Hydrogen Oxygenovich: Crafting Russian as a language of science in the late nineteenth century

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Abstract
Until the 1860s, science in Russia was principally conducted in Latin, French, and German. In the years leading up to and following the creation of the Russian Chemical Society in 1868, Russian chemists – treated in this article as both a representative sample of Russian scientists and also practitioners of the flagship science of the period – debated both the merits of developing a nomenclature that would enable Russian to “hold” modern inorganic and organic chemistry, and the practicability of doing so. The article explores debates over whether Russian syntax could be adapted to represent chemical compounds according to emerging western conventions or in a sui generis manner, as well as the struggles of Russian scientists to use French and German to communicate with their foreign counterparts, arguing that the details of these debates highlight both the fruitfulness and the limits of using “standardization” as a framework for linguistic codification.

Keywords
Russian language, chemical nomenclature, Dmitrii Mendeleev, language, standardization

In 1870, surely one of the most unusual proposals in the history of chemical nomenclature was put forth in the minutes of the Russian Chemical Society. N. A. Liasovskii (a chemist of no lasting reputation or legacy) suggested at the recent Congress of Natural

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Scientists and Physicians in Moscow that Russians should change their naming conventions of chemical compounds to feature:

…combinations of the sort of the Russian *patronymics* and *family names*; for example, for potassium chloride [KCl₂] to adopt the name *potassium chlorovich* or *potassium chlorov*, for potassium hypochlorite [KOCI] *potassium chlorovich acidov* or *potassium chloro-acidov*, for potassium chlorate [KClO₃] *potassium chlorovich three acidov* or *potassium chloro-three-acidov*.

The idea was to make use of the resources built into the Russian language to open up conceptual possibilities closed to the Germans and French. “Upon the introduction into such names of numbers for several valencies,” he continued, such procedures “present the advantage of very simple transmission of formulas into names, constructible in the same order in which the elements enter into formulas, therefore the combinations, similar to those generally deployed in the Russian language, could be easily assimilated.” Of course there were also drawbacks. To focus just on chemical issues, Liasovskii noted that this convention would produce almost identical names for salts and acids – rather important concepts to distinguish. He did not dwell on the more obvious disadvantage: this system was simply unintelligible to other European chemists, even if they could read Russian; it would not translate. The proposal dropped like a stone – I have never seen it mentioned again. Despite its prompt vanishing act, the sudden appearance of this proposal opens up a space to explore the way various languages operated in nineteenth-century European space, especially outside the dominant trio of the century of French, German, and English.

No language naturally holds scientific concepts. Science as we find it in the nineteenth century was already a highly elaborate assemblage of various specialties and disciplines, some in the throes of professionalization, each of which produced an enormous assemblage of texts chronicling the discoveries and conjectures about the natural world. Given the undeniable (and arguably quite recent) emphasis on novelty as a criterion for building a scientific reputation, it stands to reason that a good many of these new findings involved the development of a *lexical* armature – either the coining of new words or the articulation of new meanings for terms that were already in use (“potential” or “compound,” for example) – to contain the new findings, a set of words that were precisely and unambiguously defined to enable standardization. To be sure, this phenomenon was general over nineteenth-century Europe. Military and economic innovations, the construction of forms of party politics and mass mobilization, the emergence of new techniques in music, painting, literature, and other arts – all of these taxed the ingenuity of contemporaries to devise ways to discuss their world. Given the scale of this transformation, this essay does not propose to explore more than a tiny slice of it, carved out of a single science (chemistry), a lexical subset (nouns), and a language (Russian).

In chemistry, some of these problems receive unusual saliency. If you find an entirely new chemical element, you have to give it a name to differentiate it from all previous elements, and ideally that name would indicate that it *was* an element, part of a system. (English has for over a century tended to use the suffix “-ium” for this purpose.) Those names have to become common currency in the relevant community, or else they are useless for communication. How does this take place? As it happens, the development and spread of a particular nomenclature, Antoine Lavoisier’s anti-phlogistic, “oxygen”-based...
nomenclature of the late eighteenth century, happens to be one of the best-studied questions in the history of chemistry. The success of this system of naming elements and inorganic compounds persists to the present (albeit in modified form), and a very thorough historiography explores its early decades and its adaptation from French into other Romance languages (Italian, Spanish, etc.) and the Germanic tongues (German, English, Swedish, Dutch, etc.). To a much lesser degree has the question been pushed further eastward, into the Slavic languages.

My emphasis will be on chemical Russian after the throes of Lavoisierian innovation had already passed, and it will be helpful for what follows to explore a few features of how nouns – and, since we are talking about chemical nomenclature, nouns are all that is needful here – behave in that language. Each Russian noun, like German nouns, has one of three grammatical genders – masculine, feminine, and neuter. Unlike German, one can (with some important exceptions) identify the gender by inspection: if it ends in a consonant, it is masculine; if it ends in -а or -я (another way of writing “a”), it is almost always feminine (there are also feminine nouns that end in a soft sign, ь); if it ends in -o or -e, it is neuter. The gender matters because adjectives have to agree in gender, as do verbs in the past tense, and also because gender governs the declension into cases. Russian, like Latin, is a case language, meaning that the endings of nouns change based upon their grammatical function in a sentence. There are six of these cases (nominative, accusative, genitive, prepositional, instrumental, and dative), one more than Latin, two more than German, and five more than English (approximately; the ’s structure to indicate possession is a vestige of an old English genitive). In English, we mark syntax by word order; in Russian, one does so by changing the endings of the nouns, which means word order can be flexible. If you are trying to read a chemical article and learn whether to add the acid to the salt or vice versa, this is an important distinction. Aside from these morphological and syntactic characteristics, some sociolinguistic aspects of the long history of the development of the Russian language condition the nineteenth-century story, and those will be explained in the course of this essay.

