

IN DEFENSE OF THE USE OF THE FRENCH LANGUAGE IN SCIENTIFIC COMMUNICATION, 1965-1985: NATIONAL AND INTERNATIONAL DELIBERATIONS AND AN INGENUOUSLY CLEVER TAKEOFF ON THE THEME BY R. B. WOODWARD

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Supplemental Material

Abstract

For many decades, French scientists, the French Académie des Sciences, and the government of France have been concerned about the declining use of French within the scientific milieu and the trend toward English as the universally-accepted language to communicate science. This trend is discussed with a focus on the issues most vigorously debated in the time period 1965-1985, including the reduced use of French in international scientific communication resulting from the dominance of English. A summary of the merging of national-chemical-society journals into international journals is also presented. A set of previously unpublished documents from 1965 written by the late Robert Burns Woodward—actually a linguistic twist on La Marseillaise, the French national anthem, that addresses the French-English debate—and his letter and enclosures to Jean-Marie Lehn are included and discussed.

It shall and may be lawful by the said society by their proper officers, at all times, whether at peace or war, to correspond with learned Societies, as well as individual learned men, of any nation or country ...

—American Philosophical Society charter 1780

Introduction

The international nature of chemistry—indeed, of science—is a truism. Operationally, however, the practice of doing and communicating chemistry is not equally and symmetrically shared throughout the world. That is also a truism. The evidence that English has become the unofficial language throughout the world in chemistry is multifold. For example, English is the only accepted language of *Pure and Applied Chemistry*, the official journal of the International Union of Pure and Applied Chemistry (IUPAC). Indeed, there has been a gradual disappearance of non-English chemistry journals over the past several decades.

In the late 1990s, the 14 European chemical societies listed in Table 1 founded the organization ChemPubSoc Europe “as a consequence of the amalgamation of many chemical journals owned by national chemical societies into a number of high-quality European journals” (2). The journals listed in the top portion of Table 2, all published by ChemPubSoc Europe, are solely in English, “replac[ing] 14 traditional national journals” (2). In 2005, surely influenced by the model and success of ChemPubSoc Europe, the Asian Chemical Editorial Society (ACES) was founded as a “conglomeration of [13] chemical societies [Table 1] with the mutual aim of

creating a modern publishing forum for research in Asia and coordinating future publishing activities” (3). ACES publishes two journals, both in English: *Chemistry—An Asian Journal* and *Asian Journal of Organic Chemistry*. (See the bottom portion of Table 2.)

Table 1. Participating societies in ChemPubSoc Europe (2) and the Asian Chemical Editorial Society (ACES) (3)

Participating societies (abbreviation)	Country
ChemPubSoc Europe	
Gesellschaft Österreichischer Chemiker (GÖCH)	Austria
Société Royale de Chimie (SRC)	Belgium
Koninklijke Vlaamse Chemische Vereniging (KVCV)	Belgium
Česká Společnost Chemická (ČSCH)	Czech Republic
Société Chimique de France (SCF)	France
Gesellschaft Deutscher Chemiker (GDCh)	Germany
Association of Greek Chemists (EEX)	Greece
Magyar Kémikusok Egyesülete (MKE)	Hungary
Società Chimica Italiana (SCI)	Italy
Koninklijke Nederlandse Chemische Vereniging (KNCV)	The Netherlands
Polskie Towarzystwo Chemiczne (PTChem)	Poland
Sociedade Portuguesa de Química (SPQ)	Portugal
Real Sociedad Española de Química (RSEQ)	Spain
Svenska Kemistsamfundet (SK)	Sweden
Asian Chemical Editorial Society (ACES)	
Royal Australian Chemical Institute Inc. (RACI)	Australia
Chinese Chemical Society (CCS)	China
Hong Kong Chemical Society (HKCS)	China
Chemical Research Society of India (CRSI)	India
Himpunan Kimia Indonesia (HKI)	Indonesia
Korean Chemical Society (KCS)	Korea
Chemical Society of Japan (CSJ)	Japan
Institut Kimia Malaysia (IKM)	Malaysia
New Zealand Institute of Chemistry (NZIC)	New Zealand
Singapore National Institute of Chemistry (SNIC)	Singapore
Chemical Society Located in Taipei, China (CSLT)	Taipei, China
Chemical Society of Thailand (CST)	Thailand
Chemical Society of Vietnam (CSV)	Vietnam

Table 2. ChemPubSoc Europe’s and Asian Chemical Editorial Society’s journals (2, 3).

ChemPubSoc Europe’s Journals
<i>Chemistry—A European Journal</i>
<i>European Journal of Organic Chemistry</i>
<i>European Journal of Inorganic Chemistry</i>
<i>ChemBioChem</i>
<i>ChemPhysChem</i>
<i>ChemMedChem</i>
<i>ChemSusChem</i>
<i>ChemCatChem</i>
<i>ChemPlusChem</i>
<i>ChemElectroChem</i>
<i>ChemistryOpen</i>
<i>ChemViews</i>
Asian Chemical Editorial Society’s journals
<i>Chemistry—An Asian Journal</i>
<i>Asian Journal of Organic Chemistry</i>

The transition to English as the single most-dominant language of communication in chemistry from 1985 to the present is surely based on the preparative 20-year period 1965-1985. A variety of practical considerations—economics of publication being just one—have funneled many chemical forums around the world into English and away from French and German, the dominant languages of chemical communication in the 19th and first half of the 20th centuries. Other factors can be cited for the choice of English as today’s preferred language of the chemical community, a critical one being the dramatic rise of American chemistry after World War I and further powered by World War II and post-World War II chemical advances in the USA (4).

Ironically, French and German substituted for another native language in 19th-century chemical communications. For example, instead of Russian in the *Bulletin scientifique publié par l’Académie Impériale des Sciences de Saint-Petersbourg*, Russian chemists published their research in French and German. Apparently, Russian chemists during that time felt that their work would be better disseminated by using what were then the international languages of science. There are other similar cases, a full discussion of which is outside the scope of this article.

Almost certainly, nowhere has the discussion of the choice of English as the universal scientific language been more pronounced and publicly more vigorous than in France. However, recent discussions on the decreasing use of languages in science communication have taken place in countries other than France, especially in Germany, Italy, and Japan (5). There is substantial national pride by the French, and indeed in other countries, for their own language. Given the emphasis in this article on the French-to-English conversions in science communications, we note that in 1998, the venerable *Bulletin de la Société Chimique de France* and *Chemische Berichte/Recueil* and *Liebigs Annalen/Recueil* merged with other journals to form the *European Journal of Organic Chemistry* and the *European Journal of Inorganic Chemistry*. One year earlier, in 1997, *Chemische Berichte* and *Liebigs Annalen* were merged with the Dutch journal *Recueil des Travaux Chimiques des Pays-Bas* to form *Chemische Berichte/Recueil* and *Liebigs Annalen/Recueil*. For a personal account of some of these transitions, see the autobiographical essay by Wiley-VCH publishing executive and Ph.D. chemist Eva Wille in the journal *The Chemical Record* (6).

In this essay, we shall review some of the *highlights* of the concerns and trends expressed between 1965 and 1985 dealing with the choice of English as the universal language in chemistry and the French resistance to this trend. We emphasize the word “highlight” as this is neither a comprehensive research study of this communication trend nor of the various national responses to English, today, or German and French in the 19th and early 20th centuries, becoming the international language of chemistry. We also emphasize that we focus on the French response because it has been the most evident and perhaps the most persistent and vocal opposition. We shall also showcase a set of several previously unpublished yet remarkable documents written in 1965 by the then pope of organic chemistry (7), Nobelist Robert Burns Woodward. These documents call for French resistance to this takeover by the English language. Also included is a letter from Woodward to his then-recent postdoctoral student and

future Nobelist French chemist Jean-Marie Lehn. These documents reveal Woodward’s French literary capabilities coupled with his wittiness, subtle sense of humor, and adroit political savvy. We first discuss the context in which these Woodward documents are best viewed.

On English Becoming the Universal Language of Science and the Resistance to this Trend by the French

At the March 1, 1965 meeting of the French *Académie des Sciences* (“Académie” henceforth) in Paris, the following was adopted on the basis of a decision by a *Comité Secret* (i.e., secret committee, that is, one that meets behind closed doors) of the Académie, as reported in the official journal of the Académie (8). (See Figure 1 for the original.)

COMITÉ SECRET.

The following wish, to be addressed to the President of the Republic, concerning the maintaining of the use of the French language in international scientific meetings is adopted unanimously:

L’ACADÉMIE DES SCIENCES,

committed to the active defense of the French language in international scientific events and troubled by pressures in favor of the exclusive use of the English language exerted by certain international organizations of intergovernmental nature, expresses its wish for a firm intervention by the [French] state to assure from now on the respect of the French language in the scientific domain within the framework of meetings sponsored by the above organizations.

The statement by the Académie was also communicated to Georges Pompidou, Prime Minister of France (9).

