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A new type of phonetic alphabet and its applications in language teaching: From practical phonetics to morphology

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Abstract

This paper introduces a new articulatory alphabet, Artalph, invented by the author using innovative, computer-generated phonetic pictograms to aid in pronunciation and in the explication of language grammar rules and conventions. The essay highlights a variety of practical applications for the new system, from practical phonetics to morphology, and differentiates it from the IPA.

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1. Main text

1. IPA anyone?

In the nineteenth century, the phonetician Henry Sweet, the real-life model behind Henry Higgins in George Bernard Shaw’s Pygmalion (Allott, 2001, 115–145) created one of the most detailed systems of phonetic signs ever. When the International Phonetic Association was established in 1886, it adopted Sweet’s Broad Romic alphabet “with only a few minor modifications” (Singh & Singh, 2006, 26), and it became an excellent tool for studying phonetics and phonology—the International Phonetic Alphabet (IPA).

The IPA is a very precise system based on a model phonetic principal: one sign for one sound. I use it whenever I start learning a new language, and I would not have been able to learn English without it. I would also not be able

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to teach French phonetics and phonology without it. And even this article could not have come into existence without it: as it is customary in linguistic work, I use the IPA signs within this text in square brackets to distinguish them from ordinary letters. To describe the sounds, I will use both the IPA signs and the phonetic terminology found on the International Phonetic Association’s website (http://www.langsci.ucl.ac.uk/ipa/fullchart.html).

While my use of the IPA will provide firm linguistic grounds to the paper, I will also offer descriptions in simpler terms—descriptions that use pictograms and can be easily understood by any student not familiar with linguistic terminology. My experience of language learning and teaching has taught me that despite its precision, the IPA is rarely used by teachers and never appreciated by students. When I delved into the question of why, I understood that the IPA’s unpopularity results from its encoding complexity: to use it efficiently, both students and teachers need to learn a fair number of new alphabetic signs and corresponding linguistic concepts, which can be daunting. So, although a precise linguistic tool exists to help with pronunciation, many teachers either opt for approximations (if similar sounds are known to students) or struggle to find ways to show an unusual articulation (if comparable sounds are not known to students or finer distinctions are required).

Moreover, in many academic programs and in whole areas of linguistic research the IPA is not used at all. Instead, for example, there exist special traditional conventions for transcribing in Latin letters with diacritical signs languages that do not themselves use the Latin alphabet. These conventions are different for each field, and as such they complicate comparative studies and hinder communication among scholars. For example, in Slavic studies the letter “c” transcribes the dental affricate [ts], but in Sanskrit studies the same letter is used for a palatal affricate [tʃ]. The use of diacritics also differs in both fields.

Quite clearly, then, there is a need for an additional phonetic alphabet: one simpler than the IPA yet also one more universal than conventional transcriptions in Latin letters with diacritics. To help students master the IPA and to facilitate my own language studies, I developed a system of pictographic representations that, with the help of computer graphics, have led to a new type of alphabet. I call this system Artalph—to abbreviate the full name, Articulatory Phonetic Alphabet, but also to emphasize the word “art,” indicating the system’s potential creative use.

In this paper, I will share my experiences in the practical application of this alphabet when teaching language at different levels. The current article seeks to advertise the usefulness of this new type of alphabet for teaching practice, rather than present the system as a whole. I will therefore only explain the features that are necessary to achieve my practical goal—to offer a few concrete and instructive examples from the classroom. A more complete description of the alphabet is available on my forthcoming Artalph webpage (www.artalph.com).

2. What about Artalph?
From a semiotic point of view, Artalph is a system of non-arbitrary signs that depict sounds based on their articulation. The idea of representing sound articulation systematically is, of course, not new. Sweet’s alphabet that led to the IPA, for example, was based on the articulatory system of his teacher Alexander Bell—the father of Alexander Graham Bell, who together with Thomas Edison invented the telephone. Bell’s system was based on representations of articulatory positions required to produce sounds, but it was so complicated that it proved difficult to use: “It seems inescapable that many of the signs in an iconic alphabet look much too much alike” (Abercrombie, 1990, 100).