Over the nineteenth century, Russian chemists gradually proposed, debated, and then adopted various chemical nomenclatures, exposing the language in the process to sometimes French and at other times German models for how one should “speak” or “write” chemically. A crucial point here was timing: Russians began developing a systematic inorganic nomenclature at precisely the moment that Antoine Lavoisier’s chemistry had reformulated the language of chemistry in France, and they approached organic nomenclature in lockstep with a reform of that subject in Western Europe. That latter process was immeasurably complicated by the tremendous discoveries and conceptual transformations that ripped through the science in this same period, rendering even contemporary chemical French and chemical German rather unstable. These instabilities in the content of science have ramifications for historians’ general presentation of nomenclature reforms as a process of standardization, analogous to metrological standardization – which, to some extent, they surely are. But, as discussed at the end of this essay, the constant fluctuations in linguistic behavior make stabilizing language a more fraught process as a matter of degree, transitioning at the edges into a difference of kind.

The Russians had two tools in building their scientific language: Russian itself, which has always displayed a protean capacity to absorb words and even syntax from other languages; and a knowledge of foreign languages, from which Russian chemists could
appropriate and adapt certain ideas. No account of the nomenclature debates would be complete without incorporating both aspects, and they are integrated into the specifically chemical story below. I argue that instead of thinking of the development of “chemical Russian” as a process internal to the Russian language and its speakers, we must see this transformation as one formed constantly and consciously against a background of ambient western European languages, as Russians experimented with either assimilating or innovating dominant western solutions to the challenge of scientific naming. Much as the Russian scientific community grew alongside and in intimate contact with other European ones, so did the capacity of its native language to contain science.

The Russian chemical revolution, in names

All chemical nomenclatures are artificial. Noted Danish linguist Otto Jespersen observed in 1929 that “[i]f you look through a list of chemical elements you will find a curious jumble of words of different kinds.” To select just English, you noted quite ancient traditional words, such as gold or iron; such metals were named so long ago that just about every language has its own idiosyncratic terms for them (Geld, Eisen; or, fer; золото/zoloto, железо/zhelezo). Then, there were words derived from Greek or Latin roots, such as the oxygen that Lavoisier coined. (The Germans, of course, rejected this term, preferring to calque it as Sauerstoff, “acid-substance.”) Finally, Jespersen noted, a consensus solidified around the suffix -ium, although even here the stem could be derived from a place (ytterbium), a country (germanium), a planet (selenium), and so on. And that was just for the elements. When considering the many categories of compounds that populate organic chemistry (esters, ketones), the situation was more fraught still.

The point I wish to stress here is that chemical nomenclature must be artificial. New substances are being discovered or created constantly, and it is simply impossible to provide a finite list of names, or rules for naming, that will cover all eventualities. On the other hand, one cannot just select any random name for any new substance. How would a student learn the interconnections, the order that underlay chemical transformations? And then how would you translate your findings for international chemists, the only group that can vouchsafe the validity of your knowledge claims? Liasovskii’s system, which began this essay, was as perplexing to his peers as to us today, for although it built on the resources of the Russian language – as adaptable and tolerant of diversity as we have seen it to be – it moved away from intertranslatability with European nomenclatures. One cannot overstate how unusual this proposal was. For in the realm of chemical naming, the Russians were not at all “backward” with respect to western Europe – they embarked on a modern nomenclature in lockstep with their international peers, and they faced the same frustrations (although western Europeans could not know this, since they were unable to read the debates).

Aside from the traditional metals (like copper) and other substances common among apothecaries and metallurgists (like sulfur), chemical nomenclature in Russian remained decidedly lackluster until the end of the eighteenth century. By the 1770s, however, university courses began to use Russian, and theoretical chemical treatises started appearing in Russian translation. In order to teach those courses and translate those books, Russian scientists began to debate and develop a nomenclature suited for Russian. The importance
of suitability is sometimes lost on English speakers. In English, *copper* can be either a noun or an adjective (as it is in *copper* sulfate). But in French or Russian one cannot simply use a noun as an adjective without any morphological tinkering – one either has to introduce a preposition (sulfate *of* copper) or add a suffix that turns the root into an adjective. (German will allow *Kupfersulfat*. ) But which suffix to use? Arguments about the choices battered Russian chemistry for over a century: pick the right one, and you had a neat system that eased education and theorizing; opt for the wrong one, and you generated an unholy mess.

All of the dominant chemical nomenclatures in the wake of the oxygen-inspired nomenclature were, fundamentally, *lexical* in orientation. They conceived of the task of putting together a nomenclature as arranging a list of words that would correspond to the terms in the French theory. Lavoisier, even here, set the linguistic terms of the debate, basing his theoretical introduction of his *Traité élémentaire de chemie* (1789) on the philosophy of Étienne Bonnot de Condillac’s conceptualization of systematic naming. As Lavoisier put it, in Robert Kerr’s contemporary English translation:

> The impossibility of separating the Nomenclature of a science from the science itself, is owing to this, that every branch of physical science must consist of three things; the series of facts which are the objects of the science; the ideas which represented these facts; and the words by which these ideas are expressed. Like three impressions of the same seal, the word ought to produce the idea, and the idea to be a picture of the fact. And, as ideas are preserved and communicated by means of words, it necessarily follows, that we cannot improve the language of any science, without at the same time improving the science itself; neither can we, on the other hand, improve a science, without improving the language or nomenclature which belongs to it.10

However, as noted above with the example of “copper sulfate,” a simple one-to-one translation hits problems of morphology (changes in word formation) as well as syntax (what Liasovskii was especially trying to express). So a simple direct adaptation, in the manner Lavoisier implies, is not possible unless you are translating from French into French, or some other language that miraculously shares its grammar. Every group of scientists who wished to move Lavoisier’s science into a different language, therefore, found itself confronting a similar problem of how to change the nomenclature without changing the science too much.

