THE INTERNATIONAL PHONETIC ALPHABET (revised to 1993)

CONSONANTS (PULMONIC)

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b			t d		ʈ ɖ	c ɟ	k g	q ɢ		ʔ
Nasal	m	ɱ		n		ɳ	ɲ	ŋ	ɴ		
Trill	ʙ			r					ʀ		
Tap or Flap				ɾ		ɽ					
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ
Lateral fricative				ɬ ɮ							
Approximant		ʋ		ɹ		ɻ	j	ɰ			
Lateral approximant				l		ɭ	ʎ	ʟ			

Where symbols appear in pairs, the one to the right represents a voiced consonant. Shaded areas denote articulations judged impossible.

CONSONANTS (NON-PULMONIC)

Clicks	Voiced implosives	Ejectives
ʘ Bilabial	ɓ Bilabial	ʼ as in:
ǀ Dental	ɗ Dental/alveolar	pʼ Bilabial
ǃ (Post)alveolar	ʄ Palatal	tʼ Dental/alveolar
ǂ Palatoalveolar	ɠ Velar	kʼ Velar
ǁ Alveolar lateral	ʛ Uvular	sʼ Alveolar fricative

SUPRASEGMENTALS

ˈ Primary stress — ˌfounəˈtɪʃən
ˌ Secondary stress
ː Long — eː
ˑ Half-long — eˑ
̆ Extra-short — ĕ
. Syllable break — ɹi.ækt
| Minor (foot) group
‖ Major (intonation) group
‿ Linking (absence of a break)

TONES & WORD ACCENTS

LEVEL		CONTOUR	
˥ or ̋	Extra high	˦˥ or ˩̋	Rising
˦ or ́	High	˥˩ or ̂	Falling
˧ or ̄	Mid	˦˥˦ or ᷄	High rising
˨ or ̀	Low	˩˧ or ᷅	Low rising
˩ or ̏	Extra low	˧˩˧ or ᷈	Rising-falling
↓	Downstep	↗	Global rise
↑	Upstep	↘	Global fall

etc.

VOWELS

	Front		Central		Back	
Close	i	y	ɨ	ʉ	ɯ	u
	ɪ	ʏ			ʊ	
Close-mid	e	ø	ɘ	ɵ	ɤ	o
			ə			
Open-mid	ɛ	œ	ɜ	ɞ	ʌ	ɔ
	æ		ɐ			
Open	a		ɶ		ɑ	ɒ

Where symbols appear in pairs, the one to the right represents a rounded vowel.

OTHER SYMBOLS

ʍ Voiceless labial-velar fricative
w Voiced labial-velar approximant
ɥ Voiced labial-palatal approximant
ʜ Voiceless epiglottal fricative
ʢ Voiced epiglottal fricative
ʡ Epiglottal plosive

ʗ ʖ Alveolo-palatal fricatives
ɺ Alveolar lateral flap
ʧ Simultaneous ʃ and x

Affricates and double articulations can be represented by two symbols joined by a tie bar if necessary.

k͡p t͡s

DIACRITICS

Diacritics may be placed above a symbol with a descender, e.g. ŋ̊

◌̥	Voiceless	n̥ d̥	◌̤	Breathy voiced	b̤ a̤	◌̪	Dental	t̪ d̪
◌̬	Voiced	s̬ t̬	◌̰	Creaky voiced	b̰ a̰	◌̺	Apical	t̺ d̺
◌ʰ	Aspirated	tʰ dʰ	◌̼	Linguolabial	t̼ d̼	◌̻	Laminal	t̻ d̻
◌̹	More rounded	ɔ̹	◌ʷ	Labialized	tʷ dʷ	◌̃	Nasalized	ẽ
◌̜	Less rounded	ɔ̜	◌ʲ	Palatalized	tʲ dʲ	◌ⁿ	Nasal release	dⁿ
◌̟	Advanced	u̟	◌ˠ	Velarized	tˠ dˠ	◌ˡ	Lateral release	dˡ
◌̠	Retracted	i̠	◌ˤ	Pharyngealized	tˤ dˤ	◌̚	No audible release	d̚
◌̈	Centralized	ë	◌̴	Velarized or pharyngealized	ɫ			
◌̽	Mid-centralized	e̽	◌̝	Raised	e̝	(ɪ̝ = voiced alveolar fricative)		
◌̩	Syllabic	n̩	◌̞	Lowered	e̞	(β̞ = voiced bilabial approximant)		
◌̯	Non-syllabic	e̯	◌̘	Advanced Tongue Root	e̘			
◌˞	Rhoticity	ə˞	◌̙	Retracted Tongue Root	e̙			

