

Focus: Linguistic Hegemony and the History of Science

Introduction: Hegemonic Languages and Science

Michael D. Gordin, *Princeton University*

Abstract: Science has historically been a multilingual enterprise, yet the present day appears to belie this generalization. It is difficult to deny the observation that the natural sciences today have converged to a state where a particular form of English—variously termed “Global English,” “International English,” or “English as a Lingua Franca”—serves as the almost universal language of interaction among scientific practitioners. The history of science demonstrates that many other languages have served (and, in many contexts, still do) for scientific and scholarly interchange. The unusual feature about the past several decades is not that the dominant language of the natural sciences is English (as opposed to, say, German or Russian or Chinese) but that it is *a single language*. This Focus section seeks to open up avenues of inquiry that would put both the past and the present of science into conversation, along this axis of translation and hegemonic languages. In addition to outlining the contributions—which explore the cases of Arabic, Chinese, Latin, French, and Russian over a millennium—this introduction addresses the charged question of English.

Even if you know more than one language, it is easy to garner the impression that most people are monolingual. Many countries tabulate their census data as though respondents were monolingual, privileging whatever was listed as a person’s dominant or everyday language, and maps of global languages often present monochromatic blocks to track ostensibly monolingual populations. Even linguistic maps of states with multiple *official* languages (Switzerland, Belgium, Kenya, and the tremendous complexity that is India)—to say nothing of countries with significant linguistically diverse immigrant populations (the United States, Canada, Israel)—for ease of presentation pass silently over the fact that large segments of the population, almost certainly a majority, have some degree of competence in more than one language.¹ Yet it is safe

Michael D. Gordin is Rosengarten Professor of Modern and Contemporary History at Princeton University. His most recent book is *Scientific Babel: How Science Was Done Before and After Global English* (Chicago, 2015). He is now working on a book centered on Albert Einstein in the multilingual environment of Habsburg Prague, 1911–1912. Department of History, Princeton University, 136 Dickinson Hall, Princeton, New Jersey 08544, USA; mgordin@princeton.edu.

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¹ For a clear and brief account of the complexities involved in counting languages and assessing degrees of competence among users see Stephen Anderson, *Languages: A Very Short Introduction* (Oxford: Oxford Univ. Press, 2012).

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to assume that most people for most of history have been to some degree multilingual. Scientists are no exception to this rule: they are real people who live in real places and function in a diversity of contexts. In many settings—especially if they are not native-speaking Anglophones—they even use multiple languages when working *qua* scientists: in lab chatter, grant applications, popularization, teaching.² The diversity of languages and forms of language use deployed by scientists is an enormous, albeit relatively understudied, topic, far exceeding the bounds of this particular Focus section.³

The subject here is substantially more constrained: the image of “hegemonic languages” across the history of science. By this we mean the repeated representation of scientific inquiry as *being* or at least *aspiring to* a single language of communication. We use this phrase rather than the more common “lingua franca,” which functions as a term of art within contemporary linguistics to describe this phenomenon.⁴ Our avoidance of “lingua franca” is deliberate. Deploying “lingua franca” as an analytic category has the potential to cause confusion, since the term was an actors’ category used to characterize a widespread trading pidgin in the late medieval and early modern Mediterranean, a space and time covered by two of the essays in this Focus section. Further, these essays circle around efforts to standardize languages for communication, which sit oddly beside the original notoriously unstandardized trading argot.

More important than the terminology is the salience of the notion that not only can there be a hegemonic language for science but that this is a desideratum, even an obligation. Nature is one, the quest for understanding nature is unified, and therefore the language by which we represent it should be one: so the reasoning often goes.⁵ Although scientists (and, earlier, natural historians, natural philosophers, mathematicians, physicians, and so forth) are now and have always been multilingual, there are two reasons why one should not dismiss the notion of a solitary hegemonic language for science out of hand.