The novelty of Artalph consists in its visual representation: neither Bell nor Sweet had computer graphics as creative tools, but nowadays it is possible to produce quite distinguishable iconic signs representing the articulation of human speech. Artalph characters comprise a set of symbols, schematic representations of the
articulatory organs—the tongue, the lips, etc.—that serve to portray main phonological characteristics. Hence from a didactic point of view, they are easy to interpret, to remember and to recreate thanks to their pictographic nature.

Each character in Artalph is composed of a frame representing the mouth cavity, but I chose different frame shapes for vowels and consonants to visually distinguish them: the frame is rounded and fluid for vowels, but rectangular and solid for consonants. The fluid, freely flowing shape of the vowel frame symbolizes the main distinctive feature of vocal articulation: “It is produced without any kind of obstruction of the outgoing breath” (Ladefoged, 2005, 26). Unlike vowels, consonants in the alphabet are represented as angular and endowed with “teeth,” two additional lines slightly to the left of the mouth opening in the frame, because teeth can be important in consonant articulation. The mouth opening is always graphically represented on the right-hand side of the frame, and the throat opening consequently at the bottom of the left side. Not all graphics reflect mouth physiology closely; sometimes they mix surfaces and symbols in the manner of Picasso drawings of the cubist period, like the rectangle representing the unrounded lips in the vowel character in Fig. 1. As a result, each pictogram is able to manifest clearly all main articulatory features of the sound it represents, sideling unimportant ones. The arrangement of this alphabet thus allows the omission of non-pertinent symbols, or, instead, the use of a “faded” version of the signs that are not relevant for a particular issue in question.

![Mouth cavity > Picasso > vowel and consonant](image)

**Fig.1 Vowel and consonant shapes; Fig. 2 Dactylic hexameter in Virgil**

Such flexibility is also valuable for didactic purposes. For example, in a study of meter in poetry, the exact pronunciation of each sound is not important, but the distinction between vowel and consonant is. Artalph therefore makes it possible to use only the basic shapes for these two types of sounds: this lightens the whole picture and reveals the pattern of alternation of long and short syllables as shown in Fig. 2. The syllable pattern becomes even more visible when the characters are linked with lines at the bottom, and when the characters for long sounds are themselves graphically lengthened, like the last “o” in cano. In the textbook *Pronunciation for Clear Communication*, Linda Grant (2010) uses pictures of cars, buses and motorcycles to demonstrate the difference between short and long sounds in English. The characters of the Artalph can themselves be lengthened and are just as visually effective.

### 3. Practical phonetics

Since the signs of the Artalph represent articulation, their pictographic nature speaks for itself and helps students perceive fine distinctions in the pronunciation of different sounds within one language, as well as in the articulation of similar sounds in different languages. In my experiments while teaching French pronunciation to Anglophones, this system has facilitated phonetic explanations and sharpened students’ articulatory awareness.
It is relatively easy to explain the difference between the English alveolar [t] and [d] sounds and the similar dentals in French if both the Francophone teacher and the Anglophone students are familiar with this terminology and aware of the sounds’ articulation. If not, which is most often the case, the difference is either ignored or learned through multiple repetitions of trial and error. I once took an English phonetics course at the Ontario Institute for Studies in Education (OISE) and vividly remember our teacher struggling to explain this and several other differences in articulation to native speakers of French, Spanish and Hindi: “I wish I had a 3D mouth model to be able to show you where the tongue is!”

A mouth model—that is exactly what Artalph pictograms offer. They may not be three-dimensional, but thanks to their “cubist” composition, they are able to represent all the pertinent characteristics of any given articulation in one pictogram: the equivalent of a 3D mouth model is available in each character. The pictograms for alveolar and dental [t] in Fig. 3 show the difference in the place of articulation for these two sounds. Fig. 4 represents the difference between two French vowel sounds: [y] as in tu and [u] as in tout.

![Fig. 3 English alveolar [t] and French dental [t]: Fig. 4 French vowels [y] (as in tu) and [u] (as in tout)](image)

Unlike the realistic pictures often used in textbooks dealing with phonetics, these pictograms contain only pertinent features, express the nature of the sound through their basic shape (square for consonants and rounded for vowels), and efficiently represent all necessary phonological information in one image. To represent the articulation of a vowel in another system, at least two realistic pictures are required—one for the position of the tongue, another for the configuration of the lips. Moreover, realistic pictures rarely prove helpful in displaying the articulation of consonants, because they cannot show the mode of articulation that is displayed in the enlarged version of the green lozenge that marks the place of articulation at the bottom of the diagram.

