the debates about languages in science, since their status and corpus are considered unfit to express scientific thought and research findings. Significant changes in the appreciation of what constitutes scientific thought, however, as e.g. the profound knowledge about biological and agricultural processes enshrined in indigenous languages, have brought about a change in focus. Furthermore, many indigenous or intercultural universities founded in Latin America and other parts of the world increasingly seek to equip indigenous languages for academic work (Skutnabb-Kangas 2004).

Until the end of World War I English belonged to the small group of leading international languages. Once English had gained a significant lead over its competitors during World War II (Kaplan 2001), a new category had to be introduced that pointed to the new status of English. The fundamental language conflict and shift process that has occupied language globalization debates on the international scene focuses on the course of action by which English is expanding its international domains, thus pushing all super-central languages into the role of central languages and absorbing their functions in many if not most international arenas. Should this process come to fruition, English would become the sole language of communication between other language communities above the state level in most areas. Such a state of affairs coincides with Crystal's (1997) model of world bilingualism: everyone speaks her or his own language and at the same time English as the only foreign language. As a matter of fact, there has never been a language as dominant as English in history, whose role may however decline again during the 21st century (Graddol 1997, 2006).

A central language policy question in the field of science is whether the present day hegemony of one language in the multilingual field of science will give way to the state of monolingual monopoly, just sketched, where English becomes the only allowable language of international and increasingly of national communication, possibly with irreversible consequences for other languages and their communities; or, whether the national and international communities of science will oppose multilingualism being dissolved into monolingualism and opt for plurilingualism as a way to enrich the academic field.

In this paper I briefly sketch the development of language use in international scientific communication, mainly in periodicals, which has led to the dominance of English. I then point out some problems related to language policy decisions that rely solely on language distribution in a small number of international journals, concluding with some caveats and arguments that explore the future dynamics of language use in science.

From Restricted Plurilingualism to the Dominance of English in scientific publications

Whether the normal or typical situation for the field of science was to be dominated by a single language or several in different epochs of history is a matter of debate. Walter (1996) maintains that, throughout the past millennia, there was one language most of the time that was used to articulate sciences in the Occident, from the Sumerian to Greek, Arabic and Latin. Modernity constitutes the exception, when several languages, basically French, English and later on German, gradually substituted Latin. Others (Ehlich 2001) have observed that international monolingual communication has always constituted an idealization which focused on the hegemonic language of its time and the 'invisibilisation' of other languages present in subordinate strands and regions of scientific development. In any case, the period of modernity which founded and vigorously developed modern sciences deployed a system of plurilingualism, albeit limited to a few languages, in the field of science. The 15th century already witnessed a process of popularisation of scientific knowledge in Europe which developed French, English, German, Italian and Russian into scientific languages. Such a course implied a significant societal effort which seems difficult to fully appreciate from today's perspective (Ehlich 2001). From Renaissance to the beginning of Modernity advocates of empirical sciences such as Francis Bacon and the Royal Society in England promoted doing scientific research publicly in the marketplace which meant a democratization of science including the use of the local languages. Furthermore, the great advances of science throughout the Enlightenment in France and elsewhere, namely the extensive public debates, could not have come about without the massive inroads of the national languages in scientific and humanistic endeavours.

At the beginning of the 20th century, three languages, English, French and German, held a central and fairly balanced position in science, although differentiated

by disciplines. No one in the developed world could at that time study or do research in medicine, biology or chemistry without reading German and publishing scientific findings in German journals. Similarly, law and political sciences constituted the realm of French, whereas English dominated in political economy and geology (see Ammon 1998 for a detailed account). Throughout the course of the 20th century, however, this balance was lost, not because of intrinsic dynamics in the field of science itself, but due to socio-economic and political factors. The rise of the USA as the dominant economic and political world power since the end of the 19th century, a process accelerated by the two World Wars, constitutes the single most important factor that explains the shift towards English as today's dominant language in international communication including the field of science.

Figure 1 shows the development of language shift between 1880 and 1980, based on publications in American, German, French and Russian bibliographies. Figure 2 gives the continuation of the trends from 1980 to 1996 for the natural sciences, whereas Figure 3 covers the development between 1974 and 1995 for the social sciences. As we can see in Figure 1, English, French and German held a fairly close ranking between 1880 and 1910 when the decline of French began. German, in turn, experienced a significant peak around 1920 when German publications outranked publications in English for a short while. The most important result, however, is the constant rise of English to 64.1% of all publications in 1980, whereas all other languages declined to