At the March 29, 1965, meeting of the Académie, the reply (dated March 23, 1965) from Charles de Gaulle, President of the Republic, was placed into the record. (See also Figure 2.) The President’s letter stated (9):

The unanimous wish recently expressed by your society concerning the use of the French language in international meetings has my highest approbation.

COMITÉ SECRET.

Est adopté à l’unanimité pour être adressé à M. le PRÉSIDENT DE LA RÉPUBLIQUE le vœu suivant concernant le maintien de l’usage de la langue française dans les Assemblées scientifiques internationales.

L’ACADÉMIE DES SCIENCES,

— attachée à une défense active de la langue française dans les manifestations scientifiques internationales,

— inquiète des pressions exercées par certains organismes internationaux à caractère intergouvernemental en faveur de la seule langue anglaise,

ÉMET LE VŒU

— d’une intervention ferme de l’État pour que soit désormais assuré, dans le cadre des réunions susévoquées par ces organismes, le respect de la langue française en matière scientifique.

Figure 1. Letter to the President of the French Republic, Charles de Gaulle, on March 1, 1965, from the French Academy of Sciences (8).

It is in fact deplorable that the French language, so remarkably suited by its clarity and precision to the expression of scientific thought, should be too often betrayed by the very people whose responsibility it is to maintain or compel its use.

While assuring that the necessary instructions are renewed and specified by the government, I want to express to you how much I appreciate the confidence that you provide me concerning the engagement of the members of the Academy of Sciences in this essential domain. It is, in fact, of national interest that scientists and technologists draw inspiration for the use of our language from the respect that French science owes itself.

On March 26, 1965, the Prime Minister, Georges Pompidou, also responded to the Académie (10). (See also Figure 2.)

For my part, taking into consideration the reply that will be communicated to you by the President of the Republic, I am ready to support any concrete measures that will be deemed appropriate, according to your suggestions.

2/30/65
Parlez Français,
De Gaulle Demands

CORRESPONDANCE.

En réponse au vœu que lui avait adressé l'Académie, M. le **PRÉSIDENT DE LA RÉPUBLIQUE** par lettre en date du 23 mars 1965, écrit :

MESSIEURS LES SECRÉTAIRES PERPÉTUELS,

Le vœu unanime récemment exprimé par votre Compagnie en ce qui concerne l'usage de la langue française dans les réunions internationales a mon assentiment le plus entier.

Il est, en effet, déplorable que la langue française, si remarquablement adaptée par sa clarté et sa précision à l'expression de la pensée scientifique, soit trop souvent trahie par ceux-là mêmes auxquels il incombe d'en maintenir ou d'en imposer l'usage.

Tout en faisant en sorte que les instructions nécessaires soient renouvelées et précisées par le Gouvernement, je tiens à vous dire combien j'apprécie la certitude que vous voulez bien me donner quant à l'action des membres de l'Académie des Sciences dans ce domaine essentiel. Il est, en effet, d'intérêt national que savants et techniciens s'inspirent dans l'emploi de notre langue du respect que la science française se doit à elle-même.

Veuillez agréer, Messieurs les Secrétaires perpétuels, les assurances de ma haute considération.

Par lettre en date du 26 mars, M. **GEORGES POMPIDOU, PREMIER MINISTRE**, à qui le vœu avait été communiqué, écrit notamment :

« Je suis prêt, pour ma part, compte tenu de la réponse qui vous sera faite par Monsieur le Président de la République, à appuyer telle ou telle mesure concrète qui pourra paraître opportune, en fonction de vos suggestions. »

Figure 2. Responses by Charles de Gaulle (9), President of the French Republic, and Georges Pompidou (10), Prime Minister, to the request of the Académie (8) reproduced in Figure 1.

tasks of the Commission (13):

DECREES, ORDERS, CIRCULARS

PRIME MINISTER

Decree no. 66-203, March 31, 1966, implementing the creation of a High Commission for the defense and expansion of the French language.

The President of the Republic

3/30/65
French Told
To Keep Saying
It in French

These events were reported in a number of newspapers in the United States (11) and in France (12) and carried by the Associated Press (AP). (See, for example, Figure 3.)

Likely as a result of the above initiative by the Académie and its highly positive reception by the President of the Republic and the Prime Minister, on March 31, 1966, the President decreed the creation of a High Commission for the Defense and Expansion of the French Language. (See Figure 4 for an excerpt of that decree.) The decree begins as follows, citing the

Figure 3. Headlines of two newspaper articles (New York Times and Associated Press from an unknown newspaper) reporting the letter by President Charles de Gaulle to the Académie (Figure 2). De Gaulle was responding to the Académie's request (Figure 1) for the French government's intercession regarding the maintenance of French as a language in scientific communications. These two newspaper clippings were sent by R. B. Woodward to Jean-Marie Lehn on April 21, 1965; see the text and Figure 9 for more details. The date, March 30, 1965, is handwritten on the top right edge of each clipping, likely by Dolores Dyer, Woodward's assistant. A copy of the newspaper clippings provided courtesy of Lehn.

Acting on the report of the Prime Minister,
The council of ministers having been heard,
Decreets:

Article 1.—A high commission for the defense and expansion of the French language is created under the Prime Minister's authority.

The high commission is charged with the following tasks:

To study the appropriate measures for assuring the defense and expansion of the French language;

To establish the necessary connections with the competent private organizations, specifically in matters of cultural and technological cooperation;

To prompt or encourage all initiatives relevant to the defense and expansion of the French language ...

DÉCRETS, ARRÊTÉS ET CIRCULAIRES

PREMIER MINISTRE

Décret n° 66-203 du 31 mars 1966 portant création d'un haut comité pour la défense et l'expansion de la langue française.

Le Président de la République,
Sur le rapport du Premier ministre,
Le conseil des ministres entendu,

Décète :

Art. 1^{er}. — Il est créé auprès du Premier ministre un haut comité pour la défense et l'expansion de la langue française.

Le haut comité a pour mission :

D'étudier les mesures propres à assurer la défense et l'expansion de la langue française ;

D'établir les liaisons nécessaires avec les organismes privés compétents, notamment en matière de coopération culturelle et technique ;

De susciter ou d'encourager toutes initiatives se rapportant à la défense et à l'expansion de la langue française.

Figure 4. An excerpt of the first few lines of the decree of March 31, 1966, by President Charles de Gaulle (13).

As summarized by the notable French organic chemist, essayist, and historian of chemistry Pierre Laszlo (14),

General de Gaulle returned to power in 1958. Almost immediately, he realized the key importance of science and technology to France. The allocation of vastly increased funding, even more important the quality of the administrative bodies overseeing the French scientists and engineers, created a leap forward. This Gaullist policy of banking on science and technology connected with Les Trente Glorieuses: these 30 glorious years (1950-1980, roughly speaking) saw France participate in the general economic expansion and even take the lead in a few sectors.

The Gaullist activist effort translated itself into a cornucopia of breakthroughs: France became a nuclear

power, its aerospace industry became competitive worldwide, the country infrastructure (freeways and railroads, telecommunications) was renovated, and scientists won Nobel prizes and Fields medals.

In addition, De Gaulle, with his lifelong will of independence from the Anglo-Saxons, wanted French scientists not to bow to the growing hegemony of the English language. He vowed, as he did in other areas, that French science would henceforth appear to the world in French. This became official policy. If a French scientist got funding to attend a conference abroad, the paper would by fiat be delivered in French.

In 1975, Philippe Meyer discussed in a rather thoughtful and emotionally open and honest fashion "A Problem for the Non-Anglo-Saxon Scientific Community," that problem being "The English Language". He asked, what should the French government's position be regarding the use of English in teaching science in France? And how should French scientists communicate with their non-French peers within the broad international scientific community? Meyer wrote (15),

I am thus about to express my deep regrets and to discuss the vast problem raised by the feeling that I speak a dying language ...

Most of the best French contributions in science and medicine are [now] published in English ... all French research of quality is presented in English in international scientific meetings ... French scientists and doctors are informed of the important advances in their fields by books and reviews published in English.

Meyer pondered whether the solution was "in rendering the French scientific community completely bilingual" (15)?

In 1976, Eugene Garfield, the American information scientist, linguist, and founder of the Institute for Scientific Information and innovator of such publications as *Current Contents* and the *Science Citation Index*, published a then-highly controversial article entitled "La science française est-elle trop provinciale?" ("Is French science too provincial?") in *La Recherche*. Using bibliometrics and scientometrics, Garfield examined the role of French in science and the tendency of eminent French scientists to publish in English. Garfield concluded that English was becoming the *de facto* language of science. Some of Garfield's conclusions are (16):

By publishing the results of their research exclusively in the French language, French researchers prevent their findings from being casually read by the rest of the world's scientific community.

...

The data also indicate that the French themselves are the greatest citers of the French.

...

A careful examination of the citation data for many highly ranked French scientists has clearly shown that these scientists all share one characteristic: each publishes in English or in international journals outside of France.