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Nasal	m	ɱ		n		ɳ	ɲ	ŋ	N		
Trill	ʙ			r					ʀ		
Tap or Flap	ⱱ			ɾ		ɽ					
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ
Lateral fricative				ɬ ɮ							
Approximant		ʋ		ɹ		ɻ	j	ɰ			
Lateral approximant				l		ɭ	ʎ	ʟ			

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SUPRASEGMENTALS

ˈ	Primary stress
ˌ	Secondary stress
ː	Long
ˑ	Half-long
˘	Extra-short
.	Syllable break
|	Minor (foot) group
‖	Major (intonation) group
‿	Linking (absence of a break)

ˌfounəˈtɪʃən

eː eˑ ĕ

ɹ.ækt

TONES & WORD ACCENTS

LEVEL		CONTOUR	
˥ or ˩	Extra high	˨˩ or ˩˥	Rising
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↓	Downstep	↗	Global rise
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etc.

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	Front		Central		Back	
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	ɪ	ʏ			ʊ	
Close-mid	e	ø	ɘ	ɵ	ɤ	o
			ə			
Open-mid	ɛ	œ	ɜ	ɞ	ʌ	ɔ
	æ		ɐ			
Open	a	ɶ			ɑ	ɒ

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- ɕ ʑ Alveolo-palatal fricatives
- ɺ Alveolar lateral flap
- ɧ Simultaneous ʃ and x

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k͡p t͡s

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Tap or Flap				ɾ		ɽ					
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Lateral fricative				ɬ ɮ							
Approximant		ʋ		ɹ		ɻ	j	ɰ			
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ǁ	Alveolar lateral	ʛ	Uvular	sʼ	Alveolar fricative

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ˑ	Half-long
eˑ	
̆	Extra-short
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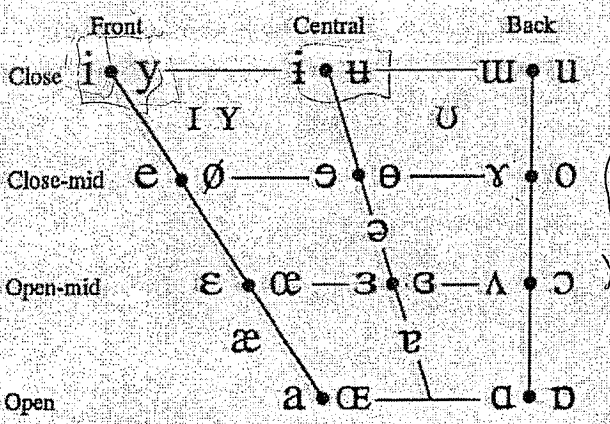
VOWELS



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k͡p t͡s

Some reflections on the IPA

Peter Ladefoged

This paper is a commentary on both the newly revised International Phonetic Alphabet, and on the 1989 Kiel Convention of the International Phonetic Association at which it was produced. The new IPA chart is examined, and the pragmatic but conservative attitudes of the Association are described. It is shown that the IPA has a phonological basis, and that an IPA transcription has two parts: a text containing IPA symbols, and a set of conventions (rules) for interpreting the symbols. The paper concludes with a personal view of the problems of whether there is a finite set of speech sounds, and whether a sound in one language can be equated with one in another, suggesting that for the phonetician there is no universal truth independent of the observer.