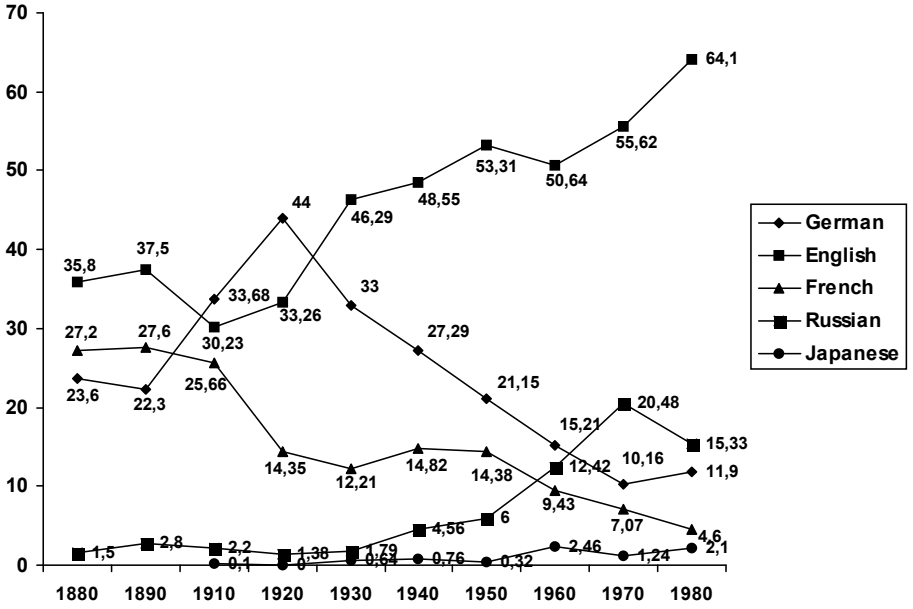

Figure 1. Proportional language use in scientific publications in the course of one century in American, German, French and Russian bibliographies (based on data collected by Tsunoda 1983, in Ammon 1998: 152; Ammon 2006: 3).

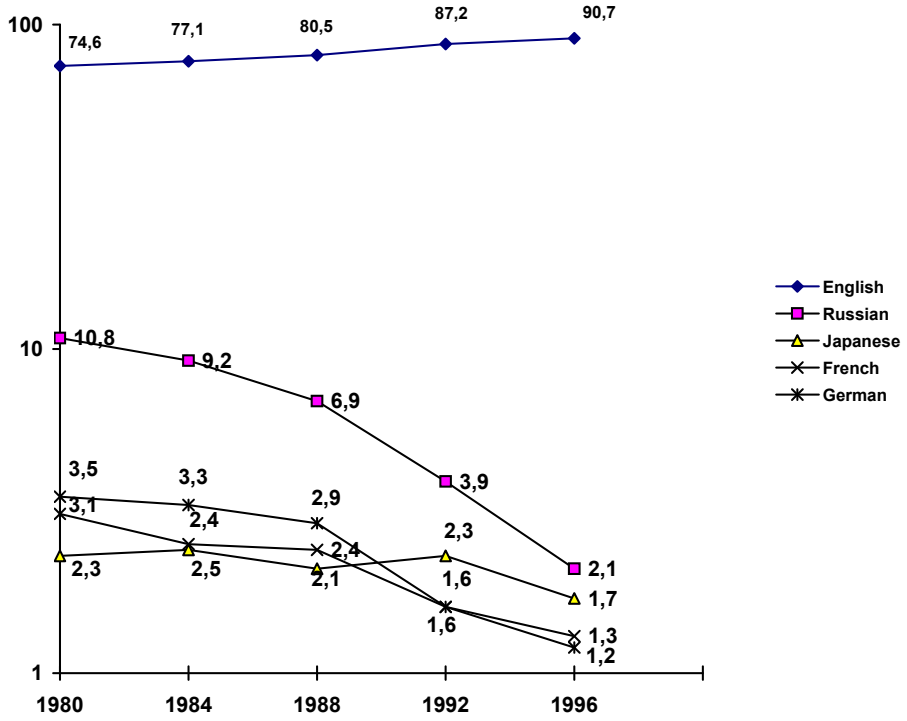

Figure 2. Share of languages in natural science publications worldwide 1880–1996 (per cent of total publications, ordinate compressed; from Ammon, 1998: 152; Ammon 2006: 3).

percentages of between 10 and about 15% for German, and Russian, and to much lower figures for French, Japanese and all other languages. During the time span between 1980 and 1996 that tendency continued. According to Ammon's (1998) figures, English reached a high of 90% for publications in the natural sciences and 82.5% for the social sciences and humanities in the selected periodicals of international ranking by the mid 1990s, with no other language exceeding the 10 per cent mark in this selection of publications.

In the natural sciences English dominance is extreme, and only a few other languages maintain a small percentage of abstracts in international data bases (Table 1). Chemistry seems to be the discipline with a slightly wider language distribution, whereas the "pure" sciences such as mathematics and physics exhibit the highest concentration in English.