The nature of Garfield's statistics notwithstanding, his article in *La Recherche* produced some strong counterarguments (17), especially from French scientists (18). There is much evidence that these issues flowed from the highest levels of government and the most sophisticated intellectual circles in France right into the laboratories of practicing chemists. Pierre Laszlo recollects two incidents relevant to our discussion, first, an interaction within a French Department of Chemistry (14).

I was Paul Schleyer's first post-doc at Princeton, during the 1962-63 academic year. I then returned home, to France. Guy Ourisson was professor of organic chemistry in Strasbourg. During the winter of 1963-64, he invited me to his Institute, to present a seminar on the topic "Should One Publish in English?" ("Doit-on publier en anglais?") After my year in Princeton, I felt strongly that French chemists ought to do so, if they wanted their work to be known.

It was an evening seminar. It was lively, just this side of hectic. The only reason I emerged unmolested from the uproar I had set up was my obvious sincerity.

The interesting question is: why did Ourisson have me do this? Despite the many intervening years—in the meanwhile, Ourisson became a personal friend of mine—the answer remains ambiguous. He was fluent in English, he had learned the language from his first wife who was British. Hence, publishing in English was no problem to him. At the same time, he was a cultured Frenchman, a member of the elite, who strongly believed in the importance of the French language and of Frenchmen showing the flag effectively. Moreover, Ourisson was a political animal: getting me to give this seminar allowed him to test the waters, with little risk that he would get splashed.

The second incident related by Laszlo involves a lecture he gave outside France:

In August 1965, I travelled to Copenhagen, with a grant by the French Foreign Ministry, to attend the IUPAC VIIIth European Congress on Molecular Spectroscopy. My paper dealt with some NMR applications to organic chemistry.

Forty to fifty people made the audience. Most were native English speakers. As I started giving my paper in the language of Molière, they looked bedazzled. Their eyes quickly glazed. This came as no surprise to me, I knew this would happen but I had my plan. After the introductory paragraph, in the midst of a sentence I switched to English. Alertness immediately returned to the room.

After my talk was over and well received, a few English and American colleagues came to ask why I had sprung such a surprise on them. I told them of the official policy, I had been compelled to toe the party line, so to say. They were greatly appreciative that I had paid to it lip service only.

Even those among us who are non-French, or even non-French speaking, or even non-French reading, can empathize with the conflicting positions and feelings within the French scientific community. Fortunately, now nearly 50 years later, there is no sign that French (or German or Italian or any of the other national languages) is a dying language, even as English has become the universal scientific language.

Tetrahedron, Tetrahedron Letters, R. B. Woodward, and the Internationalism of Chemistry

In the second half of the 20th century, several language-in-science phenomena were happening simultaneously around the world. First, as described in the previous section, many in France were concerned about the decreasing use of French in scientific venues, not just in journals but at scientific meetings. Newspaper reports of these matters such as those shown in Figure 3 added general popular interest and perhaps political pressure to the already building discussions among scientists and various governmental agencies. Second, the push for the internationalism of chemistry was well in hand (19). In the mid-1950s, Sir Robert Robinson—who had just retired as Waynflete Professor at Oxford but continued to be a significant presence within the chemical community for 20 more years—used his considerable influence to found in 1957 the first international journal in chemistry, *Tetrahedron* (20), as well as the second international journal in chemistry, *Tetrahedron Letters*, shortly thereafter in 1959. Lastly, *Tetrahedron* and *Tetrahedron Letters* were published by a commercial publisher, not by a chemical society. These two journals were very early titles of Ian Robert Maxwell's Pergamon Press. Figure 5 shows Robinson proudly handing Maxwell the first issue of *Tetrahedron*.



Figure 5. Sir Robert Robinson (left) proudly celebrating the publication of the first issue of *Tetrahedron* with its publisher, Robert Maxwell, 1957. Photograph courtesy Royal Society (London).

Robinson served also as one of the two Co-Chairs of the Honorary Editorial Board for both *Tetrahedron* and *Tetrahedron Letters*. Woodward was chosen and agreed to serve as Co-Chairman of the Honorary Editorial Advisory Board for both *Tetrahedron* and *Tetrahedron Letters* from their inception. That Robinson endorsed if not actually selected Woodward to be Co-Chairman of the Honorary Editorial Advisory Board of *Tetrahedron* and *Tetrahedron Letters* demonstrates a remarkable U-turn in the relationship between these two giants of chemistry. Their rivalry in a number of areas—the structure of penicillin (21), the structure of strychnine (22), and the synthesis of steroids (23)—is well documented. Indeed, the picture of the two of them together in the early 1950s (Figure 6) illustrates a frosty relationship better than words can describe. That only a few years after this picture was taken, they would work closely together on a project near and dear to the heart of Robinson, the formation of an international journal of organic chemistry—in spite of reservations by Woodward (see below)—speaks to the power of Robinson's goal of collegiality and to the power of a good idea over his own individual pride (24). More details of the founding of *Tetrahedron* and *Tetrahedron Letters* will be reported by one of us (JIS) separately.

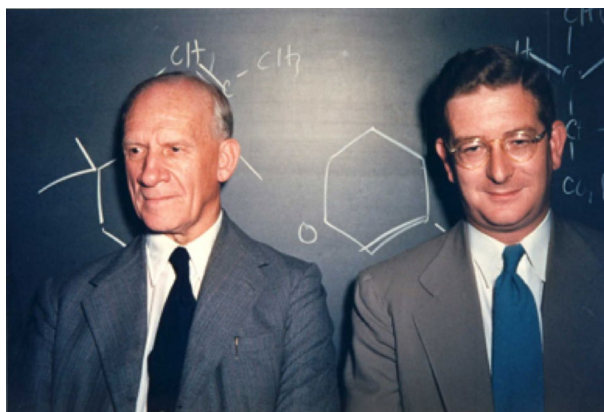


Figure 6. Sir Robert Robinson and R. B. Woodward, 1951. This photograph was taken before the two great men overcame their competitive issues and became friends. Clearly, they are not particularly comfortable standing next to each other. The structures on the blackboard were written by Robinson. Photograph courtesy J. D. Roberts.

Several factors made *Tetrahedron* and *Tetrahedron Letters* notable for their time, but rather prosaic today (25). The overriding goal of *Tetrahedron* and *Tetrahedron Letters* was to form a successful international journal. This goal of inclusivity was stated clearly on the front cover of these journals (Figure 7), in their mastheads (Figure 8), and in Robinson's essay in the first issue of *Tetrahedron* (20). These two journals immediately boasted an international team of editors and a very large international assembly of members of their advisory boards, from "Europe ... American Continents ... Far East," quite unique within the scientific milieu for the 1950s (26). *Tetrahedron* and *Tetrahedron Letters* accepted manuscripts for publication in the then-most-prominent science languages, English, German and French, though not in Russian. (See the Notes for Contributors from the first issue of *Tetrahedron* (27), Figure 8.) Indeed, articles from "the U.S.S.R. and Eastern Europe" were to be submitted to Professor A. N. Nesmeyanov in Moscow but with unspecified language.

Articles appeared in English, German and French in *Tetrahedron* for many years. In some early issues of *Tetrahedron*, abstracts for some articles published in either German or French appeared in that language as well as in English. Articles in English had only abstracts in English. In the first years of publication of *Tetrahedron Letters*, abstracts for articles that had appeared in *Tetrahedron* were published, and as in *Tetrahedron*, abstracts in either German or French appeared also in English but not the converse. In fact, it was only 50 years later in 2007 that the "Guide for Authors" in *Tetrahedron* specified that "Manuscripts must be written in English

TETRAHEDRON

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Figure 7. Front cover of the first issue of *Tetrahedron*, January 1957. Note the international representation of Honorary Regional Editors and Honorary Editorial Advisory Board members, a remarkable organizational scheme for a journal in the 1950s. Sir Robert Robinson and R. B. Woodward served as Co-Chairman of the Honorary Editorial Advisory Board while the journal itself was founded by Robinson.

...” (28). In 2006, the “Instructions to Contributors” said, “The language of submission is English, but articles in French or German will be considered” (29).

Letters within the Robert Burns Woodward collection at the Harvard Archives provide clear evidence that Woodward took seriously his role as Co-Chairman of *Tetrahedron* and *Tetrahedron Letters* until his death in 1979. Woodward was quite involved in the setting of policy and developing and maintaining the goal of very high scientific standards for the papers published therein (30). Three themes recur over and over again in documents found within the Woodward collection: the international nature of *Tetrahedron* and *Tetrahedron Letters*, a commitment for exceptional quality of submissions and publications, and rapidity of publication.

Additional evidence for Woodward’s commitment to the globalization of chemistry comes from an obituary

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Original contributions submitted for publication should be sent to one of the following editors, as appropriate:

Professor H. Stephen, the Executive Editor, c/o Pergamon Press Ltd., 4 & 5 Fitzroy Square, London W.1.