This is an opportune moment to step back from the late eighteenth century and see how the Russian language had come to assume the form it had at that moment, for the history of the language – whether consciously or unconsciously appreciated – provided constraints as to what reformers could do. Although this essay speaks of languages more or less as entities (witness “French” above), it is important never to lose sight of the fact that every mode of speech is in constant transformation, whether that rate is fast or slow depending on circumstance. Languages are in constant interaction, flowing into each other, diverging into dialects and shifting vowel patterns, and the erection of firm boundaries around the edge of a certain portion of speech behavior and declaring “This is Russian” or “This is Ukrainian” is the outcome of a series of intellectual and political decisions that do not always correspond to clear-cut distinctions in actual usage. Since the eleventh century AD – a millennium ago – we have records of a language that has, over time, become what we know as Russian, the dominant Slavic language today in
terms of numbers of speakers. The process of becoming, however, was not quite linear.

Russian is a Slavic language, a member alongside Belorussian and Ukrainian of the East Slavic branch of that Indo-European language group. Slavic also has western (Polish, Czech) and southern (Bulgarian, Slovenian, Bosnian–Croatian–Serbian) branches, spanning the broad eastern expanse of the European continent. These languages are obviously related to each other but are not necessarily mutually intelligible (much as German, Dutch, and Swedish are clearly related members of the Germanic language family, but fluency in one hardly conveys command of the others). The origins of the Slavic family are murky. We have reliable information from the sixth century AD about the presence of speakers of what we would now call Slavic languages in the Balkans, but the languages themselves were not very strongly separated even in the ninth and 10th centuries, when our information becomes more reliable. The fact that they were so closely related at that time meant that various groups could use a common written language: Old Church Slavonic.

In 863, Prince Rostislav of Moravia – in what is today the Czech Republic – sent a request for Christian missionaries to Byzantine Emperor Michael III in Constantinople, to assist his people in resisting foreign religious intrusion. (The foreigners were what today we would call Catholics.) Two monks, Constantine and Methodius, were dispatched, and one of their charges was to develop a script for the various Slavic tongues they encountered, derived from the Greek alphabet. On his deathbed, Constantine took the name Cyrill, and the later evolution of his Glagolitic script still bears his name. The writing system was designed to render a written language based on a Macedonian dialect of Bulgarian, and it was adopted first by western Slavs and then moved east. The language so written – Old Church Slavonic – became, in the words of one historian of Russian, “a kind of common literary language in the medieval Slav world.” It functioned, in many ways, like Latin in late medieval and Renaissance Europe: it was a written language for the liturgy and theology. Unlike Latin, it was rarely used for speech, but it enabled epistolary communication among linguistically diverging groups who shared Slavonic even as they used what were becoming Old Russian or Polish in their everyday interactions. But, since it was not Latin or Greek, it also had the effect of insulating this eastern region from the explosion of classical learning in contemporary Europe. Old Church Slavonic was both a unifying force and an isolating one.

In the region between Kiev, Novgorod, and Moscow, various dialects were spoken that are now labeled “Old Russian.” Beginning in the eleventh century, we find ecclesiastical writings in Russian, and in the following centuries these were joined by legal and business documents – the so-called “chancellery language” – and then literature proper. Russian was developing in contrast with Slavonic, but that contrast was never absolute, and many Slavonicisms continued to inform new word coinages throughout the medieval period. Nonetheless, many historians of Russian tend to speak of the language as literally almost trapped by Old Church Slavonic, arguing that “the subsequent history of both Russian language and Russian literature has been in a sense a long process of emancipation from the initial and paralyzing influence of Byzantine culture working through the medium of Bulgarian.” According to this rather essentialist vision of language, Russian was developing into a “proper language,” but was then stalled by repeated incursions of
Byzantine influence, most notably the so-called “Second South Slavic” influence of the 14th and 15th centuries, a consequence of learned immigrants from the Balkans flooding Moscow. According to this traditional account, Russian had to work to “free” itself from these backward-looking influences. Ironically, the way it did so was by assimilating a different set of foreign models.

In the early 17th century, Moscow became the center of a sizable group of foreign merchants, who imported western European books on topics ranging from medicine to mining to law. A printing boom followed, helping to standardize Russian in certain directions directly shaped by these foreign texts. (There had been limited printing earlier in Muscovy; the first Russian printed book to carry a date appeared in 1564.) This foreign learning often arrived via Poland or highly Polonized Ukrainian and Belorussian regions, and many of the new Russian words of Latin or German origin in fact entered through Polish mediation, which also had a significant impact on syntax.

Our records of Russian always show a language saturated with loan words. Common Slavic, which is the basis for East Slavic, already had Iranian and Germanic loans, the former donating terms for religion and the latter for materials and administrative organization. Scandinavian words poured in from the north beginning in the 9th century, often related to fishing and nautical matters. Abstract terms came either directly from Greek or through Old Church Slavonic mediation (and to a much lesser degree from Latin). Not all the imports were Indo-European: the Mongol invasions of the 13th century brought their own slew of linguistic borrowings, often related to finance, administration, trade, and communications – including the Russian words for “money” and “pocket.” Thus, the appropriation of Polish (and through it Latin and German) was not a new phenomenon; like the Second South Slavic, immigration meant borrowing, and depending on your view of cultural progress, you could consider borrowing to be “advanced” in one case and “retrograde” in another. The flow back and forth shaped Russian, but not in any determinative direction.

This aimlessness changed decisively at the turn of the eighteenth century, as Tsar Peter the Great (reigned 1682–1725) undertook a deliberate program of modernizing certain aspects of the administration and military of the Russian lands, a process that accelerated substantially after he relocated the capital in 1703 from Moscow to the brand new city of St. Petersburg. The incorporation of foreign terms had been a constant process of the development of Russian – as it is of almost every language – but Peter initiated what one historian has called the “polytechnicalization of language.” Not only did he reform the alphabet in 1708, removing some of the more Slavonic features (Vladimir Lenin would introduce a final alphabetic simplification in 1918), he commissioned a massive series of translations of foreign texts to train the Russian nobility he impressed into his service. Peter issued instructions to avoid Slavonic words and use everyday idioms for translations, forcefully chiding translators like Fedor Polikarpov who strayed from this directive. The tensions were at times unbearable. A certain Volkov, finding himself unable to render some passages of de la Quintinye’s Instructions sur les jardins fruitiers et potagers into Russian, committed suicide.