Within the social sciences and humanities, although the concentration in English also increases over time, all the languages listed, especially French and German, hold a greater percentage of publications than they do in the natural sciences.

Other sources complete the general picture, as can be seen in two extensive studies produced by the "Centro de Información y Documentación Científica" (Cindoc 1998, 1999) from Spain which evaluated the role of Spanish in scientific publications. Table 3

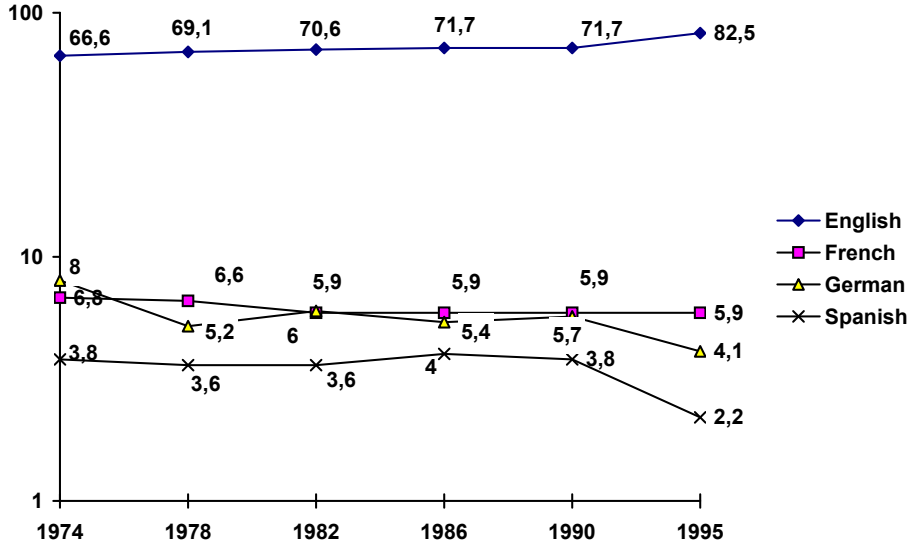

Figure 3. Share of languages in social sciences and humanities publications worldwide 1997–1995 (per cent of total publications, ordinate compressed; from Ammon, 1998: 167; Ammon 2006: 4).

Table 1. Share of languages in several natural sciences in 1996 (sources: Biological, Chemical, Physical Abstracts, Medline, MathSci Disc, adapted from Ammon 1998)

Languages	Biology	Chemistry	Physics	Medicine	Mathematics	Natural Sciences (average)
English	91.6	83.2	94.8	88.6	94.3	90.7
Russian	1.9	3.8	0.2	1.6	3.2	2.1
Japanese	1.1	3.9	1.7	1.8	0.2	1.7
German	1.1	1.9	0.9	2.2	0.3	1.3
French	1.4	0.7	0.4	1.9	2.3	1.2
Chinese	0.8	4.2	1.2	0.1	1.1	–
Spanish	0.6	0.3	0.0	1.2	0.1	–
Italian	0.3	–	0.1	0.6	0.1	–
Portuguese	0.3	–	–	0.1	–	–
Other	0.9	1.1	0.7	1.9	–	3.0

shows the average percentage of publications between 1992 and 1997 in the main languages in relevant data bases for the social sciences and humanities.

Table 2. Share of languages in several social sciences and humanities in 1995 (sources: SocioFile, Historical Abstracts on Disc, The Philosopher's Index, adapted from Ammon 1998)

Languages	Sociology 1996	History 1995	Philosophy 1995	Soc Sc and Hum. 1995
English	85.8	78.0	85.5	82.5
French	4.2	6.0	7.4	5.9
German	4.4	5.3	3.2	4.1
Spanish	1.6	2.8	1.8	2.2
Italian	0.9	2.1	0.8.	–
Japanese	0.2	0.4	0.1	–
Russian	1.5	1.4	–	–
Chinese	–	0.4		–
Other	1.4	3.6	1.2	5.3

Table 3. Share of languages in selected data bases in the social sciences and humanities from 1992 to 1997 (Cindoc 1999).

Data Bases	German	Spanish	French	English	Italian
A & H Search	8.15	2.11	11.65	71.95	3.70
Delphes	0.89	0.90	89.98	7.76	0.49
Econlit	–	1.00	2.20	95.6	1.20
Eric	0.05	0.16	0.37	99.37	0.01
Francis	5.22	4.11	35.02	32.72	4.61
Historical Abstracts	7.85	2.26	6.85	77.73	2.46
LLBA	6.29	1.77	7.82	76.32	1.23
MLA	7.55	6.57	9.02	73.63	2.00
Philosopher Index	7.00	6.33	3.00	78.01	2.66
Psych Info	1.34	0.85	1.16	95.20	0.42
Sociological Abstracts	3.65	2.07	4.56	85.75	1.37
Social Science Search	2.95	0.33	1.64	93.66	0.04

LLBA: Linguistics & Language Behavior Abstracts
MLA: Modern Language Abstracts

Table 4 presents the average percentage of publications in all the consulted sources for the social sciences and humanities for the period of study covered in this research (Cindoc 1999). While in such a short period of time no dramatic changes would be evident, all languages except English and French declined slightly in their percentages[1] with English reaching nearly 75% of all publications by 1997.