Professor A. N. Nesmeyanov (for the U.S.S.R. and Eastern Europe), Akademiya Nauk SSSR, Bolshaya Kaluzhskaya 14, Moscow, U.S.S.R.
Professor R. H. Martin (contributions in the French language), Laboratoires de Chimie Organique, Université Libre de Bruxelles, 50 Ave. F. D. Roosevelt, Brussels, Belgium.

Professor Dr. F. Weygand (contributions in the German language), Technische Universität, Berlin-Charlottenburg 2, Germany.

Figure 8. Excerpt from the “Notes for Contributors,” the instructions to authors, published in the inside back cover of the first issue of *Tetrahedron* (27). That contributions in English, French and German were acceptable is clear from these instructions. A more concise but similar set of instructions appeared in the first issue of *Tetrahedron Letters* but was silent on the matter of language.

of Woodward written in 1981 by Derek Barton and Harry Wasserman (31). This obituary served as front matter for a special memorial issue of *Tetrahedron* honoring Woodward. After Robinson’s death in 1975, Barton joined Woodward as Co-Chairman of the editorial board of *Tetrahedron* and *Tetrahedron Letters*. Upon Barton’s passing in 1997, Wasserman succeeded him as Chair of the Board of Editors of these journals. Wasserman was also one of Woodward’s first Ph.D. students, starting with him in the early 1940s and maintaining a close friendship for 40 years. Thus, when Barton and Wasserman jointly wrote the following commentary about Woodward’s commitment to internationalism in chemistry, they based their conclusions on knowing him quite well (31):

His concern for these journals, particularly for their international influence, was of immense importance in establishing them as major publications in the world of organic chemistry.

By the early 1960s, Woodward had become a chemist of international fame and influence. Of course, his permanent academic position was at Harvard. In addition, he travelled to and lectured in Europe frequently, often visiting the United Kingdom (where his close friends included Barton and Alexander Todd) and Switzerland (where his close friends included Duilio Arigoni, Albert Eschenmoser, and Vladimir Prelog in Zürich). The Woodward Research Institute in Basel, Switzerland, was up and running in 1962 (32).

By 1965, Woodward also had a number of European postdoctoral fellows including the Frenchman Jean-Marie Lehn. Woodward had also published a number of papers with Barton, Prelog, Arigoni, Oskar Jeger, Hans Herloff Inhoffen, and other European scientists, the vast majority of which were written in the German language. Indeed, from 1934 to 1962, Woodward had 117 publications, 13 of which were written in the German language. Woodward well recognized and understood the tensions—the values and the shortcomings—regarding dissemination of his science in languages other than English. Thus, beyond knowing of the concern within both the scientific community and in non-English-speaking countries to preserve the use of their own national languages, Woodward himself had his own professional “investments” to protect as well. For example, in his March 5, 1956, letter to Robinson, Woodward wrote (33)

The proposal to publish an international journal for organic chemistry is an intriguing one. My initial reactions are these ... Could the leading chemists in the various countries be induced to place their best material in the new journal? I am not sure, for example, that I could easily be induced to do so ...

In fact, in 1958 Woodward published his total synthesis of reserpine (34) in *Tetrahedron* and in 1963 he published the full account of his total synthesis of strychnine (35) in that journal (among seven other publications in *Tetrahedron* and four in *Tetrahedron Letters*).

“Woodward’s La Marseillaise”

In April 1965, surely encouraged by the involvement of President

Charles de Gaulle in the matter of scientific communications, Woodward exercised his brilliance, prankishness, and mischievousness and provided us with an insight into these dimensions of his personality. On April 21, 1965, Woodward wrote about the French-English language controversy to Jean-Marie Lehn (Figure 9). Lehn had just recently returned to France after a postdoctoral term with Woodward and had taken up a position at the Université de Strasbourg where he remains today.

In addition to this witty and humorous letter, Woodward enclosed two newspaper clippings (Figure 3) and a one-page witticism which is reproduced in column 3 of Table 3 and which we refer to herein as “Woodward’s La Marseillaise.”

The newspaper clippings establish Woodward’s awareness of the French-English language controversy.

Table 3 contains the first verse and the refrain of the

French national anthem La Marseillaise, “Woodward’s La Marseillaise,” and their translations into English. Woodward’s lyrics were perhaps a light-hearted repartee, surely a play on words, on the French-English controversy using the first verse (from a total of seven verses) and the refrain of La Marseillaise. For the convenience of even those fluent in French, Table 3 presents a line-by-line comparison of La Marseillaise and “Woodward’s La Marseillaise” along with the English translations of both. Our analysis of Woodward’s key substitutions is found in Table 4. Woodward’s cleverness is seen by his substitution of one word for another. Woodward transformed La Marseillaise’s calling for resistance to foreign invasion to a call for resistance to the invasion of scientific communication in French by the English language.

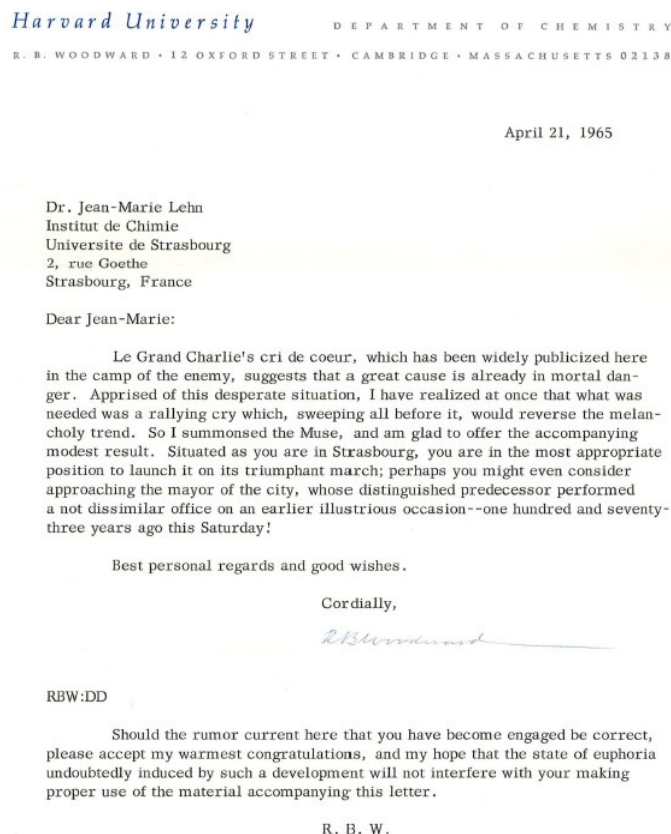


Figure 9. R. B. Woodward’s cover letter to Jean-Marie Lehn (36). Included with this letter were two newspaper clippings (Figure 3) and “Woodward’s La Marseillaise” (column 3 of Table 3). The typographical error of “summonsed” instead of “summoned” is extraordinarily rare if not unique in Woodward’s correspondence. Letter courtesy of Lehn.

Table 3. The third column is from Woodward (36, 37). The fourth column is our translation of “Woodward’s La Marseillaise.” The English translation of Woodward’s “La Marseillaise” and of La Marseillaise is by one of the authors (JG). For a line-by-line analysis of the changes made by Woodward, see Table 4.

English translation of La Marseillaise	La Marseillaise	“Woodward’s La Marseillaise” (36, 37)	“Woodward’s La Marseillaise” in English
Let’s go, children of the fatherland, The day of glory has arrived! Against us is tyranny, The bloody banner is raised, The bloody banner is raised! Do you hear in the countryside The roar of these ferocious soldiers? They come right into your arms To kill your sons, your women!	1 Allons enfants de la Patrie, 2 Le jour de gloire est arrivé ! 3 Contre nous de la tyrannie, 4 L’étendard sanglant est levé, 5 L’étendard sanglant est levé ! 6 Entendez-vous dans les campagnes 7 Mugir ces féroces soldats ? 8 Ils viennent jusque dans vos bras 9 Égorger vos fils, vos compagnes !	Parlons enfants de la Patrie, Le jour de gloire est arrivé! Contre nous de la taironnie, L’étendard anglais est levé, L’étendard anglais est levé! Entendez-vous dans cette campagne Mugir ces féroces savants? Ils viennent jusque dans nos bancs* Débaucher nos fils, nos compagnes!	Let’s speak, children of the fatherland, The day of glory has arrived! Against us is not speaking The English banner is raised, The English banner is raised! Do you hear in this campaign The roar of these ferocious savants? They come right to our classrooms To corrupt our sons, our women!
To arms, citizens, Form your battalions, Let’s march, let’s march! So that an impure blood Will water our fields!	10 Aux armes, citoyens, 11 Formez vos bataillons, 12 Marchons, marchons ! 13 Qu’un sang impur 14 Abreuve nos sillons !	Aux armes, citoyens, Formez vos bataillons, Parlons, parlons! Qu’une langue impure N’abreuve nos salons!	To arms, citizens, Form your battalions, Let’s speak, let’s speak! So that an impure language Will not flood our salons!