The International Phonetic Alphabet (IPA) was revised at a convention in Kiel, Germany, in August 1989. This paper is a personal view of some aspects of the new IPA, and the convention that led up to it. It is in no way an official account of either. The convention was clearly An Event, with capital letters, which everyone who was there will recall with a sense that history was being made in the field. There had been a great deal of preparation, involving the soliciting of opinion by mail on a wide range of topics, and considerable research on the present status of the IPA. At the convention itself there were five major groups which met almost continuously for the first two days, discussing and arguing about every conceivable issue concerned with phonetic transcription. Three of the five main groups considered consonants, vowels and suprasegmentals; the other two considered computational aspects of the IPA, and the needs of speech pathologists and others for extensions of the IPA. In addition there were groups that met for shorter periods to discuss the principles on which the IPA should be based, the form of presentation of the IPA symbols on a chart, and past successes and failures of the IPA. All the groups reported back to plenary sessions that were held at intervals; and on the last day the convention met in continuous plenary sessions to consider and vote on the final working reports. A complete account of the form of the convention and of its decisions has been published in the *Journal of the International Phonetic Association*, 19.2, (1989), and the decisions taken have been officially approved by the Association's Council.

Perhaps the first thing to note about the revised version of the IPA is that it is very much like it predecessors, both in the particular symbols that were approved, and in the Association's beliefs concerning these symbols. The symbols themselves are easy to summarize. They are as shown in the chart in Figure 1. There are a number of new symbols, notably [ʙ] for a voiced bilabial trill, [ʟ] for a voiced velar lateral, [ʝ̟] for a voiced palatal fricative, and the diacritics for creaky voiced, linguolabial apical and laminal, and advanced and retracted tongue root. All of these sounds have been documented in the phonetic literature only comparatively recently (although they have been noted in the descriptions of individual languages for far longer). There are also some changes in particular symbols, notably the dropping of approval for [ɩ] and [ɷ] in favor of the more traditional [ɪ] and [ʊ], and the revising of the mid-high back unrounded vowel, changing [ɤ] to [ɤ], a symbol with curved upper branches making it look more like a ram's horn, and thus more different from the voiced velar fricative [ɣ].

The prevailing mood was to avoid making changes in specific symbols, unless a very strong case could be made. In this spirit, after considerable debate, the symbols for clicks were changed. The convention voted to approve [ǀ, ǃ, ǂ,ǁ] on the grounds that these symbols, together with [ʘ] which was already an IPA symbol, were what were actually used by nearly all the scholars working on the Nguni and Khoisan languages. But this spirit of bowing to prevailing use did not extend to accepting the widespread American use of [š, ž, č, ǰ]. The convention was not sufficiently impressed by arguments (which to me, seemed logical) to the effect that these sounds formed a natural class, and thus it would be appropriate to recognize this by maintaining a common aspect to their symbolism.

Clearly the most controversial innovations were the symbols for the voiceless implosives. Within the phonetic literature there have been very few accounts of these sounds. Supple and Douglass (1949) note their occurrence in Tojolabal, and Pinkerton (1986) provides instrumental data in various other Mayan languages. None of the Mayan languages contrasts voiceless implosives with voiced implosives. Contrasts of this kind have been documented only in Owerri Igbo (Ladefoged et al 1976). At the convention, Constance Kutch-Lojenga noted that voiceless implosives were used in a number of other languages spoken in different parts of Africa; she gave as one instance Lendu, a Nilo-Saharan language spoken in Zaire. There is, however, no instrumental evidence supporting this assertion; and to my ears the recordings of Lendu so-called voiceless implosives sounded like laryngealized stops, perhaps accompanied by a glottal closure, but without involving a descending larynx producing suction. Many members of the convention felt that voiceless implosives were sufficiently rare not to need a whole new row of symbols. There were proposals (which I favored) for symbolizing these sounds by a diacritic, such as the

voiceless diacritic under the more usual voiced implosive symbol, e.g. [ɓ̥] for a voiceless bilabial implosive. But the symbols that now appear on the chart were voted in.