Table 4. Average share of languages in all consulted data bases for 1992 to 1997 in per cent (Cindoc 1999)

Languages	1992	1993	1994	1995	1996	1997
English	67.11	68.84	71.50	74.83	71.70	74.57
French	14.02	16.56	16.62	16.81	16.93	16.89
German	4.54	4.59	4.22	4.74	3.77	3.14
Spanish	2.06	2.39	2.27	2.04	2.12	1.37
Italian	1.87	1.73	1.66	1.48	1.56	1.98

The conclusion is that, by the end of the 20th century, English had become the dominant language in selected international journals with 75 per cent or higher of publications. Important differences arise between the natural sciences on the one hand, and the social sciences and humanities on the other with the latter retaining a greater proportion of publications in other languages including in books which continue to play a central role in most social sciences and humanities (Cindoc 1998, 1999). This difference, although small in absolute numbers in this kind of studies, turns out to be relevant for language policies and strategies in the field of science. As a matter of fact, the proportional growth of English masks the absolute growth of publications in many other languages given the rapid expansion of the scientific market in general.

The shift towards English implies that an increasing number of scientists whose mother tongue is not English have shifted to English for publication. An empirical trace of this process can be identified directly in the fact that the number of contributions in English language journals by authors from non Anglophone countries has grown significantly over the past decades. Indirect evidence materializes in the fact that publications in languages such as French, German, Russian or Spanish are increasingly loosing their attraction as places for publication by authors whose mother tongue is not the language of publication. Consequently, the proportion of native authors grows in these publications. This very important process affects the status of international, super central languages which is defined by the fact that participants from outside their native language circle use the language for purposes of international communication. Thus, in terms of Kachru's (1986) framework of three concentric circles that represent the zones of influence of international or imperial languages, the third circle of foreigners using that language is rapidly expanding in the case of English, whereas it is evidently shrinking or even imploding in the case of other super central languages in the field of science. Ammon (1998) provides the following tables (5a and 5b) which show the relative increase of German authors in German language publications, while at the same time their participation in English language publications grows as well.

In sum, when we observe the process of international communication defined narrowly as the exchange of information between speakers of different languages as reflected in a reduced number of high ranking international periodical publications, we can only arrive at the conclusion that relevant scientific findings have to be published in English if their authors want to be acknowledged by the top scientific community

Table 5a. Share of authors from Germany in *Biological Abstracts* (percent of total publications, Ammon 1998: 154).

Biological abstracts	1980	1984	1988	1992	1995
In German-language contributions	22.0	23.6	26.7	10.7	77.2
In English-language contributions	0.7	3.0	3.1	1.4	5.3

Table 5b. Share of authors from Germany in *MathSciDisc* (percent of total publications, Ammon 1998: 154).

MathSciDisc	1975	1980	1982	1983	1985	1990	1995
In German-language contributions	1.3	2.1	4.4	27.7	38.8	51.2	58.0
In English-language contributions	6.0	6.0	6.2	10.2	12.2	12.1	12.3

of their discipline. Even results of utmost relevance and originality, e.g. in natural sciences or medicine, may get lost or pass unnoticed if they are published in any other language.

Monolingualism or plurilingualism in science?

The previous conclusion based on trends in databases calls for further explanation and differentiation. The question whether monolingualism in international scientific communication will finally become the norm and if this is a desirable outcome is a matter of debate.

In many investigations and discussions of language globalisation, and, more broadly, globalisation as such, the past two decades have been characterised by a tendency to not accept the possibility of alternatives to the dominant views, much along the lines of Margaret Thatcher's rude and famous "there is no alternative". For many, therefore, there is no alternative to the English monopoly in international communication. Numerous influential studies, however, exaggerate English dominance, either by using wrong or distorted information[2] or by the very design of their approach and the construction of their data base. Ammon (2003) points out that the databases in the social sciences and humanities he used for his 1998 study are biased towards English and are much less representative for publications worldwide that the ones in the natural sciences. Most biographical databases create a vicious circle of self fulfilling prophecies based on a strong bias in favour of English and Anglophone countries. Such a bias can be inferred from data in the Citation Indexes, as Sandelin and Sarafoglou (2004) pointed out in their study on language and publication statistics. Thus, the Arts and Humanities Citation Index for 2006 cites 62,513 entries in English. Given the selection of journals it happens that Germany, one of the world's leading nations in these fields whose researchers increasingly publish in English, publishes fewer articles in English than Australia and Scotland, Italy ranks behind Wales and Spain behind