The first is that the hegemonic ideal captures something striking about science as compared with other forms of human cultural activity: the compression to a smaller set of languages. In every historical period and geographic context of which I am aware, scientific communication has taken place in a relatively small number of vehicular languages—languages intended to be understood by a community of researchers dispersed across broader space—compared to the number of ambient languages in the region. That number has not, historically, been *one*, but

² This is easily seen in the ubiquitous practice of “code-switching”: alternating among different languages within a single utterance or conversation. The prevalence of code-switching varies, but it inarguably has played an important role in scientific communication and has left numerous residues in terminology (witness Russian “*chernozem*” in soil science or German “*Gestalt*” in psychology).

³ See Michael D. Gordin, *Scientific Babel: How Science Was Done Before and After Global English* (Chicago: Univ. Chicago Press, 2015); and Scott L. Montgomery, *Science in Translation: Movements of Knowledge through Cultures and Time* (Chicago: Univ. Chicago Press, 2000).

⁴ For a helpful discussion and embrace of the term see Nicholas Ostler, *The Last Lingua Franca: English until the Return of Babel* (New York: Walker, 2010). On the etymology see Henry Kahane and Renée Kahane, “*Lingua Franca*: The Story of a Term,” *Romance Philology*, Aug. 1976, 30:25–41.

⁵ For a thoughtful contemporary discussion of the costs and benefits of a single language for scientific communication see the recent treatment in Scott L. Montgomery, *Does Science Need a Global Language? English and the Future of Research* (Chicago: Univ. Chicago Press, 2013). Throughout these essays we refer to human languages, of the sort that can be learned as a native language by a child. Alongside such languages, scientists deploy a large array of representational systems that are not at all linguistic (graphs, chemical diagrams) to convey scientific results, as well as mathematical formalism, which as a form of writing shares some features of human languages. On this point see Sundar Sarukkai, *Translating the World: Science and Language* (Lanham, Md.: Univ. Press America, 2002), p. 7; and Gordin, *Scientific Babel* (cit. n. 3), pp. 12–13. The problems posed by the universality (or not) of mathematical representation within the sciences are not the subject of this Focus section. For an introduction see the classic essay by Eugene Wigner, “The Unreasonable Effectiveness of Mathematics in the Natural Sciences,” *Communications in Pure and Applied Mathematics*, 1960, 13:1–14.

it is typically low. When you compare science with trade, literature, the military, the fine arts, you find that all of these tend to allow for greater linguistic diversity than does science. (Certain religious traditions with liturgical languages are the chief domain that has greater compression than science.⁶) Given this compression, one would expect to find that at certain times and places the number would be so restricted as to be basically unitary (at least to a reasonable approximation).

For science, one of those times and places is right now, essentially everywhere around the world, with the phenomenon sometimes called “Global English.” This is the second reason to examine the notion of hegemonic languages across the history of science closely: for the first time in history, there seems to be one and only one language that is globally assumed to be understood by any natural scientist.⁷ There is no question that English is overwhelmingly dominant in scientific communication today, such that, with some exceptions, publishing in some other language is a marked act, a deliberate indicator of a specific agenda.⁸ English, by contrast, is framed as neutral. (It goes without saying that it is not actually neutral.) The cultural status of the natural sciences is so high, and the research infrastructures of national and transnational funding bodies are so heavily influenced by their model, that the effects of Anglophonia are already quite noticeable in the social sciences and, to a lesser degree, the humanities.⁹

Why has this happened, and how is it maintained? We should not expect the same answer to both questions. It is difficult to separate the causal story of the rise of Global English from the massive sprawl of the British Empire, though this seems inadequate to explain the case in science, because both the timing of Global English in this domain (beginning after World War II) and the general form of the idiom (highly Americanized) indicate a center of gravity on the Northwestern Atlantic rim. That American hegemony was intimately involved in the linguistic hegemony of the English language is undeniable, but the mechanics are frustratingly tricky to pin down. Some have posited that the advent of computerization and, especially, databases, which at the outset were largely American, pushed the language of the United States everywhere.¹⁰ The case cannot be so straightforward, as shown by classics, a humanities discipline that adopted computerization, text searching, and online publishing very early but remains one of the most multilingual humanities disciplines. (Here, the fact that the discipline is centrally *about* language obviously raises awareness of the scholarly importance of multilingualism.)