The Association's beliefs concerning the general nature of phonetic representation are more difficult to discern, because they reflect the views of a group of individuals who are, on the whole, more pragmatic than dogmatic. They certainly do not all hold to the same view of the relation between phonetics and phonology. Nevertheless they were all able to work together in a remarkable way. The convention was dominated by a delightful willingness to compromise that rested on a premise that virtually everybody shared, that it was more important to agree on and promulgate a standard set of symbols than it was to haggle over matters of phonetic or phonological theory.

There are explicit statements reflecting this pragmatic view in the revised set of Principles that the Association has adopted. They begin by noting that the IPA "is designed primarily to meet practical linguistic needs." The Association also decided that in exemplifying the use of the IPA: "Several styles of transcription should be illustrated, and the point should be made that these are all valid IPA transcriptions." In the new set of illustrations of the use of the IPA that the Association is preparing, the American English section notes that "Four different forms of transcription of the vowels are given in the list of Key words." Perhaps now that the Association has been explicit in its eclectic approach, outsiders to the Association will no longer speak of *the* IPA transcription of a given phenomenon, as if there were only one approved style.

The most interesting ambiguities in the Association's theoretical concepts concern what the symbols are symbolizing. The newly adopted *Principles* that form the basis of the IPA begin by saying that:

> "The IPA is intended to be a set of symbols for representing all the possible sounds of the world's languages."

This seems to regard a sound (or perhaps, in other terms, a phone) as the basic unit. But the next few sentences present a different point of view:

> "The representation of these sounds uses a set of phonetic categories which describe how each sound is made. These categories define classes of sounds that operate in phonological rules and historical sound changes. The symbols of the IPA are shorthand ways of indicating certain intersections of these categories. Thus [p] is a shorthand way of designating the intersection of the categories voiceless, bilabial, and plosive;

[m] is the intersection of the categories voiced, bilabial, and nasal; and so on."

These statements indicate that the symbols are *not* symbols for phones; they are simply shorthand for what a phonologist would regard as a bundle of features. The basic units are the phonetic categories which the symbols represent. The Principles go on to say:

"The sounds that are represented by the symbols are primarily those that serve to distinguish one word from another in a language."

This is clearly a phonological view, one that is further supported by the statement on the following page concerning the establishment of the set of symbols:

"When two sounds occurring in a given language are employed for distinguishing one word from another, they should whenever possible be represented by two distinct symbols without diacritics."

Both these sentences suggest that the Association's alphabet is intended to have a phonological basis, rather than what what might be called a purely phonetic approach. This is indeed the Association's long held view. In its first *Exposé des Principes,* published in 1900, it noted that its alphabet included "les *sons distinctifs* de toutes les langues étudiées jusqu'ici". (My emphasis.) Similarly, the 1912 English version, in a section headed "principles of transcription for languages hitherto not transcribed," notes, long before the phoneme became a popular notion: "It is necessary to ascertain what are the *distinctive* sounds in the language, i.e. those which if confused might conceivably alter the meanings of words." (Emphasis in the original.) The corresponding section in the 1922 *L'Écriture phonétique internationale* uses the then new term 'phoneme' saying: "Pour chaque langue, on représente les *phonèmes* ou sons distinctifs, et ceux-là seuls." (Emphasis in the original.)

The Association is deliberately not explicit about what is meant by a phonological contrast. Perhaps this is because of the British influence within it, which makes it behave somewhat like the Church of England – a body whose doctrine is so diffuse that one can hold almost any kind of religious belief and still claim to be a member of it. In this spirit, the Association in its Kiel Convention followed its long tradition, and worked towards establishing an alphabet that would be maximally useful to all, whatever their theoretical persuasion. Inevitably they did not entirely succeed. There was, for example, a request from Cathe Browman and Louis Goldstein (who were unable to be present at the meeting) that the Association should provide a standardized means of symbolizing articulatory gestures. They drew attention to a pre-publication version of their paper (Browman & Goldstein 1990), in which they noted:

"We have been trying different approaches to the question of what gestural symbols should be; our present best estimate is that gestures should be

> treated like archiphonemes. Thus our current proposal is to use the capitalized form of the IPA symbol for oral gestures, capitalized and diacritized {H} for glottal gestures, and {±N} for [velic close] and [velic open] gestures respectively. In order to distinguish gestural symbols from other symbols, we enclose them in curly brackets: { }. This approach should permit gestural descriptions to draw upon the full symbol resources of the IPA, rather than attempting to develop additional symbols."