New Zealand and Ireland (Table 6). Similarly, in the entries in Spanish for the same year, US contributions are the most frequent (Table 7). If the journals included in these citation indexes were representative of the quality and quantity in a given field, it would mean that the USA outnumbers and produces more noteworthy publications in Spanish than any Spanish-speaking country. Here we find in the selection of journals included not only a significant bias in favour of English as the language of publication, but also in favour of Anglophone countries as the origin of publication in other languages (Baldauf, Jr, and Jernudd 1986). Who selects the journals and who defines the impact factors? Generally speaking, the selected journals create impact through their citation of articles by authors in a self-validating process.

Table 6. Arts & Humanities Citation Index 2006. 62,513 Entries in English by Countries or Territories of Origin

Country	Entries	Country	Entries
USA	18,617	France	356
England	5,776	Wales	335
Canada	1,788	Italy	322
Australia	970	Israel	276
Scotland	792	New Zealand	251
Germany	590	Ireland	209
Netherlands	408	Spain	191

Table 7. Arts & Humanities Citation Index 2006. 1.384 Entries in Spanish by Countries or Territories of Origin

Country	Entries	Country	Entries
USA	245	France	22
Spain	205	Canada	7
Chile	45	England	6
Argentina	28	Italy	6
Mexico	27	Peru	5

The focus on English blurs our view of the existence of important and well-established circles of international academic communication outside English such as the international networks of the Francophonie which comprises over 50 countries and their universities (*Association des Universités francophones, AUF*). Every year ACFAS, the *Association Francophone pour le Savoir*, organises a large congress in Québec with several thousand papers in all fields of science that are presented overwhelmingly in French, even by participants from Anglophone countries. Certainly, French is the most visible case of status loss as international language which includes the field of science. However, international studies on the topic hardly ever acknowledge the close networks and intensive international communication in science that functions in French (Rousseau 2005).

Similarly, Hispanic America and Spain maintain solid and massive academic communication in Spanish which is more autonomous in the social sciences and humanities than in the natural sciences. This network comprises many thousands of journals published mostly in Spanish. UNAM, the leading Mexican university with over 300,000 students, created *Latindex*, a scientific index which includes 11,000 periodical publications from Latin America, the Caribbean, Spain and Portugal, out of which 2,883 are Brazilian (Café 2005).

Over the past decade, the linguistic and academic integration of Brazil, which produces 40 per cent of Latin America's scientific publications (Café 2005), with its main Hispanophone neighbours, has progressed significantly through the Common Market of the Southern Cone (Mercosur). General communication including academic exchange and cooperation are based on a language policy of receptive bilingualism in Spanish and Portuguese, with no need to revert to English (Hamel 2003b). Few experts would expect that Brazil alone produces 5,986 scientific and technical journals (Instituto Brasileiro de Informação em Ciência e Tecnologia, in Café 2005). The overwhelming majority of them are published in Portuguese, but only 17 are registered in the international Science Citation Index (Café 2005).[3] Who reads these journals, what do they publish, and why would their circulation not be of relevance according to standards exclusively defined by the increasingly monolingual Anglophone academia and their satellites in other language areas?

The previous discussion posits the question about what we understand by international scientific communication, how it relates to other scientific communication and to what extent it makes sense to separate scientific communication (publications and conference presentations) from the whole process of scientific production. International communication sould not be reduced to interlingual communication, i. e. the interaction between speakers of different language communities, but should include the extensive and diverse scientific communication of established networks inside Francophonie, the Luso-Hispanic or the Anglophone world.

Furthermore, the dynamics of scientific communication seem to signal a tendency of internationalisation which makes it more and more difficult to distinguish between national and international communication. I would argue that globalisation is increasingly diluting the distinction between the national and the international sphere, and is dissolving nation-states altogether (Hardt and Negri 2000) — with the exception of the USA. As it happens, the thrust for English as the only world language in science blurs the hegemony of a single national state, the USA, under the label of 'globalisation' and creates the ideology that English has already become so international that it neither belongs to any country, nor is it controlled by any group of native speakers (Crystal 1997, see a critique in Hamel 2006b). Authors critical of this stance belonging to super central language communities such as French and German (Durand 2001, 2006, Ehlich 2001, 2005) have identified traces of cultural imperialism in this process which not only affects the national scientific cultures but the development of science as a whole. The US scientific market is largely organised in terms of a national and

imperial structure which admits subordinate foreign participation within the frameworks established by US science, but not as a global market. Its impressive capacity to individually shape and absorb foreign scientific intelligentsia and thus maintain its worldwide lead does not suggest that there is any significant influence of other scientific communities in its structure or organisation. The same applies to language use where tolerance of foreign pronunciation of English only superficially covers up the real language and discourse requirements for academic work in English only.