Peter’s second impetus to the creation of a scientific Russian language was his 1724 establishment of the Imperial Academy of Sciences in St. Petersburg, one of his final acts. Peter had several goals for his Academy; the promotion of the Russian language
was not one of them. Russian was not treated as a medium of scholarly discourse. The official language of publication was Latin – which was imported into Russia specifically to be used for science, as there was no domestic Catholic religious tradition preceding it – at the very moment when the dominance of this language was slipping among European scholars. Mathematician Christian Goldbach was appointed Secretary of the Academic Conference explicitly because of his command of Latin, although German and French often slipped into the minutes and, given the central European origin of most of the academicians, German was obviously the language of conversation. Latin, however, remained obligatory for the presentation of treatises, a source of constant irritation. For example, the presidency of the Academy was a patronage position, but not all appointees understood Latin. In 1734, the notoriously pro-German Empress Anna selected Baron Korff for the post, but he knew almost no Latin so minutes were kept in German. Count Razumovskii’s accession in 1742 brought Latin back, but Count Orlov’s appointment in 1766 entailed the return of German, citing Korff as precedent. (In 1773, everyone gave up, and the minutes were taken in French.) As if this were not confusing enough, Russian was obligatory for all business dealings within the Academy, necessitating translation to and from German when communicating with academicians, most of whom knew little or no Russian.

Among Russian-born circles of intellectuals, Latin continued to be seen as a force retarding Russian advancement due to the necessary slowing of learning which education in the language imposed. Nikolai Popovskii, rector of the gymnasium at the newly established University of Moscow, conducted his lectures entirely in Russian to contest the monopoly of this foreign language. In certain fields such as medicine, however, this approach would not work; Latin was considered essential for medical education until the middle of the nineteenth century, with German as a subsidiary language required for reading. It was not until October 1859, in fact, that Heinrich Lenz, dean of the physico-mathematical faculty of St. Petersburg University – and clearly of German ancestry himself – felt emboldened to petition his supervising ministry: “[T]he Faculty finds that from now on, there is decisively no need for particular instruction in the Latin language in the category of the natural sciences.”

As the sciences were beginning to move toward Russian as a language of communication within Russia, the nature of Russian itself was changing radically. As historical linguist W. K. Matthews noted: “It must have been easier for, say, a seventeenth-century Russian to understand twelfth-century Russian than it is for a Russian of today to understand seventeenth-century Russian.” Beginning in the middle of the eighteenth century with the writings of the first ethnic Russian member of the Academy of Sciences – poet, chemist, and polymath Mikhail Lomonosov (1711–1765) – one of the most momentous transformations in the history of Russian took place, gradually reforming not just the vocabulary but even the syntax and word order of Russian to resemble western European languages, especially French. By the early nineteenth century, a modern Russian entirely intelligible to a speaker of today’s language had emerged, and alongside it a scientific style shaped by libraries full of foreign texts.

The 1770s was thus an excellent moment for Russians to begin searching for an inorganic chemical nomenclature, because this was precisely when Lavoisier and his colleagues began to overhaul the entire system of French names – and, by knock-on effect,
German and English names. The Russians had access to these books in either the original or in translation almost instantly; between 1772 and 1801, 12 translated books on the new chemistry appeared in Russian. Fedor Politkovskii, fresh from a two-year trip to Paris, began lecturing on the subject in 1783 in Moscow. If scholars were prepared to read French – and who wasn’t? – the Academy library also had a copy of Lavoisier’s *Opuscules physiques et chimiques*, sent by the author himself in 1774. German commentaries followed, and by 1801 almost the entire (very small) Russian chemical community was committed to Lavoisier’s new chemistry. They only needed to figure out how to talk about it.

As noted in 1870 by Fedor Savchenkov before the Russian Chemical Society, in one of the occasional debates about updating chemical nomenclature, the dawn of the nineteenth century saw “a rather close translation of French names, introduced as the foundation of principles taken in the nomenclature.” But the perception that Russians were simply mimicking the French was more a surface appearance. In an 1810 article on Lavoisier’s principles, academician Iakov Zakharov both extolled and warned against the French system:

> The French naming system is now adopted in all of Europe. Languages which for the most part or in entirety are of Latin origin had no difficulties at all in introducing the very same words into their languages, it was only necessary to substitute the final syllable for one appropriate to the properties of that language.

That included the Spaniards, Portuguese, Italians, and even the English. But “[t]he Russian language with all of its branches has a completely different quality, just as German and others.” The Germans had begun to calque and otherwise adapt the French system to their language, and “we should also follow this example.” He went on to develop an integrated system that used native Slavonic prefixes (*pere-, do-*) to mark levels of oxidation, and otherwise followed the German model. In the end, what was happening was a greater convergence of nomenclatures syntactically, even as they differed lexically. And it was this divergence that Liasovskii seemed interested in undoing by embedding the syntactic genitive relationships of patronyms into chemistry. Russian nomenclature would go in another direction.

**The protracted standardization of chemical name-calling**

Academician Hermann Hess articulated a synthetic version of the nomenclature proposals that had come before by 1836, and they have survived mostly unchanged down to the present. But although the essentials of inorganic nomenclature were established early enough, it was not until 1912 that the Russian Chemical Society officially sanctioned this system. The reasons for this rather lengthy holding pattern were twofold. First, a consistent groundswell of commentators felt that only chemical practice could determine the right nomenclature, and that premature codification would only lock in a flawed theory as the basis of Russian naming. Over two centuries after Lavoisier, this may seem absurdly over-cautious; Mendeleev and his contemporaries, however, were taught by individuals who had studied under Lavoisier’s students. Radical conceptual transformation was not so
unthinkable to them. Writing in 1870 in response to yet another stalled debate on the formalization of a nomenclature, Vladimir Markovnikov saw this temerity as so much dilly-dallying. He insisted that the problem was not getting the right nomenclature, but a uniform one, for if each professor taught his students an idiosyncratic convention, all progress in chemistry and chemical industry would crash to a halt.36