*As can be seen in the typewritten text in Figure 10, Woodward did not change the word “bras”, i.e., arms (limbs), in his first attempt at revising La Marseillaise. However, in the version shown in Figure 11 he replaced “bras” with “dents” (i.e., teeth). This appears to refer to the mouth, i.e., the organ of language, the implication being that the “enemy corrupts the language of our sons, our people”. In a continuing evolution of “Woodward’s La Marseillaise,” in the text of the 3rd page found in the Harvard Archives (reproduced in column 3 above), the original “bras” (column 2) is changed to “bancs” (column 3), i.e., benches (which we render in context as laboratory benches or classrooms, see column 1 and entry line 8 in Table 4). Moreover, “bancs” is retained in the version Woodward sent to Jean-Marie Lehn, which is thus identical to the version shown in column 3 of this table.

Table 4. Listing and analysis of Woodward's revisions to the first verse and the refrain of *La Marseillaise*^a.

Line	La Marseillaise → "Woodward's La Marseillaise"	Analysis of Woodward's Revisions
1	allons (let's go) → parlons (let's speak)	Pseudo-homophones, ^b two syllables
3	tyrannie (tyranny) → taironnie (not speaking) Heterographs ^b , three syllables. There is no such word as "taironnie" in French; Woodward created this word by converting "tyrannie" to "taironnie," a word very similar in appearance and sound. "Taire" is a verb in French that means "to say nothing (about something);" in its reflexive form ("se taire"), it means "to be silent, to hold one's tongue," i.e., not to speak. Thus, "taironnie" fits in form and meaning "Woodward's La Marseillaise" and expresses the French-vs.-English language debate in communicating science.	
4 & 5	sanglant (bloody) → anglais (English) Same number of syllables and some close similarity in sounds, i.e., the syllables, "sang" and "ang".	
6	dans les campagnes (in the countryside) → dans cette campagne (in this campaign) The former refers to a battle with weapons, the latter to a conversation—it could be a debate—with words, in science.	
7	soldats (soldiers) → savants (savants, scholarly persons)	Similar letters, same number of syllables.
8	jusque dans vos bras (right into your arms) → jusque dans nos bancs (right to our classrooms) Note the two changes within this one phrase: "arms" is changed to "benches," or, by implication, "laboratory benches" or "classrooms," and "your" is changed to "our." "Classrooms" refers to the location where either French or English would be used in teaching or lecturing.	
9	Égorger (literally, to cut the throat; figuratively, to kill) → débaucher (literally, to entice, to lead astray; figuratively, to corrupt) Woodward expresses the intent of the "enemy of the French language" to corrupt the language of "our young, our country." Égorger and débaucher have the same number of syllables and are pronounced sufficiently similarly so that the new version retains the overall flavor of the original.	
9	vos → nos "Vos" and "nos" are very similar in pronunciation. Woodward is now speaking of "our" sons and women, presumably students at all educational levels.	
12	Marchons, marchons (let's march, let's march) → Parlons, parlons (let's speak, let's speak) Similar sounds, poetic license	
13-14	Qu'un sang impur Abreuve nos sillons (so that an impure blood will water our fields) → Qu'une langue impure N'abreuve nos salons (so that an impure language will not flood our salons) "Sillons" and "salons" are very similar in pronunciation. The latter is a substitution that is particularly noteworthy, as its several meanings all fit Woodward's lark. "Salon" can mean "a sitting room, drawing room," and, by extension, "a meeting place for fine conversation," as well as a lounge where alcoholic refreshments may be served. To "not flood our salons" in Woodward's text seems to refer to watering-down or reducing the effectiveness of a discussion, and, more specifically in the present context, to "drowning out our French language." The phrase could however also refer to diluting the percentage of alcohol in a drink. Woodward's text fits the overall context of his addressing the French/English language debate; moreover, the interpretations also relate well to Woodward's personality, as he was a keen participant in the art of debate and he was certainly known to enjoy alcoholic beverages.	

^a The analysis provided in this table is for the "definitive" version of "Woodward's La Marseillaise," i.e., that appearing in column 3 of Table 3 (36, 37).

^b Homophones are words that are pronounced the same but differ in meaning and may differ in spelling. Heterographs are two words with different meanings and different spellings but with the same pronunciations. Actually, these are loose heterographs, as they have either the same or almost the same pronunciation.

^c The appearance of "bancs" and its predecessors in the earlier versions of "Woodward's La Marseillaise" is discussed in Table 3 and in the captions to Figure 10 and Figure 11.

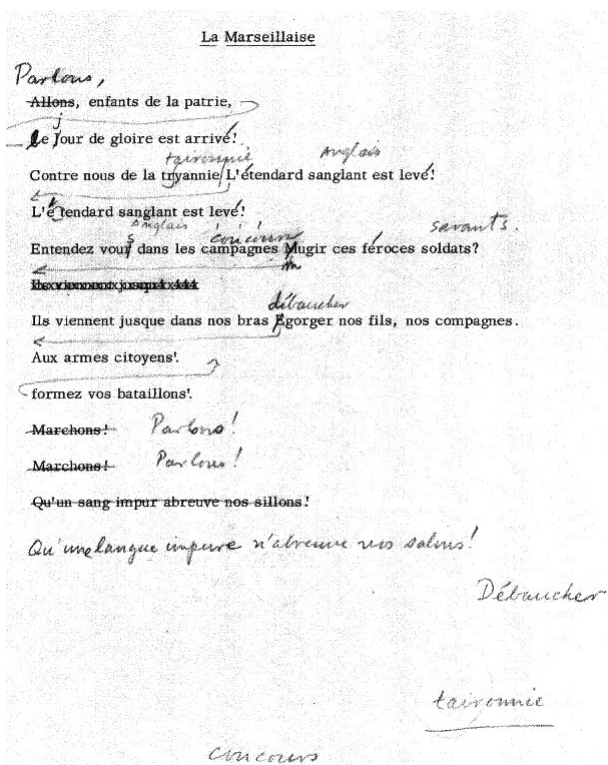


Figure 10. The first verse and refrain of “Woodward’s La Marseillaise,” a page from the Woodward Archives at Harvard University (37). Woodward apparently had “Woodward’s La Marseillaise” typed by his administrative assistant, Dolores Dyer, as the typeset (font) matches Woodward’s letters and manuscripts of the 1960s. The handwriting is Woodward’s. Woodward wrote “concoures” as a potential replacement for “campagnes.” “Concoures” in French has several meanings, but it appears that Woodward proposed it in the sense of “concourse,” “gathering of people” (i.e., scientific conferences where the “roar” of English was heard). In fact, he chose not to use it in his definitive version (column 3 in Table 3). Note also that at the bottom of his “corrections” Woodward wrote “Débaucher,” “concoures,” and “taironnie.” These may have been notes of his during the construction of this first draft. Also, in the typewritten “original” of La Marseillaise in the figure, “nos” (i.e., our) in “nos bras, nos fils, nos compagnes” incorrectly appears rather than “vos [your] bras, vos fils, vos compagnes.” The correct words are used in Table 3, column 2. See also Figure 11 and Table 4 for discussions of the changes introduced by Woodward.

La Marseillaise was written by Claude Joseph Rouget de Lisle in Strasbourg in 1792 at the request of the mayor of Strasbourg for the Army of the Rhine following France’s declaration of war on Austria. La Marseillaise was a patriotic song of the French Revolution, a chant of the revolutionary war calling for mobilization and resistance to foreign invasion and tyranny. La Marseillaise was first adopted as France’s national anthem on

July 14th, 1795. In 1830, Berlioz arranged it for orchestra and chorus.

It is these events, especially the fact that La Marseillaise was written at the request of the mayor of Strasbourg, to which Woodward refers in his letter to Lehn (Figure 9) (36),

Le Grand Charlie’s cri de coeur ... Situated as you are in Strasbourg, you are in the most appropriate position to launch it [a “cri de coeur,” a cry from the heart, a rallying cry, to retain the use of French in chemical communications] on its triumphant march; perhaps you might even consider approaching the mayor of the city ...”

Within the Woodward collection of documents held in the Harvard Archives resides a set of three pages which speak to the origin of “Woodward’s La Marseillaise.” Figure 10 and Figure 11 show two of these three pages; the third page of this set is reproduced in column 3 of Table 3 (37).