The plosive consonant [t] is articulated by a sudden separation of two surfaces: of the tongue and alveoli in English, but of the tongue and the upper teeth in French. To represent this mode of articulation, the lozenge features two lines symbolising surfaces and two arrows depicting the movement of these surfaces from one another.

To make it even simpler, I just say to the students:

- Look at the pictures in Fig. 3
- Pronounce the sound [t] in English while paying attention to the position of the tongue
- Identify the place of articulation of the English [t] and the corresponding pictogram
- Change it intentionally to the French sound by changing the position of the tongue according to the pictogram
• Listen to the difference in the sound
• Work in pairs: pronounce English or French [t] and ask your partner to tell you which one it was
• Repeat until you get it right

The pictograms shown in Fig. 4 help learners see and sense the difference between two French vowels that constitute a pronunciation challenge for most non-Francophones. Both vowels are closed, which means that the tongue is at its highest point in the mouth, and both are rounded, which means that the lips round during articulation. Yet the sounds differ in the position of the tongue in relation to the front or the back of the mouth. The pictograms clearly show this distinction and assist with the proper articulation of these sounds.

Artalph proves useful in explaining practical phonetics not only to language students. Some years ago I was coaching a singer who needed to perform a few songs in Russian, a language she did not know at all. Pronunciation was crucial for her work, and the pictograms helped greatly in this regard. I imagine that the same would hold true for TV and radio commentators who strive to pronounce foreign names properly.

4. Reading rules
Artalph has further applications. For example, it can prove quite helpful in teaching rules for reading, especially in languages for which they are strict but also complicated, such as Sanskrit. To demonstrate my alphabet’s helpfulness for understanding of the phonetic laws behind letters, I will use two common vowel combinations in French: the combination “au” that reads like [o] and the combination “ai,” which may read as either an open or a closed [e]. Since phonetic laws have universal application, the same logic will hold in Sanskrit vowel coalescences and its system of vowel strength. Artalph, which also applies universally, can easily assist in otherwise complicated challenges.

![French reading rules: a+i=[e] & a+u=[o]
 in IPA and Art-alph](image)

![Sanskrit : grades of vowel strength
 in Sanskrit, IPA, and Art-alph (ृ [i] & ू [u] not included)](image)

Fig. 5 French reading rules for [a/i/u]; Fig. 6 Sanskrit grades of vowel strength for [a/i/u]

The pictograms of Fig. 5 clearly demonstrate that the sound [e] is, in terms of articulation, the middle way between the sounds [a] and [i]: all three sounds are pronounced with the tongue in the front of the mouth and without rounding the lips. However, the [a] sound is open, while the [i] sound is closed, which is represented on the corresponding pictograms by the lower and higher position of the “tongue” and by a bigger or smaller opening of the “mouth” in the diagram—both in accordance with actual articulation. On the pictogram representing the resulting sound [e], the position of the “tongue” and the opening of the “mouth” represent the average of the previous two. It is just as obvious that [o] is a hybrid between [a] and [u].
Although this fact is common knowledge in phonology and historical linguistics, language students are generally not aware of it; they just learn these combinations of letters by heart without paying attention to the articulation, which would help them understand why this is so. To my knowledge, there is no French textbook that explains the articulatory logic of these reading rules.

Again, to put it more simply, as I would do for my students in the classroom:

- Pronounce the French [a] with the tongue at the front of the mouth, pressed to the lower teeth, and notice how wide open your mouth is
- While pronouncing [a], slowly start closing the mouth and lifting the back of your tongue, striving to reproduce the [i] pictogram of Fig. 5
- Listen to the intermediate sound
- Pronounce all three sounds in this sequence [a] - [e] - [i] - [e] - [a] while paying attention to the position of the tongue

Artalph can be even more useful in the teaching of Sanskrit at universities, where students frequently face the need to learn, in a short period of time, many new sounds, letters, and especially the rules of their combination, known as sandhi. An understanding of the phonetic, or rather articulatory, logic behind these combinations helps with memorization. Using Artalph, I managed to summarize and fit onto one page all sixty-one rules of sandhi listed in the Devavanipravesika textbook (Goldman & Goldman, 2011). My sandhi page helps me find the right rule quickly thanks to the clear pictographic nature of the symbols.