He did not get his way, in part because of the second reason for hesitancy with respect to chemical names: the nomenclature of organic compounds. After the introduction of structure theory of organic molecules in the 1860s, the field boomed, chemical periodicals announcing the discovery of hundreds, even thousands, of new compounds, byproducts of the new pharmaceutical and artificial dyestuffs industries. The problem of arbitrary, individualized naming was not a unique plague in Russia, but beset western Europeans as well. Edward Frankland, an eminent British chemist, wrote to his German contemporary Hermann Kolbe (a famously reactionary figure), with equivalent complaints to Markovnikov’s about inaction and willfulness:

Every young chemist here seems to think that he does something both highly important and original, if he can invent some slight modification in the nomenclature of chemical compounds. Hence in the place of the tolerably uniform old system of names, all sorts of systems and various have sprung into existence, and all uniformity has been lost. Much the same state of things appears now to prevail in Germany, where the language also lends itself much less readily to the new system.37

The situation continued to deteriorate into the late 1880s and early 1890s, when Alsatian chemist Charles Friedel convened a group of chemists in Geneva to develop a new international nomenclature to tame the new compounds.38

As far as the Russians were concerned, “international” meant a club of British, French, and Germans. The only Russian involved in the discussions was Friedrich Konrad Beilstein, of German ancestry but born in St. Petersburg and raised fully bilingually. Yet many Petersburghers were not willing to consider their German-named native son truly “Russian.”39 On 8 October 1892 (O.S.), the Russian Chemical Society held a discussion about the new proposals. It was inconclusive. Beilstein encouraged chemists to adapt to the new regulations, which would standardize European chemical publishing; by no means was it intended to change daily practice: “No one imagines eliminating the old names, nor introducing the new nomenclature into conversational language.” So it was to be a purely written convention? Mendeleev would have none of it, declaring that:

[O]nly a language that has worked itself out historically is a living language. Such is the natural, international language of chemistry – the language of formulas. Translation of the language of formulas to oral and written speech is a difficult and doubtful affair, in order that, given the large number of words necessary for this, new names might summon up exemplary notions and therefore would be appropriate for oral and written speech.

In the end, Nikolai Menshutkin postponed any decisions.40 Like the inorganic nomenclature, this issue remained unresolved for decades.

The silent background to this hostility and stalling was understood by all present: the relationship of Russian to contemporary western European languages. Russian chemists
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not only thought about Russian chemical nomenclature in juxtaposition with the nomenclatures of French and German; they thought about Russian itself in conjunction with those languages. Their intimate familiarity with learning and using those languages, including the frustration of not having their linguistic efforts reciprocated, motivated much of the delay so that Russian chemical nomenclature might sit more comfortably in the ambient national language. But this familiarity with foreign tongues was not only a source of frustration—it was also a resource to be used to generate chemical nomenclature itself. While the key referent for chemical nomenclature was obviously French, the key linguistic referent in general for Russian chemists was German.

A commonplace about Russian culture in the nineteenth century has it that the elite all spoke French. Like many commonplaces, this is not false—as a glance at any of the monuments of Russian literature will attest—but it obscures the important role of German, especially for learned conversation. French was arguably the dominant western language in Russia in general, but German was absolutely everywhere in scientific circles. One obvious reason for this was the presence of large numbers of Russian subjects who were native German speakers among the bureaucratic and academic elite. For example, the above-mentioned Beilstein preferred to use German while among friends or at home. Oral German was not confined to private settings. In 1854, Carl Julius Fritzsche, a German-born chemist who since the 1830s had been a mainstay of academic culture in St. Petersburg and used Russian with ease, volunteered to give a series of charity lectures on chemistry to raise funds for the Crimean War effort; his Russian-language petition to the state specified that the lectures would be in German, presumably because that would bring in a greater audience.

The eclipse of Russian among academic circles within the Empire was particularly acute in the Baltic regions. Karl Klaus, professor of chemistry at the University of Dorpat (today, Tartu in Estonia), felt constrained to correspond with organic chemist Aleksandr Butlerov (then at the University of Kazan, later in St. Petersburg) in German. He wrote in 1853:

As you see, I wanted to write you in Russian and would have done so, of course, in case of necessity, because here, in Dorpat, I risk completely forgetting that little of the Russian language which I learned by the sweat of my brow; however in view of the fact that you understand the German language as well as you do your native language, I will write to you in German this time in order not to waste excess time.

In later letters he did write in Russian, both to please Butlerov and because “the Russian language is more pleasant for friendly relations.” Butlerov had written to Klaus to see if he could defend his dissertation at Dorpat—such venue-shopping was common practice among Russian scientists—but the latter informed him that this would be impossible, for:

…none of the members of the faculty would be able either to read your dissertation, or conduct a disputation with you, since none of them command the Russian language. […] You would have to translate your dissertation or have it translated into German or French and conduct the disputation either in German or in French.

The shock, of course, is that this was a leading institution in the Russian Empire.
Yet these Baltic Germans or German immigrants were a subsidiary reason for the prominence of German as a language of oral interchange in Russian science. The main advocates of the use of German turned out to be Russians themselves, especially when they were speaking with non-Russian Slavs. For example, as Dmitrii Mendeleev’s close friend and Petersburg University geologist Aleksandr Inostrantsev noted in his autobiography about his time abroad in Prague:

In the evenings my wife and I usually went to dine and observe certain “Slavonic Evenings” as they were called at that time. Sometimes an especial interest was presented here when, after dinner with a pint of beer, a general conversation began, although it was difficult for us to understand due to our poor knowledge of the Czech language. To acquaint us with these conversations and speeches the masters of ceremonies of this club introduced us to two young people, Vanžura and Patera, who spoke Russian not badly, and when they were absent it was necessary sometimes to speak with the neighbor in, as one ironically says, the common Slavic language, i.e., in German.48