⁶ For a programmatic outline of some of the linguistic issues involved see David Crystal, “A Liturgical Language in a Linguistic Perspective,” *New Blackfriars*, 1964, 46(534):148–156.

⁷ This statement, and the rest of this essay, refers to the elite natural sciences; clinical medicine and applied sciences (e.g., agronomy, civil engineering), because of their closer contact with various governing agencies and diverse populations of lower education, typically exhibit a much broader state of linguistic diversity, or at least status-conditioned bilingualism.

⁸ See esp. Ulrich Ammon, ed., *The Dominance of English as a Language of Science: Effects on Other Languages and Language Communities* (Berlin: Mouton de Gruyter, 2001); Montgomery, *Does Science Need a Global Language?* (cit. n. 5); Claude Truchot, *L'Anglais dans le monde contemporain* (Paris: Le Robert, 1990); and David Crystal, *English as a Global Language*, 2nd ed. (Cambridge: Cambridge Univ. Press, 2003).

⁹ Ulrich Ammon, “Linguistic Inequality and Its Effects on Participation in Scientific Discourse and on Global Knowledge Accumulation—With a Closer Look at the Problems of the Second-Rank Language Communities,” *Applied Linguistics Review*, 2012, 3:333–355; and Ammon and Grant McConnell, *English as an Academic Language in Europe: A Survey of Its Use in Teaching* (Frankfurt am Main: Lang, 2002). It is anyone’s guess whether in either domain the compression will become as total as in the natural sciences. My own view is that such an outcome is unlikely but that scholarship in many fields has not yet reached the limits of Anglification.

¹⁰ Robert B. Kaplan, “The Hegemony of English in Science and Technology,” *Journal of Multilingual and Multicultural Development*, 1993, 14:151–172. It is worth noting for the record that the United States does not have an official language. Many civic functions—voting, taxes—can be and are performed in multiple languages, including Spanish, French, and Vietnamese, and much of the Southwest of the country is functionally, if not officially, bilingual in Spanish and English. Nonetheless, at least thirty states have mandated English as the official language. The absence of a federal official language is an occasional right-wing talking point. See Jody Feder, “English as the Official Language of the United States: Legal Background and Recent Legislation,” Congressional Research Service Report for Congress, 7–5700 (16 Jan. 2009).

Another hypothesis is naked imperialism. Although there is no question that at various moments—as a condition of Marshall Plan aid, at various postwar international conferences—the American government has promoted the international use of English, the inconsistency of this pressure, and the fact that English was a dominant international vehicular language of non-aligned nations such as India (a legacy of the British Empire, to be sure), speaks to a more complex story.¹¹ Elsewhere, I have argued that the most important causal force was likely the non-native speakers of any of the languages that have together dominated scientific communication in the modern period (English, French, German, and Russian). The question is what native speakers of Dutch, Chinese, Swahili, Arabic, Portuguese, and so forth have chosen to publish in as their professional, international language. A combination of geopolitics and contingency, especially the decline of German internationally after each of the world wars, left English as the dominant alternative.¹² Surely, a mixture of these factors and others needs to be incorporated into any account.

Maintenance is more straightforward. Once there is a hegemonic language of publication in English, the desire of researchers to be read and cited usually decides the question. Governments and universities have adopted bibliometric indicators such as impact factors and citation counts that reinforce the hierarchy of journals—themselves increasingly aggregated by the relatively few publishers that constitute an oligopoly—further increasing the costs of defecting to another tongue. As research funding has become, with the end of the Cold War, significantly transnational, multinational organizations like the European Science Foundation and even national competitions like Germany's *Exzellenzinitiativen* demand applications in English to facilitate international peer review.¹³ The interconnection of Global English and today's scientific infrastructure is extremely tight.