On the other hand, the national scientific organisation of the world's most powerful country significantly influences the course and structure of science policies in most other countries. Therefore, while the idea of introducing a kind of diglossic barrier between international scientific communication in English and national communication in the local languages that could shelter the latter looks quite attractive at first sight (e. g. Ammon 2006), this is less feasible in a globalising world since linguistic boundaries coincide less and less with national borders, as is highlighted in the debate on language use in science in the Scandinavian countries (Phillipson 2001, 2003) or in the European Union (Ammon and McConnell 2002). What we witness is in fact a process of increasing linguistic hierarchisation and of domain loss for lower ranking languages. Stable language boundaries tend to disappear. Once English is declared the only international language for science, all other languages not only lose international status but are menaced in their own territories, as Durand (2001, 2006) stringently argues.

Similarly, the linguistic and conceptual division operated in many studies between the communication of results and the larger field it belongs to, i.e. the field of scientific production, circulation, and the construction of human capital through academic teaching and team-working, becomes arguable when submitted to closer scrutiny. Congress papers and publications are integrated into the larger cycle of scientific production which is by itself a communicative social process that implies a research community. The attempt to isolate the external communication part and assign a language to it that differs from the one used in the rest of the process may only transfer linguistic and other conceptual conflicts from one place to another in the field of science. In any case, integrated plurilingual models in the whole field of science are called for to attend possible conflicts (Hamel 2006a).

Ultimately, the difficulties of introducing clear-cut diglossic barriers in any part of the process of producing, teaching and diffusing science has deep roots in the very nature of the science-and-language relation, i.e. in the language of science itself. The idea of an abstract language structure common to all languages whose slots only need to be filled with interchangeable technical terminology from each language may have risen within natural sciences where the very process of acquiring scientific knowledge is largely identified with memorising technical nomenclature, at least in the beginning (e. g. in medicine). Scientific language, however, is much more than that, especially if we focus on the *alltägliche Wissenschaftssprache*, the everyday language of science, as Ehlich (2001: 7) calls it. Beyond the specific scientific terminology, this register uses a particular national language with its structure and idiomatic properties

for the purposes of oral and written communication. Consequently, we can only access world scientific knowledge through the existing languages and their structures, which provides a perspective of diversity to the dynamics of world knowledge development (Ehlich 2001). The experience of multiple perspectives enshrined in specific languages of science may constitute a relevant barrier against scientific ethnocentrism often disguised under the cover of globalism.

Beyond the individual experiences, it has been argued that the reduction of science to one language could severely hamper the development of science itself. This line of thought is related to Humboldt's and Herder's view of the role languages play for cultures and nations, and to the Sapir-Whorf hypothesis about cultural relativism and linguistic determinism, a debate that has been referred to in many publications on the topic of language and science (e.g. Ammon 2006, Durand 2001, Ehlich 2001). More important than to discuss whether research findings formulated in one language can be properly translated into another is to acknowledge the risks and the possibility of distorted results that may derive from the study of language use in science based on a narrow concept of language as an abstract structural entity, and to exclude from the analysis its interrelation with power relations, discourse structures and cultural models underlying research orientations (Hamel 2003a). A comprehensive investigation, that includes these three components would have to show to what extent the present process of spreading English in science implies the imposition of a specific Anglo-Saxon scientific discourse and related cultural models, research paradigms and selection of topics. Power relations and hierarchisation of prestige between approaches, scientific schools, disciplines and lobby groups from outside turn out to play a fundamental role in the dynamics of science, as Bourdieu (1984) so masterly demonstrated when analysing *Academia* as a sociological field. The new hierarchy with English on top, including its discourse structures and related cultural models, constitutes a powerful instrument and at the same time an outcome of this broader process.

The increasing supremacy of English reinforces a tendency towards growing monolingualism in science. Whereas only fifty or seventy years ago Anglophone scientists could hardly afford to ignore relevant literature in at least a few other languages, today they can deny the very existence of scientific results outside English and reinvent the wheel as is often ironically observed from outside. On the one hand, this process generates bi- or multilingual language proficiency among non Anglophones. An important argument in favour of scientific monolingualism has always been the fact that non-Anglophones, especially speakers of languages which are marginal to science, would only have to learn one foreign language instead of several, an argument that cannot be easily dismissed (Ammon 2006).