Likewise, in 1867 Aleksandr Borodin, who taught chemistry at the Medico-Surgical Academy not far from Inostrantsev, wrote to his musical patron Milii Balakirev atop a manuscript of some Czech musical themes: “I gave the title in German, since in general the German language is for Slavs the international language. I am convinced of this, sitting in Petersburg. Not long ago I had a conversation with a Czech in German[…].”49 The tone is ironic in both instances, but it speaks to a deeply lived reality for these men. The problem was not only in communicating with Slavs. In 1902, Nikolai Menshutkin, secretary of the Russian Chemical Society, boasted to his peers that at a meeting of “northern” (read: Baltic and Scandinavian) scientists and physicians in Helsinki – at that time part of the Russian Empire – roughly 20% of the 1000 attendees were Russians, heavily concentrated in the chemistry section. Menshutkin was delighted that the prominence of Russians made the Scandinavians relent in their linguistic practices, and that all papers in chemistry were delivered either in German or with German summaries.50 Russian chemists, when abroad, were Germanophone. The international language of the Slavs, indeed.

Menshutkin’s glee gives the impression that German was almost second nature to Russian scientists, and they could alternate with ease between their “international language” and their native one. Countless asides in correspondence and memoirs attest, however, as physiologist Ivan Sechenov noted in his autobiography, that “[i]gnorance of languages among the majority of our students represents a great misfortune.”51 Attentive professors sometimes resorted to extreme measures to get their students up to linguistic speed. For example, as chemist Ivan Kablukov reported in his memoirs about an interchange with his teacher, Moscow professor Vladimir Markovnikov:

I went to V. V. Markovnikov and asked:

– How am I supposed to study organic chemistry?

He said:

– Prepare ethyl acetoacetate.
– And how should I prepare it?
– Take the German journal *Liebigs Annalen der Chemie* and read about it there.

I didn’t know German. One could either take the French or the German track in the gymnasium. I took the French. What to do? I took the article, took a dictionary, and began to read. In the end, it is impossible to recommend this method, which is of course very difficult, but sometimes it works.

I read everything, prepared ethyl acetoacetate, and this was the spur to further study.52

Markovnikov himself encountered difficulties with German. Upon arriving in Berlin, he looked around and discovered, as if it were a surprise, “to my displeasure here they speak only German, and you know how weak I am in this language.”53 The solution? “With chemists I conversed here in French because,” he wrote to Butlerov, “having begun with [Adolf von] Baeyer in German, [I] soon was obliged to shut my trap.”54 Complaints about fumbling oral skills were legion, and letters transmitting self-translated articles almost always contained a statement to this effect: “At the conclusion of my writing I find myself obliged to ask your forgiveness in a possibly too unelaborate handling of the German language.”55 (The original German is equivalently awkward.)

Dmitrii Mendeleev – in 1869 a victim of a translation mistake (from Russian into German) that helped power the longstanding priority dispute with Julius Lothar Meyer over the discovery of the periodic system of chemical elements – found himself similarly incapacitated both in speech and in writing, notwithstanding two years spent living in western Europe (1859–1861) and the substantial numbers of foreign books kept in his library.56 While in Heidelberg, he relied on a Russian named Baksht to translate his articles into German; in conversation, he muddled through or resorted to broken French.57 This barrier was most inconvenient in personal correspondence, where both the intimacy of the medium and the need for a prompt reply placed the burden of composition entirely on his own shoulders. When writing to Wilhelm Ostwald, then at Leipzig but by birth a Baltic German subject of the Tsar, he could resort to his native language: “I write in Russian because I want to answer without delaying and translation is a lengthy affair.”58 But most German professors did not know the language, and so when he had no amanuensis he had to inflict broken German, full of Russianisms and misspellings, on his interlocutor. For example, writing to August Kekulé from his dacha in Boblovo, he lamented:

In the village, where I live, no one knows German and you know how weak I myself am in this language. I want however to try to relate to you everything that is important concerning my views about the constitution of Benzol – according to my opinion.

He concluded with an obligatory apology: “Forgive me my German. From Petersburg I would be able to write better – here is by me no person, also no dictionary.”59 Even with Erlenmeyer, whom he had known for years, he was no less uncomfortable. “Ooof! I have finished. I understand nothing and believe that you cannot understand my letter any more,” he wrote. “If my letter actually remains not understood, then I write French. I can certainly find a translator, but in so delicate [a] story I want to involve nobody else.”60
His German was pretty good compared to his English. Certainly, he was able to read the language and often cited British articles in his own writings, but of the three dominant languages of science of the day, this was by far his weakest. When he gave the prestigious Faraday Lecture in London in 1889 – on perceived links between the periodic law and Isaac Newton’s laws – he was invited to write his address in Russian. It was then translated into English by Vassili Ivanovich Anderson, chair of the Mechanical Section of the British Association for the Advancement of Science, who had been born and educated in St. Petersburg. The result was then read at the meeting by Sir James Dewar; Mendeleev sat on the dais and observed the procedure, lecturing by proxy. Then the page proofs of the published version of the lecture arrived to him at Boblovo. Summer was a bad time to find an English-speaker in Russia – all of his peers had dispersed to their summer addresses. He turned to his colleague Nikolai Menshutkin, famously polyglot and seemingly comfortable in all three dominant languages. Mendeleev delegated the corrections to Menshutkin:

I received from Prof. [Henry] Armstrong the attached proofs about the periodic law. [...] You know that I cannot command the details of the English language, and therefore I resolved to ask you to read through and correct it, wherever you consider it appropriate.

I have been unable to determine whether Menshutkin managed to oblige, but the published version is admirably free of typographical errors, so someone clearly gave it a once-over.