What role does this provide for the history of science? It is important to underscore that in recent decades history of science as a discipline has exhibited a strong dominance of English, something easy to observe at international conferences and often remarked upon by researchers who are not native Anglophones. It is a rare article in the field today, published in any language, that does not display some, often quite extensive, familiarity with the Anglophone secondary literature; a converse familiarity by Anglophone researchers with the non-English scholarship is much less in evidence. The phenomenon of English in the history of science is not that surprising. Not only is the community more international in composition and subject matter than those subfields of history that concentrate on a particular nation-state or geographic region, but the manifold connections between historians of science and practicing scientists—through our training, our students, our primary sources, our colleagues—likewise work to reinforce a particular linguistic order.

Precisely because the phenomenon of Global English happened so early and so totally in the sciences (as compared to other domains of scholarship), and because of our field's specific relationship to both those disciplines and the language, the history of science has a unique capacity to interrogate the causes and implications of the present linguistic situation. Given the compression of languages in science noted earlier, historians can readily find several significant examples where a single hegemonic language was either quite pervasive across large regions or such a goal was actively striven for by certain communities of scientists. (It is understandable

¹¹ On the hegemony hypothesis see Roswitha Reinbothe, "Der Rückgang des Deutschen als internationale Wissenschaftssprache," in *Wissenschaftssprache Deutsch: International, interdisziplinär, interkulturell*, ed. Michael Szurawitzki, Ines Busch-Lauer, Paul Rössler, and Reinhard Krapp (Tübingen: Narr, 2015), pp. 81–94; and John Krige, *American Hegemony and the Postwar Reconstruction of Science in Europe* (Cambridge, Mass.: MIT Press, 2006), Ch. 2.

¹² Gordin, *Scientific Babel* (cit. n. 3), esp. Chs. 8–11.

¹³ See Ammon and McConnell, *English as an Academic Language in Europe* (cit. n. 9).

that many people would wish that the language they were most comfortable with was more widespread in a particular discipline; it is quite something else to want that language to be the only language of scientific communication.) This Focus section explores five different instances where the hegemonic potential and reality of particular scientific languages was actively under discussion or where it has been broadly assumed by historians to have been in evidence. None of these map precisely onto the situation of today's English—hardly to be expected in any historical comparison—but all of them highlight different features when read against each other and against the present. The cases enable us to begin to chart what is specific to the sciences, what to English, and what to our contemporary era.

The following essays focus on five putative hegemonic languages: Arabic, Chinese, French, Latin, and Russian, listed alphabetically—an arbitrary scheme that highlights the specificity of English as the medium in which the essays are written. In what follows, those essays are presented chronologically, as each author takes a particular moment in the history of each language in the sciences, fully recognizing that the history of each language extends both before and after the moment of his or her emphasis. These languages all have different sociolinguistic trajectories that display enormous historiographical variability. Arabic, for example, is strongly diglossic, with a high-status (Classical or Modern Standard) and an everyday (e.g., Maghrebi) variant, analogous to the polyvalent and polycentric status of German.¹⁴ On the other hand, “Chinese” is a category that encompasses not only Classical Chinese and Mandarin but also mutually unintelligible tongues such as Hokkien and Cantonese; the designation of all of them as “one language” is as much a political point as is the single time zone that unifies today's People's Republic of China.¹⁵ In those two instances, the written language offers an intelligibility not always present in spoken communication, a property shared with Latin. For Russian, and to some extent French as well, use in international science frequently privileged spoken interactions in situations where the written medium was different. In order to convey, however imperfectly, a feel for some of these languages, each author has left quotations in the text from the main language under discussion in the original orthography; translations into English are provided in the corresponding footnote.

The most striking impression in reading the essays is how *not* monolingual these contexts are. Ahmed Ragab recasts both the “translation movement” of ancient scientific texts into Arabic and the second wave of translations of modern science into the language in the nineteenth and twentieth centuries as evidence that Arabic always functioned as a dominant but not exclusive language of scholarly interchange in the region. Arabic's omnipresence is evidence of the existence of a multilingual linguistic regime, not of its absence. Dagmar Schäfer argues an analogous point for Chinese during the Ming dynasty, widely regarded as more intensely focused on a single hegemonic language than, say, the Qing. This impression, she notes, is an artifact of the archive produced by Ming scholars, and reading against the grain brings the diversity of linguistic translation to the fore. Sietske Fransen builds on contemporary scholarship regarding translations out of but also *into* Latin in the seventeenth century to show how Dutch, French, and Italian worked alongside, not in opposition to, Latin at the supposed height of its dominance. Her story is echoed in Mary Terrall's analysis of French during the eighteenth century, when Francophone scholars found themselves with a language that would take them almost everywhere in print or speaking—but not without friction, gaps, and a significant sense of unease. Finally, Elena Aronova explores the role of Russian in both Soviet internal communication (within the USSR and the Soviet bloc) and in international organizations, highlighting how en-