There are several slight changes throughout the several Woodward drafts. We comment upon these briefly, primarily to be complete and also for the benefit scholars of Woodward (32, 38) or La Marseillaise. The trend in these drafts provides insight into Woodward’s

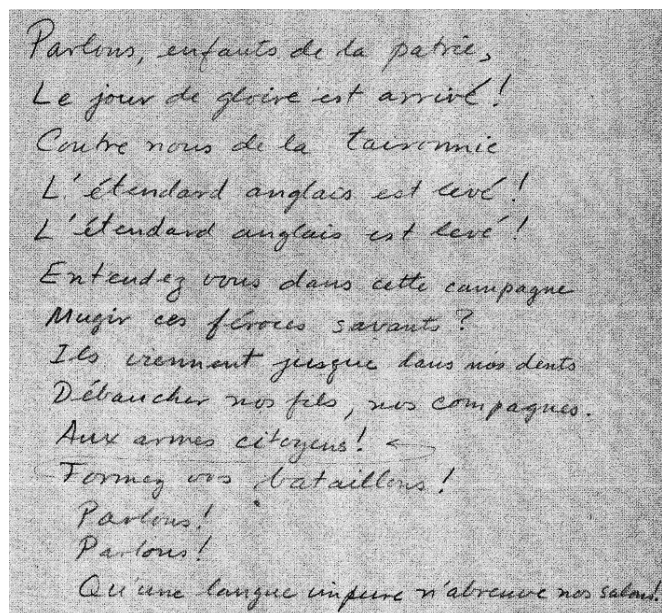


Figure 11. Woodward’s handwritten draft of “Woodward’s La Marseillaise” (37). Note that “concoures,” proposed in the version shown in Figure 10, is not used in this draft. Also noteworthy is the appearance in this draft of “dents” (i.e., teeth) in “jusque dans nos dents,” i.e., “right to our teeth.” In what appears to be the “definitive” version (column 3, Table 3), however, “dents” is replaced by “bancs” (i.e., benches; see the explanation in the caption of Table 3).

development of his play on *La Marseillaise*. The handwritten portion of Figure 10 shows what appears to be Woodward's initial trial at creating a linguistic twist of the original text. A very slightly different version appears in Figure 11, and column 3 of Table 3 contains a version yet slightly different from that. The various changes Woodward introduced are discussed in Table 4 and in the captions to Table 3 and Figure 10-11.

Woodward's letter to Lehn (Figure 9) displays Woodward's superb and subtle sense of humor, and also shows more evidence of his high-level knowledge of French. For example, Woodward used the very French expression "cri de cœur" (a cry from the heart). He also showed a detailed knowledge of the history of *La Marseillaise* (before the days of easy searching for historical details via Wikipedia!), referring to the mayor of Strasbourg in 1792, Frédéric de Dietrich, and referencing the 173rd anniversary of the writing of the lyrics the Saturday following the day Woodward's letter was written.

We speculate that four factors led Woodward to have fun with Jean-Marie Lehn and *La Marseillaise*. Indeed, his very choice of the French national anthem is an indication of the versatility of this man of letters and the proclivity of his subtlety. These factors are: (i) Woodward had a serious commitment to science as an international adventure. (ii) He was aware of the stirring controversies dealing with the movement to make English the universal language of chemistry. (iii) He had a keen sense of humor, loved intricate puzzles, had a vivid imagination, and enjoyed playfulness among his colleagues. (iv) He loved languages and, as we see herein, had an intimate knowledge of French.

The photograph of Woodward in Figure 12 illustrates several of these factors: Woodward and his visitor were playing some game or puzzle with matchsticks; and an issue of *Angewandte Chemie* is on Woodward's desk. That particular issue is not *Angewandte Chemie International Edition in English* but rather the German-language edition of that journal. In fact, the first issue of *Angewandte Chemie International Edition in English* was published in January 1962 and continues to be published, entirely in English, but its title has, for many years, been shortened to *Angewandte Chemie International Edition*.



Figure 12. R. B. Woodward and Paul Buchschacher, playing with what appear to be matchsticks in Woodward's Harvard office, June 21, 1960. Buchschacher received his doctorate working with Oskar Jeger before a postdoctoral experience with Woodward during the late stages of the chlorophyll synthesis. Woodward's tie is green rather than his typical blue. Likely this photograph was taken the day that the synthesis of chlorophyll was formally proclaimed (*The JACS communication* (39) was submitted on June 29, 1960.), thereby the celebratory color of Woodward's tie. Photograph from the Walter Lwowski Collection at New Mexico State University, courtesy William Maio.

It is worthy to note that *Angewandte Chemie* continues today to be published in its original German-only language edition, simultaneously with its English-language edition. That in 1962, the publisher of *Angewandte Chemie* decided to publish a second edition in English while the publisher of *Tetrahedron* (1957) and *Tetrahedron Letters* (in 1959) decided to publish multi-lingual journals are early steps in the trend toward globalization of communication within the chemical community. In a 2011 editorial celebrating the 50th anniversary of the publication of the English edition of *Angewandte Chemie*, the long-term Editor-in-Chief of this journal Peter Göllitz wrote (40)

A half-century ago, only a handful of contributions in *Angewandte Chemie* came from authors outside of German-speaking countries, and it was certainly a courageous step for the Editor-in-Chief at the time, Wilhelm Foerst, and his successor Helmut Grunewald, to start an English edition ... It hasn't been passed down whether they had the undivided support of the Editorial Board, which in 1961 was made up of Richard Kuhn, Otto Bayer, Wilhelm Klemm, Klaus Schäfer, and Karl Winnacker. But today's readers and authors, and of course also the editors, the publisher, and the GDCh [Gesellschaft Deutscher Chemiker], are most grateful to these pioneers for an internationalization of the chemical sciences.

Returning to Woodward and *La Marseillaise*, the eminent chemist and close friend of Woodward's, Duilio Arigoni wrote that, reading a draft of this manuscript (41)

reminded me that in September 1970, Bob and I (with my wife Carla) were participating in a meeting at St. Gervais organized by some French colleagues. On the occasion of a dinner party, Bob and I were challenged to address the audience in a duet. The choice of *La Marseillaise* was immediately obvious to the two of us, and the result has been immortalized visually (if not vocally) in several photographs. [See Figure 13.] The top of the party, however, was reached at midnight, when Bob defied Carla to take a midnight swim with him in the hotel pool. Carla, with her poker face, accepted right away, and I leave the hilarious consequences to your imagination.



Figure 13. Duilio Arigoni (left) and Woodward, singing *La Marseillaise* as a spontaneous duet as after-dinner entertainment, responding to a “challeng[e] to address the audience in a duet.” The lady in the background is Irène Felkin, wife of Hugh Felkin. St. Gervais, France, September 1970. Photograph courtesy Duilio Arigoni.

Woodward's modification of *La Marseillaise* relies on the use of homophones and heterographs to produce altered text that retains the original sound and flavor but introduces meaningful new wording that is (falsely) related to the original. (For definitions of these terms, see footnote b in Table 4.) Such imaginative use of language is reminiscent of *homophonic translation*, which is another type of clever linguistic manipulation. In homophonic translation, text in one language is “translated” into another in such a manner that the translation, when read in the new language, reproduces (with a touch of foreign accent) the sounds of the text in the original language. Most such “translations” are, in fact, not translations and are nonsensical in the new language. An ingenious example of such homophonic translations is *Mots d'Heures: Gousses, Rames: The d'Antin Manuscript* (Mother

Goose's Rhymes), English-to-French “translations” of English-language nursery rhymes, published in 1967 by Luis d'Antin van Rooten (42).

Woodward's Election as a Foreign Associate of the Académie des Sciences of the Institut de France

In early May 1978, Woodward received a handwritten letter from the eminent organic chemist Maurice-Marie Janot, then in the 74th and last year of his life. Janot wrote in French (43)

An hour ago you were elected foreign associate of the Académie des Sciences (founded December 22, 1666) of the Institut de France, that is to say, the highest distinction our country can bestow on a foreign scientist. By virtue of a proposal by Henri Normant, Marc Julia, Alain Horeau, and myself, you have just been elected with a so-called ‘Maréchal,’ that is, by unanimity. I congratulate you and am very happy for this result.

Woodward's response, dated June 2, 1978, to Janot, appears in Figure 14. In Woodward's elegant use of language—in English—he expresses his delight and joyfulness and even his inability to “find the words to express adequately my pleasure, and my appreciation”. He further comments on his “admiration for the great traditions of French science”. Lastly, and most relevant to the topic of this paper, Woodward says (44)

Forgive me that my capacity in your exquisite language does not extend to the expression of emotions as strong as those engendered by your news.

Woodward loved languages and, as we see in the examples above, he had an intimate knowledge of French. However, according to Elkan Blout, Woodward's close friend, eminent scientist, member of the U.S. National Academy of Sciences, recipient of the U.S. National Medal of Science, and biographer (See Ref. 38 (Blout).), Woodward apparently “was unwilling to speak [French] because he felt he was not perfect in [its] use” (45).

Woodward's policy not to speak French may well have implied to others—incorrectly, as it turns out—that he had little ability with that language. His statement to Janot to that effect was an understatement.

Marc Julia's congratulatory note said, in part, “We realize that it is only one line in the long list of honours that have been conferred upon you” (46). Woodward responded (47)

You are far too modest on behalf of France in your surmise that for me this distinction might count as only one of many honours. Very much to the contrary! My respect and admiration for the great traditions of French science is unalloyed, and that being the case, I can only regard this election as a most especial and singular honour, which will forever have a special place in the warmest recesses of my heart.