On the other hand, it reinforces a tendency towards individual and societal monolingualism among Anglophones who feel less and less inclined to acquire foreign languages for science and other purposes of international communication when they can achieve their goals and do their business in English. Such an individual and societal language policy is based on the rationale that, to learn any or even several foreign

languages for academic purposes would not provide the Anglophone academic with an access to more bibliography than English alone can supply, as Ammon (2006) correctly points out. Furthermore, it saves the Anglophone countries and their speakers a significant investment in capital, effort and time by not learning other languages (Grin 2005). Another perhaps more profound reason for such an "English only" strategy is the perpetuation of an asymmetric power relation between the Anglophone native speakers and their non native counterparts in international communication. Many of our Anglophone colleagues in the fields of second language acquisition, bilingual education or multilingualism celebrate linguistic diversity in theory but practice functional monolingualism since they do not publish, teach or communicate in any other language. In English they can play their role as communicative stars at international conferences or promote their publications that are usually better formulated, without having to be more sound or profound than those of the non native authors. Such individual and societal strategies may provide advantages in the short term. It bars the monolingual researchers, however, from acquiring the fundamental experience of encountering multiple research perspectives through knowledge framed in other languages, and to measure their own knowledge against the possible world knowledge formulated in a diversity of languages. Beyond such personal experience, individual and societal monolingualism is regarded increasingly as a handicap in a modern, globalising world, both by representatives of the English language industry that profits from the expansion of English (Crystal 1997; Graddol 1997, 2006) and by those who oppose scientific and other types of monolingualism (Durand 2001, 2006; Ehlich 2001, Hamel 2005, 2006a; Phillipson 2003).

The dominance of English in science and its perspectives

The present pre-eminence of English language use in scientific publications has already severely reduced multilingualism in the field, and may eliminate the status of any other language as an international language of science. Figures and forecasts send out a mixed message for future development. Most of them seem to suggest that there is an inevitable course of affairs towards an English monopoly. This is furthermore presented as a natural process and by-product of globalisation by many experts. If you want to have your research findings read by the relevant international scientific community, so the story goes, you have to publish in English. Whether this tendency is desirable or not is a matter of international and national debate where many actors understandably take sides according to the perceived interests of their professional and language communities.

As we have seen, many investigations on the use of languages in science reduce their object of study step by step to focus on the language of publication in a small, selected number of prestigious international journals included in the main databases and citation indexes that today are predominantly published by English language

enterprises. Certainly, journals well documented in large databases are fairly easy to research for language use, compared to the complex sociolinguistic field of production, circulation and diffusion of science. Thus, this strand of research usually isolates scientific communication, mainly its publications, from the field of science as a whole with its possible negative consequences. Finally, the complex relation between languages, discourse structures and cultural models is not examined and the fundamental question to what extent dominant research paradigms and their ideological construction profit from the integration of the these three components but spread even beyond language borders is not pursued, with rare exceptions.

In the previous section I have argued why such systematic reductions in the construction of language use in science as an object of research may be tainted with liguicentrism and objectively trigger off a circle of self fulfilling prophecies. Given such reductions in the scope of research, it should not be surprising that overwhelmingly the figures and the supposedly inevitable arguments for natural processes pave the way to English monolingualism.

Any language policy proposals will have to tackle the complex question whether stable language domains can be established that recognise English as the sole international language of science and find some niches for other languages, mainly on the intra-national level and for academic teaching (e.g. Ammon 2006, Ammon and McConnell 2002). Interestingly, the Francophonie discussed this question over 20 years ago, namely whether the whole field of the natural sciences was already 'lost' for French and should be abandoned to English (see Walter 1996 and Maurais' personal communication in 2003). Such a position was however never adopted by French institutions. Durand (2001, 2006), a firm defender of French *and* plurilinguism in science, strongly argues against the recognition of English or any other language as the sole international language of science, since that would entail negative consequences not only for French but for the role of French scientific contributions as a whole. Contrary to a common view he argues that, if French scientific findings were exclusively published in English, French science would lose visibility and recognition on the international scene. Such a policy would furthermore deter people around the globe from learning French or any other language except English.

I have elsewhere (Hamel 2003a, 2005, 2006a) argued in favour of a plurilingual enrichment model for Spanish as a language of science that might help to avoid a zero sum game and the "either — or" dichotomy present in approaches that assume the unrestricted defense of a given language and foster monolingualism. Plurilingualism entails a view of intercultural communication where ones own position or academic standpoint recognises that other perspectives and procedures are also part of the possible world knowledge; or, to put it another way, that other valid positions and knowledge bases exist that may be formulated in terms of different languages, discourse structures and cultural model that define research paradigms.