Fig. 6 depicts the strength grades of three Sanskrit vowels, [a], [i] and [u], and it shows the same regularities as Fig. 5, because vowels are “strengthened” through the addition of an [a] sound. However, when a long [a:] is added, both sounds retain their properties and combine into a diphthong without fusing into one sound with average characteristics. According to Goldman and Goldman (2011), “this series of changes is extremely important, … and must be learned immediately and thoroughly.” The understanding of articulation processes responsible for these changes gained through Artalph helps in this task by showing the mechanism of these combinations. Moreover, the long [a:], lengthened as the whole character, is visually stronger, which helps explain why the sound does not mix in this case: a stronger sound can resist the influence of the following vowel better, and the strong visual representation of it helps learners remember this rule.

And this is not to mention that the Sanskrit alphabet itself is constructed according to phonetic features based on articulation. The representation of its sounds in Artalph thus improves the understanding and articulatory awareness of students who struggle to learn by rote an alphabet that is much easier understood by paying close attention to articulation.

5. Vowel harmony and grammar

Artalph is also an excellent tool to explain the rules of vowel harmony typical of most agglutinative languages like Turkish or Hungarian. Generally speaking, the main point of vowel harmony is that the vowel sounds of one word should all agree according to one of their phonetic features. For example, they should all be rounded vowels, or all back vowels, or all front vowels. Since the notion of phonetic feature forms the basis of the Artalph inventory, vowel harmony is extremely easy to represent and perceive when a word is written in the new alphabet: each Artalph symbol, which is used to construct its characters, corresponds to a phonetic feature.

The grammar of agglutinative languages uses numerous suffixes that carry syntactic meaning and usually come in at least two phonetic forms differing in one of its vowel characteristics. For example, the Turkish locative suffix that means “in” has two forms, -de/-da, whose vowels differ according to the feature [front/back]. In Fig.
7, all the graphic representations of the suffix -de/-da are circled, and the Artalph representation displays that distinctive feature clearly: the “tongue” of the front vowel in -de is at the front of the “mouth,” while the “tongue” of the back vowel in -da is at the back of the “mouth.”

![Front / back vowel harmony in Turkish in IPA and Art-alph](image)

![Turkish vowels: i / ü, ı / u; e / ö, a / o in IPA and Art-alph](image)

**Fig. 7 Vowel harmony in Turkish; Fig. 8 Vowel system in Turkish**

In the words in Fig. 7, the consonants, irrelevant to the issue at hand, are represented in “faded” consonant frames, thereby highlighting clearly that all the vowels in the whole word *Türkiye*’de are front vowels, while the ones in *Româ da* are back vowels: the position of the “tongue” in all of them visually indicates as much.

In simpler terms:
- Look at the pictograms and notice the position of the tongue in the two words
- Notice that Turkish *[a]* is a back vowel
- Pronounce each vowel in the first word while paying attention to the position of the tongue and experience the front vowel harmony
- Pronounce each vowel in the second word and experience the back vowel harmony

Neither conventional letters nor realistic drawings would ever offer such a direct and simultaneous view, but Artalph allows seeing and comparing the phonetic features in several sounds at the same time. The table depicting Turkish vowels in Fig. 8 offers a perfect example of Artalph’s visual and synthesizing potency.