These communications further demonstrate Woodward's high regard for the French language and French science as well as his reluctance to use the French language—in these instances, in writing, where he could have expended various resources to assure himself of perfection.

Communications in the Chemical Community 1975-1985. The French Concerns

On September 22, 1981, Mr. Jean-Pierre Chevènement, French Minister for Research and Technology, emphasized the importance of the use of the French language. He suggested that (48)

- researchers use French in meetings in France or in the French-speaking countries
- they publish their work in French or at least in bilingual form
- conferences be provided equipment for simultaneous translation.

Shortly thereafter, on November 2nd, 1981, at a colloquium on “The Future of the French Language” in Montreal, Canada, Chevènement discussed several aspects of this issue, including (49)

- the danger of disappearance of French from the language of science;
- the responsibilities of scientists; and
- the need for energetic policies to promote French as a language of science.

Chevènement also addressed more specifically some of the desirable measures in this domain, e.g.:

- improvement of the quality and distribution of French-language scientific journals;
- advancement and evaluation of researchers as a function of the imperative of the promotion of the French language;
- efforts to promote translation; and
- creation of a veritable francophone domain for science and technology.

In November 1982, the Académie published a report

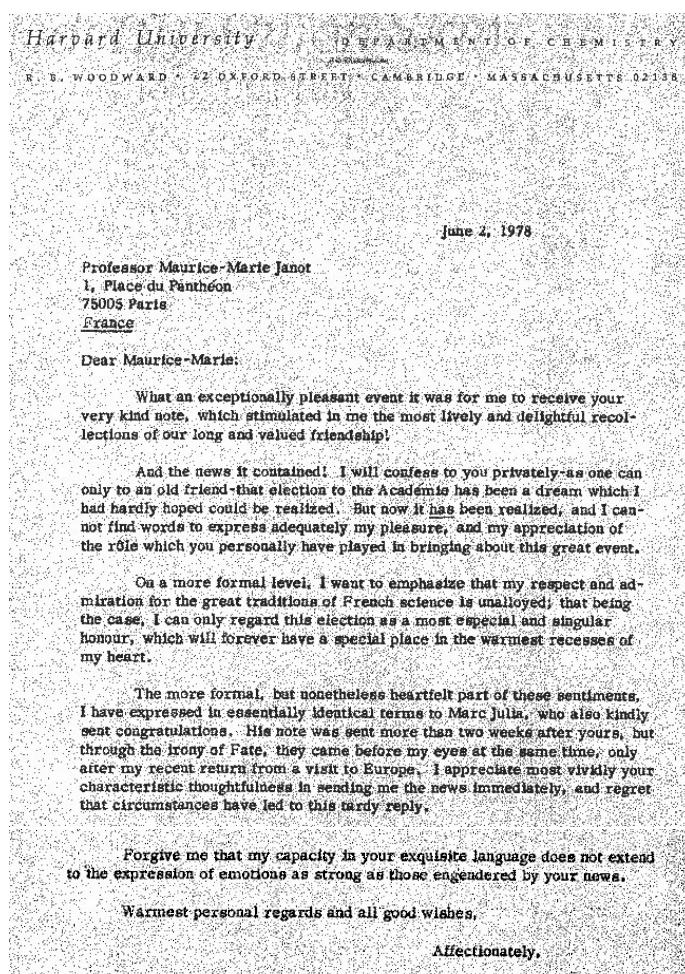


Figure 14. Woodward's letter of June 2, 1978, thanking M.-M. Janot for his note of congratulations on his election to the French Academy (44).

(50) on the matter of the emerging dominance of the English language and the diminishing use of French in scientific communication. An English translation of this report by one of us (JG) can be found in the Supplemental Material of the *Bulletin* and is available open-access with the gracious permission of the French Académie des Sciences. The report was the result of a “reflection” on and an examination of the issue by the Académie and was introduced by the statement

... given the national importance of what is at stake and the imminence of the decisions being prepared, the Académie decided to carry out a reflection on the subject and to publish its conclusions

The report contained an extensive scrutiny of the matter and included concrete proposals for potential remedies considered necessary for the safeguard of the French language. Excerpts on particularly important issues follow (50).

Our science needs to be examined, critiqued, and tested abroad; it must be compared to findings obtained elsewhere that are sometimes contradictory, sometimes complementary. Without such regular comparison, confrontation, testing, and without the international collaborations resulting from them, our science would become isolated and narrow and would at times lose its way, and, in the end, would decline, sooner or later. National independence, which we cherish, is neither possible nor desirable in the domain of pure science ...

The reasons for the decline of French in favor of English as a scientific language have often been pondered. The complexity and rigidity of French grammar and historical evolution have been cited. The principal reason, which deserves emphasis here, is the very high quality of scientific research in the English-speaking countries during the last decades. By contrast, it is observed, for example, that owing to the eminent position occupied by the French school of mathematics, there are still many mathematicians around the world who make use of French and are often even able to express themselves in French ...

All those who care about the future of our language, and in particular all the members and corresponding members of our Academy, are today greatly concerned about a triple threat that weighs at this moment on the destiny of the French language ... the influence exerted by all that comes to us from the US due to its scientific, industrial, and commercial power, to be sure, but also because of its cultural vitality ... the incapacity shown by our people to preserve its language in its traditional purity and accuracy ... with the development of distance-broadcasting, every French-speaking person, not only in France but also in Africa, will be able to receive directly in English an extraordinary collection of information, cultural riches, and entertainment ...

The proposals that will be made concern only the dissemination of French science and its connections to the influence of French culture and thereby the influence of the French language ...

(a) USING ALL THE ASSETS OF FRENCH SCIENCE IN SUPPORT OF THE INFLUENCE OF FRENCH CULTURE AND LANGUAGE

(b) DEVELOPING EXPRESSIONS OF FRENCH SCIENCE AND TECHNOLOGY IN THE SERVICE OF SCIENTIFIC TRAINING AND INFORMATION IN THE FRANCOPHONE COUNTRIES

(c) ASSURING THE FRENCH PRESENCE IN HIGHLY SPECIALIZED SCIENTIFIC MEETINGS AND PUBLICATIONS. [emphasis in the original]

In 1983, Lehn—still four years prior to his receipt of the Nobel Prize in chemistry but nearly 20 years from being a postdoctoral student of Woodward's—participated in a colloquium entitled “Should the National Languages be Saved? The Role of Translation and Interpretation.” The proceedings of the colloquium were published with the help of the High Committee of the French Language. Lehn's contribution was entitled “Language of Science or Science of Languages, The Point of View of a User.” Highlights of Lehn's philosophical essay include (51):

Letters, words, symbols, structural representations, formulas, equations, the vocabulary, the grammar, and the syntax of chemistry are universal. With [the languages of] numbers, musical notes, alphabets, and gestures, the chemical language is a fifth language. In fact, it functions both as a system of signs [implied by the word “langue” in the original] and as expression of thoughts [from the word “langage” in the original] ...

The question therefore remains: which language to use in written and spoken science? I would answer: not a single language, but that which is understood by the majority of the audience, on condition to be sure that one is able to use it appropriately. Because it is above all a matter of communicating. The first obligation of the language is to serve the dissemination of science; it is not the role of science to defend the language ...

[The most] effective way to defend and spread a language and a culture of a country in parallel with its science is through collaboration programs and international exchanges. My experience with the fifty or so researchers who trained in my laboratory has convinced me that encouraging international exchanges is without a doubt one of the most effective ways to publicize the activities of French laboratories, to promote the French language and culture, to establish personal or professional relationships that will further amplify the effects of the exchanges. French scientific renown is due first of all to the research carried out in France ... The best method for a scientist to participate in the defense and display of his language and culture is to do the best science possible and to communicate it to the largest audience, regardless of languages or cultures

Lehn then provided eight recommendations to foster and improve the progress in chemistry, the ambience within the chemical community, and the interactions between scientists and the broader population (51). An English translation of this publication by one of us (JG) can be found in the Supplemental Material of the *Bulletin*.

Communications in the Chemical Community: Current Status

In Europe and in Asia, over the past 20 years, numerous chemical journals once published in their national language have merged into multi-national single-disciplinary journals published in English. Such prestigious journals as *Liebigs Annalen*, *Chemische Berichte*, and *Bulletin de la Société Chimique de France* have been folded into these new international journals. As shown in Table 2, recent years have also witnessed the formation of new multi-national single-subdisciplinary journals published in English.

This evolution of journals is a remarkable transformation with much consequence to all the stakeholders: the publishers, professional societies, funding agencies, users (authors, reviewers, and readers), institutional subscribers, and individual subscribers. The driving force in the formation of these new international journals surely was for maximum inclusivity, rapid distribution of research results, and financial stability for the publishers—issues that have been faced by publishers of scientific journals for several centuries. The forces that have melded this transformation have been highly interactive and flexible, both responding to the stimuli and being the stimuli.