Ammon (2006: 19) proposes an interesting scheme of hypothetic attitudes that inform and guide linguistic behaviour among academics and determine reading

preferences. First, he establishes a reading preference hierarchy between English, other international languages and non international languages which is probably irrefutable based on sheer language competence and numbers of publications. More interestingly, he postulates that both Anglophones and non Anglophones prefer to read texts written by Anglophone native speakers over those written by non native language users who publish in English. Such a predilection, if it turned out to be empirically sustained, would have to be explained, not so much in terms of stylistic quality, but rather in terms of discourse structures and cultural models that correspond to dominant research paradigms. Readers — academics or others — enjoy texts that confirm their own knowledge, beliefs and values including familiar ways of organising texts. Beyond that basic preference, critical readers probably rather look for contributions from other cultural and linguistic communities to whose languages they have no direct access. Furthermore, those researchers who keep track of publications in a number languages have certainly experienced that, while fundamental contributions appear in leading English language journals, there is also a huge amount of low quality work being published in English, given the sheer numbers of publications and the economic interests of publishing houses. Very often native writers of English find it easier than non natives to have their work published, even if their contribution adds little to the field, just because they are capable of formulating their papers in mainstream conventional discourse styles. Conversely, we often hit upon real jewels of inspiring research formulated in other languages that are fully integrated into the sophisticated research traditions of, say, French, German or Spanish social and philosophical thought that may never reach the English language market or appear only years later.

Ammon's typology should therefore be broadened by adding some alternative attitudes that characterise the critical researcher oriented towards plurilingualism:

1. To actively read scientific literature in as many languages as possible.
2. To prefer texts in their original languages over translations.
3. To quote the original texts — with translation only if necessary — to counteract the growing 'invisibilisation' of other languages than English in scientific texts.
4. To avoid the translation of titles into English in reference lists.
5. To present whenever possible one's own papers in the host country's language.

The perspectives of the future constellations of language relations seem to be largely uncertain in a rapidly changing world. In 1997, Graddol (1997: 58) argued that in the course of the 21st century no single language would occupy the monopolistic position which English achieved by the end of the 20th century. Rather, an array of some six languages would form an oligopoly as the world's dominant languages. In his updated prognosis on the future of world languages, Graddol (2006) moves English from the role of a foreign language to that of a basic skill comparable to computer skills for almost any society. But he argues forcefully that "English will not be enough" in the UK, the USA or elsewhere (Graddol 2006: 118–119) to survive in a future multilingual world society. The same in my view applies to the field of science: "English will not

be enough", neither to enhance international communication in science nor to foster creativity and diversity in the scientific research of the future.

Many experts had identified the rise of the USA as the dominant economic, political and military power since the end of the 19th century as the single most important factor to explain the hegemony of English. If in the soon future a monopolar power relation that existed since the end of the Cold War will give way to a multipolar world which revitalises the role of Europe and includes the BRIC states as emerging superpowers, there is no reason to take the survival of English as the only world language for granted, even if it is increasingly taking on the status of world *lingua franca* that has autonomy from its internal circle (Kachru 1986) of native speaking countries. Those who reject other languages and attempt to formalise a language policy that institutionalises English as the only international language of science already may be outdated, caught in a phase of globalisation and an ideal of monolingual communication that is coming to an end. In light of this it can be argued that those language communities that preserve the vitality, updating and presence of their languages in the field of science, even if they occupy only a small percentage in international publications, provide an important service for their own language community and the international community of science. They avoid possibly irreversible language attrition for their own languages and contribute to maintaining a plurilingual perspective in the field of science. Maybe such a plural language policy will help to open the *AILA Review* again to languages other than English, and we may see articles published in Spanish, Chinese, Arabic or Hindi at some point in the future.

Notes

1. in Table 3 and 4, the numbers for French are significantly distorted, i. e. they range much higher than in other comparisons due to the inclusion of the French Delphis data base which assigns over 70% of its coverage to French publications.

2. According to Graddol (1997: 11), 19 countries that are currently shifting from an EFL status (English as a foreign language) to a L2 status for English, meaning that "the use of English for intranational use is greatly increasing". At least for Argentina, Honduras and Nicaragua that are among the countries he mentions such an assertion is clearly wrong. Later on Graddol (2006) acknowledges that the very distinction of L2 status is losing its meaning, and, following Kachru (2004), he suggests that different levels of proficiency among learners should rather be considered when analysing the role of English. However, the massive distribution of his oeuvre has left the wrong impression that Latin America is shifting to English in a way comparable to many Asian countries. This is certainly not the case.

3. To render Brazilian research and Portuguese more visible in international science, the Brazilian federal government created an online library (SCIELO, Scientific Electronic Library Online) with 92 selected Brazilian journals, mainly in the field of medicine. 16.3 % of them publish only in English, but almost a third (32.6%) accept articles in English, Portuguese of Spanish, the three languages usually read by Brazilian scientists (Café 2005).

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