¹⁴ See the classic essay by Charles A. Ferguson, “Diglossia,” *Word*, 1959, 15:325–340.

¹⁵ John DeFrancis, *The Chinese Language: Fact and Fantasy* (Honolulu: Univ. Hawaii Press, 1984).

forcement of a linguistic hegemony was often a strategy promoted alongside a simultaneous push for multilingual inclusion.

It is hard to imagine any collection of essays on this issue that would leave these cases out. Could the set have been expanded? Certainly, although less obviously for the modern period. German, for example, for all its ubiquity in nineteenth- and twentieth-century science, never enjoyed a solitary hegemonic reputation (though there were quite a few who aspired to it throughout that period). Many other European languages—Italian, Dutch, Portuguese, Spanish—had regional importance, often through colonial administrations, but in none of those cases did their civic significance correspond to something that can be neatly categorized as “hegemonic.”¹⁶ The situation in the premodern period is rather different. Consider just three languages (there are others) that stand out for their significant role as regionally monolingual vehicular languages: Greek (*koinē*), Sanskrit, and Persian.¹⁷ It is regrettable that the exigencies of space do not allow a more comprehensive treatment.

What do we learn from the juxtaposition? Obviously, that is largely something for readers to decide for themselves as they consider what follows. One of the most important lessons from my reading, however, is that hegemonic language regimes have not, historically, been totalizing; these languages were always significantly conditioned by the medium of communication (oral, written), the intended audience, and the kind of knowledge being communicated. That point also holds for English today, although its dominance within the sciences is much greater than any of these historical examples. (Whether that is a difference in degree or in kind is a matter of intense debate.¹⁸) Any attempt to write the history of even very recent science that fails to consider the possible linguistic dimensions—even if those aspects are in turn discounted as not relevant—will always be incomplete. Potentially significant, often informal, aspects of scientific practice can take place in multiple idioms even in an Anglophone world of print. As a corollary, we as a community need to pay more attention, even in Anglophone situations, to what *kind* of English is being used: native speaker or not, formal writing or casual note taking, slang, American, South Asian, Singaporean, and so on. None of the languages discussed in the following essays were static entities, and they all bore the traces of the historical moment in which we find them. It is a dimension that we cannot afford to ignore, in scholarship or with each other.

¹⁶ The regional significance of these languages is a point often made in passing or implicitly, but it structures the argument of many histories of science in imperial contexts. See, e.g., Jorge Cañizares-Esguerra, *Nature, Empire, and Nation: Explorations of the History of Science in the Iberian World* (Stanford, Calif.: Stanford Univ. Press, 2006); Neil Safier, *Measuring the New World: Enlightenment Science and South America* (Chicago: Univ. Chicago Press, 2008); and Harold J. Cook, *Matters of Exchange: Commerce, Medicine, and Science in the Dutch Golden Age* (New Haven, Conn.: Yale Univ. Press, 2007). Many further examples could be given.

¹⁷ See, respectively, Geoffrey Horrocks, *Greek: A History of the Language and Its Speakers*, 2nd ed. (Malden, Mass.: Wiley-Blackwell, 2010); Sheldon Pollock, *The Language of the Gods in the World of Men: Sanskrit, Culture, and Power in Premodern India* (Berkeley: Univ. California Press, 2006); and Nicholas Ostler, *Empires of the Word: A Language History of the World* (London: HarperCollins, 2005).

¹⁸ See, e.g., the literature surveyed in Montgomery, *Does Science Need a Global Language?* (cit. n. 5).