We conclude: *There is no denying the trend today to English as the international language of chemistry. But who can tell of the future?*

We also note that not all diversity has been lost! The venerable *Angewandte Chemie* continues to be published in German along with its English version *Angewandte Chemie International Edition*.

The concern of substituting English, or any language, for French in the scientific literature has, to some limited extent, persisted, somewhat continuously if sporadically, to this day (15, 52). We shall cite just several examples. In 1994, the Toubon Law was passed in France, mandating the use of the French language in many venues. For example, it said in Article 11 (53),

The language of instruction, examinations and competitive examinations, as well as theses and dissertations in State and private educational institutions shall be in French ...

In 2002, Gingras published a lengthy discussion that illustrates the continuing depth of the feelings in this matter (54). His article summarized the Garfield “provocation” (16), the French reaction, and the evolution of the

situation over the previous three or more decades. More recently, in 2013, there has been an eruption in France regarding these very issues. In May and June of 2013, the following headlines appeared:

From *The Guardian*, May 10, 2013 (55):

French academy in war of words over a plan to teach in English”

The global spread of the English language has long been a sore point in Paris politics ... teaching and lecturing in a foreign language at French universities has been banned by law, except in the case of language courses or visiting professors ...

From U.S. National Public Radio, June 14, 2013 (56):

War of Words: France Debates Teaching Courses in English

Will teaching in English at France’s universities undermine the French language? That’s up for debate in the country now, and the argument is heated.

From *The New York Times*, June 14, 2013 (57):

Bid in France to Add Courses in English Raises Fear for Language

The reaction was loud, swift and fierce this week to a proposed law that would require French universities to teach more of their courses in English, a measure that a well-known scholar had called a “suicidal project” that would lead to France’s sacrificing its language to “Americanization disguised as globalization.”

Nonetheless, the trend toward English as the universal language of science continues. As shown in Figure 15, ChemPubSoc Europe published the first issue in February 2012 of an English-only, open-access journal (58). On the other side of the coin, a very serious and not solely academic discussion on these matters continues throughout the academic literature (59) as well as in the popular press. Dahl concluded that “national culture will be more important [governing the pattern of metatext in economics and linguistics] than in medicine” and likely than in the physical sciences including chemistry “where the IMRD (Introduction-Method-Results-Discussion) structure is globally implemented and the research data to a greater extent are given outside the text” (60). In 2001, Ammon published a book on the effect of English dominance as the language of science on other languages and language communities (61). Indeed, criticism has recently been leveled against Germany’s highly regarded Duden dictionary “for contributing to the decline of German by importing too many English words” (62).



Figure 15. A black and white version of the front cover of the first issue of the journal *ChemistryOpen*, published by ChemPubSoc Europe. This is an entirely English-language, open-access journal first published in February 2012 (58).

Conclusions

This paper encompasses both the serious and the ingeniously clever.

For serious: in 1965 the Académie wrote to the President of the French Republic “express[ing] its wish for a firm intervention by the [French] state to assure from now on the respect of the French language in the scientific domain.” President Charles de Gaulle and Prime Minister Georges Pompidou responded affirmatively. In the 1980s, additional serious discussions and considerations regarding safeguarding the French language in scientific communications were made by the Académie and by the French Minister for Research and Technology. In 1994, French law (the “Toubon Law”) banned the teaching and lecturing in a foreign language at French-government financed schools (53).

For ingeniously clever: R. B. Woodward’s letter to Jean-Marie Lehn and “Woodward’s La Marseillaise.”

Thus, this paper reveals the interplay between the very public French national trauma about the possible loss of language on the one hand and Woodward’s private

play with language in the context of a scientific debate on the other hand. From the words of Woodward, the French Académie, and the French government, there is a clear display of a private/public-simultaneous match and contrast.

Nearly 50 years after the English-French language-of-chemistry debate became acute, English has in fact become the dominant means of scientific communication as judged by the rise in number and strength of English-only international chemical journals. Despite this fact, the concern about the decreasing use of certain national languages continues—at least in France—as is well documented in recent media headlines. Will instruction in English in French universities, especially in disciplines like science—continue to be against French law?

The past 50 years is just a slice in the continuing evolution of communication within self-selected scientific communities, one being the chemical communities throughout the world. In our view, the net effect of these transitions has been more positive than negative—in the dissemination of knowledge, in the internationalism of science, in shared cultural experiences, and in economic terms. Indeed, today some in France are accepting this trend and proposing that teaching at French universities can be in English when appropriate for the subject, e.g., in chemistry. The serious and mindful efforts by the most influential among us to make readily available the research results of all within our community deserve praise as does the understanding and flexibility of those who place country-pride at high priority.

The evolution in the communication within the chemical community continues. Not only has the journals’ choice of language changed over the decades but the very nature of chemical publication has changed. Several journals—and *Chemical Abstracts*—publish only electronic editions and in many others, subscription trends have moved away from paper and to “virtual” media. The manner of browsing, reading, searching and managing the chemical literature has certainly changed. New online-only, open-access journals have made their presence felt, especially with the increased number of journals and the number of pages published each year. Surely the matter of open-access publications has risen to a very high level of concern among publishers, learned societies, governmental funding agencies, organizational subscribers and individual scientists. The inclusivity and effectiveness of communication within the scientific community is central to the progress of science and to the pleasure of those doing science. The controversy about language was once a localized phenomenon; today, open

communication is more than a goal, it is a necessity. It is interesting to consider what the scientific literature will look like and how it will be accessed in another 50 years.

In this paper, we have focused primarily on events in the 1965-1985 time period. We discussed the founding and role of the first international chemical journals, *Tetrahedron* and *Tetrahedron Letters*. We did point out that in the 19th Century, Russian chemists published their research in the French and German languages in the Russian journal *Bulletin scientifique publié par l'Académie Impériale des Sciences de Saint-Petersbourg*. In the 20th Century, the journal *Russian Chemical Reviews* was also published in English. Evidently, Russian chemists for several centuries wanted their research to be read by non-Russian reading scientists. To the extent that there were still “national” components to these journals and that chemistry was not truly a worldwide enterprise, the descriptor “international” rather than “global” was and is more accurate.

It is clear that the desire to have one's research read and valued is a powerful motivating force to communicate in whatever language will best serve that purpose, over and above one's language-patriotism (63). Furthermore, financial imperatives have begun to squeeze national chemical societies and forced them to merge their journals into new, international journals.

Indeed, for many of the reasons and conclusions discussed herein, in a book published after the acceptance of this paper for publication, Scott L. Montgomery concludes, “yes” to the question asked as the title of his book, *Does Science Need a Global Language* (64). Henning Hopf, in the opening paragraph of his review of this book, responded to Montgomery's question (65)

The answer to the title of the book is straightforward: not necessarily, but it would be advantageous. An option is easy to find, as it already exists: namely English.

Robert Buntrock's review of this book (73) concluded that (66)

The trend toward English as the *lingua franca* of science has been very rapid ... The advantages ... include education and collaboration in research on an international basis.

According to a recent report, at the 94th Annual Meeting of the Chemical Society of Japan (CSJ) in March 2014 (67)

Although most of the events and presentations were in Japanese, there was an international program in-

cluded in the symposium and—for the first time—a 36 page guide for all presentations was provided in English. The CSJ discussed if the official language should be changed to English from 2015.

Lastly, it is obvious but worth saying: all of these changes affect people, the chemists themselves; and these changes affect national education, culture, and economics. Almost 50 years ago, the quite remarkable R. B. Woodward considered these matters and exercised his brain in a poetic yet fun fashion. In this instance, Woodward actualized his abilities to meld wit with seriousness, thereby inherently bridging the language barrier and the human tensions of the situation. Woodward's high-level use of French, his plays on words, and his knowledge of the nuances of French vocabulary and French history are stunning in their sophistication, originality, and ingenious cleverness.

May there always be celebration of the languages of the world. We note that the degree of appreciation of the wonders of “Woodward's La Marseillaise” is related to one's fluency in French. Nonetheless, all of us can understand the cleverness of Woodward's design as well as—in the broader sense—appreciate the tensions between protectionism and worldwide community, empathize with the intensity of the issues, and value the humor and intellectualism which is part of the human experience.

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Supplemental Material

English translations of the Rapport de l'Académie des Sciences sur la langue française et le rayonnement de la science française (Report by the Academy of Sciences on the French Language and the Influence of French Science) (50) and of Jean-Marie Lehn's paper "Langue de la science et science des langues : Multilinguisme ou langue unique ? Le point de vue d'un utilisateur," ("The Language of Science and Science of Languages: Multilingualism or Single Language? The Point of View of a User") (51) can be found in the Supplemental Material for the *Bulletin for the History of Chemistry* at the journal's website,

www.scs.uiuc.edu/~mainzv/HIST/bulletin/index.php.

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Joseph Gal has long been interested in the history of French chemistry and the language of chemistry, and has published a number of articles on these topics. Jeffrey Seeman was Chair of HIST in 2005-2006. He has long been interested in Woodward as a chemist and a person.