**6. Grammar and morphology**

Vowel harmony is an extreme case of a sound’s dependence on its environment, but it also represents a universal rule: in all languages, sounds influence each other and these influences lead to phonetic changes. Many grammar rules can be explained through historical changes based on phonetic laws, yet they are rarely taught from this point of view, instead being learned by repetition as inexplicable irregularities. In modern Romance languages, for example, textbooks generally simply list the irregular stems for the future tense, and students then mechanically memorize them. The grammar textbooks (Renaud & Hoof, 2007, 315–316; Vercollier, Vercollier, & Bourlier, 2004, 213–214) used in the French program at the University of Toronto at Scarborough (UTSC) do not even mention that the future tense of modern French was historically formed through the combination of the given verb’s infinitive and the verb *avoir*, although understanding this history and the phonetic changes it involved could significantly reduce the amount of learning by rote.
For quite a few verbs, the irregularities are easy to explain, and Artalph helps illustrate the abstract phonetic concepts involved: stress and vowel reduction. I used to simplify complex explanations by saying that once the conjugated *avoir* is added to the infinitive, it robs the infinitive’s ending of its stress and makes the vowel in front of the final **-r** so weak that it disappears if the verb is often used. This is a rule for regular verbs: their **-e** in the ending **-er** is never pronounced in the future forms (**étudier**>**étudierai** [etyldej]>[etydiRe]). This is also true in the case of the irregular verbs whose stem ends in **-r** because two sounds of the same nature—like the **[R]** of the stem and the **[R]** of the ending in this case—always strive to join. A weakened vowel cannot resist this striving, so we get the “irregular” forms **courir**>**courrai** and **mourir**>**mourrai**, which in fact only reflect phonological regularity. There are always students who confirm that this reasoning helps them. However, I noticed that for quite a few other verbs, this kind of explanation was difficult to follow, even though the examples of these verbs were displayed on the screen with marks for stress and with the disappearing vowels crossed out.

![Diagram of vowel reduction](image)

**Fig. 9** French verb *mourir*: infinitive and future tense; **Fig. 10** Articulation of French sounds [v/w/u]

So Artalph helps explain this in simpler terms:

- Look at the pictograms for the infinitive of the verb *mourir* in Fig. 9
- Pronounce it so that the stressed vowel is louder and **longer** (its pictogram is bigger and longer)
- Pronounce the infinitive with the following “**a**” so that the final **[a]** is louder and **longer** but the **[i]**, which is now in the weak position, is softer and eventually drops off
- Pronounce the future form “**il mourra**,” making sure that the two **[R]** are fused into one sound. Find other verbs that form their “irregular” future by dropping the vowel in their infinitive ending

Students themselves usually recognize that the same rule also holds true for many irregular verbs ending in **-voir**, and if they are interested, it is possible to continue exploring this method. Even the forms of *avoir* and *savoir* can be explained, but the explanation requires an understanding of the similar nature of the participating sounds. Romans used only one letter, “**V**” for [v] and [u] because they knew that these sounds corresponded to variations of one sound that acquires slightly different qualities depending on its environment: in front of a consonant, it becomes a vowel (GAIVS IVLIVS); in front of a vowel, it becomes a consonant (VICTOR). However, our students today need to see the Artalph pictograms and try to pronounce the sounds while paying close attention to their articulation to comprehend this. In Fig. 10, the similarities between the vowel **[u]** and the approximant **[w]** are quite obvious—both sounds are closed and require the same rounded position of the lips, as well as the tongue at the back of the mouth. The only difference is that the semi-vowel is twice shorter, which is shown by
its narrower shape. As a result, it is a little noisier too, and therefore it is sometimes referred to as a semi-vowel or a semi-consonant.

As for the consonant sound [v], it might look more complicated at first glance, but one can see that the tongue is inactive and rather at the back of the mouth, and that the lips play an important role in the sound’s articulation. The wavy line along the “throat” in the diagram stands for the vibration of the vocal cords and denotes that, unlike its unvoiced counterpart [f], the sound [v] is pronounced—with the participation of the voice. Thus, whenever this sound is followed by a consonant, it has a tendency to lose its consonant qualities when pronounced quickly and without care: when the lip and the teeth do not come into contact, the resulting sound is [w] or [u] because the lips are still tensed and rather closed.

In simpler terms:

- Look at the pictograms in Fig. 10
- Pronounce the sound [u]
- Pronounce the same sound in combination with [a]: [ua]. Pronounce it faster and you will get the semi-consonant [wa]
- Pronounce the sound [v] in combination with [R]: [vRa]. Pronounce it faster and you will get the semi-consonant [wR]
- Pronounce avoir and aura. What happened to the -oi- part of the ending? (Dropped) What happened to the -v- part of the stem? (Became -u-)

Clearly, even if teachers or textbook authors are aware of the phonetic reasons for these changes, there is no way to explain the details to students without teaching them all the linguistic terminology first. I once tried to shorten the explanations of alternations -all-aux (cheval-chevaux, oral-oraux, etc.) by saying, “Just believe me: phonetically [u] is just an unfinished [I],” but in response I saw only a sea of surprised and confused faces. Students do not really understand such statements if they cannot experience the articulation of these sounds. To experience it, they need to observe their sensations properly, and to do so, they need to see the points of interest in the pictograms of Artalph.