If Mendeleev struggled with English, this paled with the troubles Englishmen had with reading Mendeleev’s Russian. Some British chemists had indeed studied the language a bit. Alexander Crum Brown, one of the architects of structure theory in organic chemistry, wrote to Mendeleev in much excitement about the latter’s imminent arrival in Edinburgh in 1884:

As far as language is concerned, I speak German – not well, but all the same entirely comprehensibly – and French only with the greatest difficulties. I even had certain successes in reading Russian. Butlerov sent me already a long time ago his “Introduction to a Complete Study of Organic Chemistry”, and I read rather a lot from it before the German edition appeared … I also have your “Principles of Chemistry,” and I also read something from it. But I am afraid that we will depend on German and French in our conversations, because I am sure, that you are much better acquainted with the English language, than I with Russian.

The case of fellow Scottish chemist William Ramsay was, however, more typical. Ramsay was solidly working through the literature on atmospheric gases – he would receive the 1904 Nobel prize in chemistry for his discovery of the inert gases – and he came across some references to Mendeleev’s volume of studies on the topic, *On the Expansion of Gases (Ob uprugosti gazov)*, published in 1875. When they had met at the Faraday Lecture, the topic had come up (presumably in German), and Ramsay wrote a letter to follow up, explicitly stating that he wrote in German because it was likely the best common tongue. In the next missive, Ramsay thanked Mendeleev for the book, with sadness noting the tome’s impenetrable language. “It will be for me hard work to read the book, but I will try,” he wrote in German. “With the help of a dictionary and a
grammar, I hope in any event to be able to spell out the sense.”66 It seems he did not get terribly far, for in 1892 he again wrote Mendeleev on the same theme, this time in French: “Does your memoire exist only in the Russian language? Or could one find a translation, or even an abstract, in some Western journal?”67 No such luck. Yet Ramsay observed that “I see in the text some numbers which guide me, and I will do my best to understand your beautiful work.”68 The unity of notation, mathematical formulas, and scientific nomenclature – transliterated into and out of Cyrillic – surely made the task easier. Such interchangeability of nomenclature, however, was not easily achieved.

Over the past 25 years, historians and sociologists of science have developed a sophisticated framework for thinking through how standardization works, whether it be meter sticks, fruit flies, or body-mass indexes. The general idea is that a standard is set up – a negotiated, contingent standard in all cases, later constructed as “natural” – and then through constant circulation of exemplars everyone is brought into coordination.69 This account is persuasive in many instances, but it is valid only in very specific cases when it comes to language. Although some languages (e.g. French, Modern Hebrew) are claimed as the special domain of institutionalized academies that attempt to regularize “standard” usage, the constant mutations of everyday use produce even here a dialectic where the academy attempts to restrain usage, and then adapts to it. For less administered languages like English, the typical model is even harder to maintain. What standardization exists is enforced through education, copy-editing, the media, and other gatekeepers, but these also do not stay stable.70 Which brings us back to Jespersen’s observation about the artificiality of scientific nomenclatures: it is precisely their limited purview, their constructed character, that enables stability over long stretches. Yet this stability, as the Russian case indicates, is only maintained as long as the parallels between the nomenclatures set up between languages are held to be “equivalent.” This was precisely the feature Liasovskii, with his grand dreams of a chemical nomenclature that exploited the Russian patronymic as a uniquely cultural feature of Russian qua Slavic language, did not understand.

**Conclusion**

The point of the nomenclature struggles in Russian, however, was not in the resolution, but in the fact that not only the dynamics of the debate – when it ebbed and flowed, which arguments crested or retreated – but also the very points raised were astonishingly similar to those in Western Europe. To a certain extent, this is unsurprising. We have already seen that Russian chemists used French and German (and to a lesser extent English) routinely in their research, and often published in foreign venues. Naturally, they paid attention to what was happening abroad. But there was more to it than a simple imitation, for the timing of Russians’ inquiries into organic nomenclature, starting in 1870, preceded the most significant western debates. Rather, one observes that the question of how to make a language hold science consists of a series of obligatory passage points, and the most distinctive point about Russian is that the entire development of the scientific language was compressed into a single century, while German had begun this path in the early eighteenth century, and French and English earlier still.71
The pattern of questions and the solution-space may have been largely determined, but the choice to go down this path at all was certainly not. Science (and before it, natural philosophy and natural history) had been taking place for a long time in Russia before there was a perceived need for a Russian-language variant of it. As I have argued elsewhere, the priority dispute over the periodic system was symptomatic of a conjuncture that made a patriotic stance to publishing science in Russian uniquely favored, while publishing in German – in the wake of the 1871 unification of Germany, now a looming military power on Russia’s western border – was in rather worse odor. Precisely that kind of enthusiasm was necessary, because building up a scientific language in the middle of the nineteenth century, after a large body of nomenclature already existed in foreign languages, demanded a sizable investment of intellectual and publishing resources. It is a choice that only one other scientific community has seriously embarked on since (the Japanese, in the middle of the twentieth century). Nonetheless, Russian scientists did not promote a monoglot pattern of scientific communication analogous to the American community in the wake of World War II; they could not afford to. Just as scientific Russian was born of an engagement with western tongues, the relative ignorance of ordinary Russian beyond Romanov borders meant that it would continue to evolve in elaborate engagement with them.

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Notes
1. This article is a revised adaptation of Michael D. Gordin, “Hydrogen oxygenovich,” in Michael Gordin, Scientific Babel: How Science was Done before and after Global English (Chicago: University of Chicago Press, 2015), pp. 79–103.
2. Russian dates in the nineteenth century followed the “old-style” Julian calendar, and lagged 12 days behind the Western European Gregorian calendar; dates in the former are labeled with “(O.S.).” All unattributed translations are my own.
5. Viktor A. Kritsman, “Die Entstehung der russischen chemischen Nomenklatur im europäischen Kontext: Die Frühgeschichte,” in Bernhard Fritscher and Gerhard Brey (eds.), Cosmographica et Geographica: Festschrift für Heribert M. Nobis zum 70. Geburtstag (Munich: Institut für Geschichte der Naturwissenschaften, 1994), pp. 199–218. Related to the eventual evolution of Russian into a dominant language of scientific communication in the twentieth century, one finds that certain aspects of the process are idiosyncratic compared with other Slavic languages (Czech, Polish, Bulgarian), which had smaller populations speaking them and which did not serve as the administrative language of states (for the most part) in the early nineteenth century (being colonized by Germans, Austrians, Hungarians, Ottomans, and Russians). For some of these other cases, see Jan Surman, “Science and its Publics: Internationality and National Languages in Central Europe,” in Mitchell G. Ash and Jan Surman (eds.) The Nationalization of Scientific Knowledge in the Habsburg Empire, 1848–1918 (Basingstoke: Palgrave Macmillan, 2012), pp. 30–56.