Similar regularities are explained and used as examples in theoretical phonology and language history, but such explanations rarely reach the majority of language students simply because there is so much to explain—from too many new phonetic signs to complicated theoretical concepts like “phonological feature.” Artalph makes the articulation so obvious that there is no need to explain: a pictogram is worth a thousand words. Through the enhancement of articulatory awareness, Artalph thus helps bring linguistics, and especially comparative and historical studies, closer to the level of language practice classes, which in my experiences increase students’ understanding and interest.

7. Conclusion: What is useful about Artalph?

Although there are even more applications for Artalph in higher-level linguistics courses, in this article I limited the examples to its use in beginner and intermediate language classes. To conclude, let me mention a few more possible applications related to the features demonstrated above.

In the domain of practical phonetics, my examples of teaching the difference in the pronunciation of dental and alveolar consonants, as well as in that of front and back vowels, demonstrated how Artalph characters combine both articulatory precision and simplicity of interpretation. This same quality makes them extremely valuable in
the explanation of complex concepts in theoretical phonology, because they can clearly illustrate articulatory phenomena.

Yet Artalph is not a mere collection of illustrations for IPA phonetic signs. On the one hand, the visual transparency of its characters, iconic signs by nature, evokes an immediate psychological connection between the character and the sound articulation, which the IPA signs could never provide. On the other hand, Artalph’s inventory of symbols lends itself to creative use by students and teachers: in a phonology course, one can ask students to create a representation of an *archi-phoneme* of two phonemes or to represent a phonological rule in Artalph characters. Students love this type of creative task, and it allows the teacher to better judge their understanding of the material than from their use of IPA signs: a mistake in an Artalph character shows precisely and visually what kind of misunderstanding led to it.

Thus Artalph can be used in a range of testing activities, from fun quizzes to final exams. Moreover, even in a practical phonetic course, where the ultimate test takes the form of a sound recording of a student’s pronunciation, Artalph can be used for intermediate testing and to check students’ comprehension of phonetic differences between sounds and their awareness of sound articulation.

In the same way, Artalph characters can test students’ knowledge of reading rules, and marking this type of test will take significantly less time than listening to all students’ recordings. I could even imagine a multiple-choice exam: “Choose and circle the Artalph character corresponding to the following letter combinations.” The whole point in using this system is to teach reading rules through understanding and articulatory awareness, instead of through rote repetition. The IPA signs do help the study of reading rules, but only because they are precise—one sign for one sound. They do not facilitate articulation, because this system uses the same encoding principle for words and sentences as it does for individual letters: IPA employs symbols representing certain sounds, while Artalph characters are icons reflecting articulation.

The few examples I provided explaining the rules of vowel harmony or irregularities in the formation of the future tense through articulation showed how Artalph helps demonstrate the logic behind these phenomena through the practical study of sounds involved in morphological changes. Such practical explanations increase students’ deep understanding of grammar and morphology. They can also facilitate the study of lexical clusters with stem alternations, and, most important, the recognition of cognates in other languages.

The overall didactic utility of Artalph lies in its transparent form: all its signs—the characters, which represent sounds, and the symbols, of which the characters are composed—are easy to interpret and reproduce. This transparency results from Artalph’s higher level of phonological abstraction in comparison to the IPA: it is based on a new principle—one sign for one phonological feature. Since most symbols representing the features are, in fact, transparent icons, all characters formed by them are easily graspable. Certainly, this new principle and the visibility of phonological features within the character are only possible when the characters are graphically displayed on a relatively large scale. The whole Artalph system would be impossible without computer technologies: when the IPA was created, teachers did not use PowerPoint presentations and students did not read on the iPad tablets that allow for all sorts of enlargement.

But since most of us are currently using these electronic devices in our teaching and learning, it made sense for me to create and now make available to my colleagues the Artalph signs. The whole system is explained and available online (http://www.etudes-francaises.net/dossiers/sonina.artalph.pdf), and by the beginning of the new academic year, I will have a new, fully operational website (www.artalph.com) with the complete system of signs available to be copied and used as they are or to be modified according to specific teaching needs. I am sure that many
colleagues will find ever more creative applications for this articulatory alphabet, and I look forward to seeing them.

References