6. For most individuals raised with scripts derived from the Latin, the Cyrillic alphabet introduces an additional complication. This barrier, however, is easily surmounted, especially for one with a passing familiarity with the Greek alphabet – a trait common to classically educated elites from the nineteenth century, and even more so to chemists with some education in mathematics. Many of the letters are either identical to Latin ones (a = a, м = m), or simply straightforward modifications of the Hellenic system (н = n, д = d). True, there are fascinatingly different letters to capture specifically Slavic sounds (ж = zh, ш = shch), but some of these are at least as straightforward as the consonant clusters by which Latin-scripted Polish renders these same sounds.

7. Lissa Roberts’s essay “Science Dynamics: The Dutch Meet the ‘New’ Chemistry,” in Bensaude-Vincent and Abbri, Lavoisier in European Context, pp. 87–112, helpfully chronicles the Dutch case, which in many places is analogous to the Russian in the significance of a local linguistic tradition combined with heavy engagement with French, English, and other ambient nomenclatures.

8. Translation played a crucial role in intellectuals’ definition of what was distinctive about Russian culture in the nineteenth century, emphasizing Russians’ ability to absorb foreign notions from East and West. See the interesting discussion in Andrew Wachtel, “Translation, Imperialism, and National Self-Definition in Russia,” Public Culture, 11(1), 1999, pp. 49–73.


27. E. Lenz to council of St. Petersbur University, 10 October 1859 (O.S.), TsGIASPb (Central State Historical Archive of St. Petersbourg), f. 14, op. 1, d. 6039, l. 1.


35. See, for example, N. Sokolov and A. Engel’gardt, “Ot redaktssii,” Khimicheskii zhurnal N. Sokolova i A. Engel garvida 1, January 1859, pp. i–xvi, on p. xi; Fedor Savchenkov in minutes of the Russian Chemical Society meeting of 5 November 1870 (O.S.), Zhurnal Russkogo Fiziko-Khimicheskogo Obozhestva, 2, 1870, pp. 289–90.


41. The continuous interplay between Russian and other European languages (principally French and German) is omnipresent in correspondence in this period. A large proportion of the letters addressed to Aleksandr Butlerov, for example, oscillate around this issue, although the same is visible in Mendeleev’s correspondence. See Bykov, Pis’ma russkikh khimikov k A. M. Butlerovu. On the issue of delays in engaging with nomenclature, see Solov’ev, Istoriia khimii v Rossii.


44. Petition to the Vice-President of the Academy of Sciences, 9 October 1854 (O.S.), PFARAN (St. Petersburg Annex to the Archive of the Academy of Sciences) f. 5, op. 1(1854), d. 513, l. 2.

45. K. K. Klaus to A. M. Butlerov, 15 April 1853 (O.S.), reproduced in Bykov, *Pis’ma russkikh khimikov k A. M. Butlerovu*, p. 161.

46. Klaus to Butlerov, 12 May 1857 (O.S.), reproduced in Bykov, *Pis’ma russkikh khimikov k A. M. Butlerovu*, p. 166.

47. Klaus to Butlerov, 11 August 1853 (O.S.), reproduced in Bykov, *Pis’ma russkikh khimikov k A. M. Butlerovu*, p. 164.


54. Letter of 25 November 1886 (O.S.), quoted in Solov’ev, *Istorii khimii v Rossii*, p. 355. Solov’ev also reproduces a letter from Ostwald to Mendeleev, dated 19 January 1888, where the former complained that Mendeleev’s Russian handwriting was atrocious, and hard for him to read, especially since his Russian was not excellent. He suggested having it copied over, perhaps in a woman’s hand. Solov’ev, *Istorii khimii v Rossii*, p. 357.


61. Mendeleev, Dva londonskikh chteniia, reproduced in Dmitrii Mendeleev, Izbrannye sochine-
62. Mendeleev to Menshutkin, 23 July 1889, Boblovo, reproduced in B. N. Menshutkin, 
Zhizn’ i deiatel’nost’ Nikolaia Aleksandrovicha Menshutkina (St. Petersburg: M. Frolova, 
63. Crum Brown to Mendeleev, 29 March 1884, reproduced in V. E. Tishchenko and M. N. 
Mladentsev, Dmitrii Ivanovich Mendeleev, ego zhizn’ i deiatel’nost’: Universitetskii period, 
history of the translation of Butlerov’s book, and the general history of translating Russian 
chemistry textbooks into German, see Michael D. Gordin, “Translating Textbooks: Russian, 
64. On Mendeleev’s gas work of the 1870s, see Michael D. Gordin, A Well-Ordered Thing: 
Dmitrii Mendeleev and the Shadow of the Periodic Table (New York: Basic Books, 2004), 
chapter 3.
Mendeleev) Alb. 2/280.
69. A good account of the framework remains Joseph O’Connell, “Metrology: The Creation of 
Universals through the Circulation of Particulars,” Social Studies of Science, 23(1), 1993, 
129–73.
70. The literature on this subject is vast. For just the case of English – a famously “non-standard-
ized” language – see the variety of mechanisms detailed in Raymond Hickey (ed.), Standards 
of English: Codified Varieties around the World (Cambridge: Cambridge University Press, 
2012).
71. For German, see Eric A. Blackall, The Emergence of German as a Literary Language, 1700-
in Roger Chartier and Pietro Corsi (eds.), Sciences et langues en Europe (Paris: European 
Communities, 2000 [1994]).
72. Gordin, “The Table and the Word.”