This proposal, which seemed to me to be very sensible, fell on deaf ears, largely because most of those present had not yet been introduced to the notions of articulatory phonology, and did not understand the need.

A somewhat related proposal (of my own) was also rejected. I had wanted to include on the consonant chart some of the terms traditionally used for describing features, and perhaps also to include some of the notions of a feature hierarchy. With that in mind I suggested that there should be cover terms above the places of articulation, Labial above bilabial and labiodental, Coronal above dental, alveolar, post-alveolar, and retroflex, Dorsal above palatal, velar and uvular, and Radical above pharyngeal and (potentially) epiglottal. If this had gone through, I would have tried for an even more hierarchical organization. But it was not to be. Inherent conservatism triumphed (perhaps quite rightly) over something that is not yet fully established and agreed; I had, for example, considered Dorsal to include palatal on the grounds that what most IPA phoneticians call "palatal" is an articulation defined in the 1949 *Principles of the IPA* as having a tongue position similar to that in the cardinal vowel [i] in which it is the part of the tongue below the hard palate, and not the blade of the tongue that is the active articulator. But many phonologists consider palatal consonants to involve the blade of the tongue, and therefore to be Coronal (Keating 1988).

I have tried to argue so far that the Association views its set of symbols as having a phonological basis. But others might disagree. Thus Gösta Bruce, who was the coordinator of the suprasegmentals section, said in his preliminary report summarizing the views of those interested in this section: "Assuming with J.C. Catford (Ann Arbor) that the primary purpose of the IPA is to provide symbols and diacritics for the notation of primarily phonetic - and *not* [his emphasis] phonological - entities, the kind of suprasegmental notion we are aiming at will be diacritic symbols for suprasegmental categories added to a segmental, phonetic transcription." Nevertheless, Bruce then goes on to note that: "The proposed phonetic notation must, however, be related to the needs of phonology, so that phonological surface contrasts in the languages of the world can be symbolized." Furthermore he joins others in pointing out that "it is usually not

possible or meaningful to create a transcription which is completely independent of some linguistic interpretation. This means that a suprasegmental transcription somehow has to be model-based and based on at least some knowledge of the language to be transcribed." (The above quotations are all from documents informally circulated at the Convention.)

Members of the Association are thus somewhat schizoid in their view of phonetic transcription. There is still a lingering spirit of the founding fathers such as Jespersen, and, only a little later, Jones, neither of whom recognized Trubetzkoy's distinction between phonetics, the continuous substance of the sounds that signify meanings, and phonology, the discrete, formal basis of the images that combine to form concepts. It was not that Jones and Jespersen did not acknowledge the distinction between Saussure's "langue" and "parole," which formed the basis for Trubetzkoy's view. It was rather that they preferred to look at the world in a different way. One of Jones's major works is called *An Outline of English Phonetics*, although it is concerned with what we would now call phonemics. The book describes both the set of items that can contrast (the phonemes) and the actual sounds (the allophones) that occur in particular contexts. Jones viewed phonetics as *containing* phonemics, making the phoneme a unit within the more encompassing notion of a phonetic description of a language.

Probably very few of the phoneticians at Kiel would still use the term "phonetics" in exactly the same way as Jones. But most of them would hold to something like his view of phonetic transcription. The contemporary view of possible types of transcription is still basically that of Abercrombie (1964). Much of what follows in this section is simply a paraphrase of this classic paper. Abercrombie's terms are summarized in Figure 2.

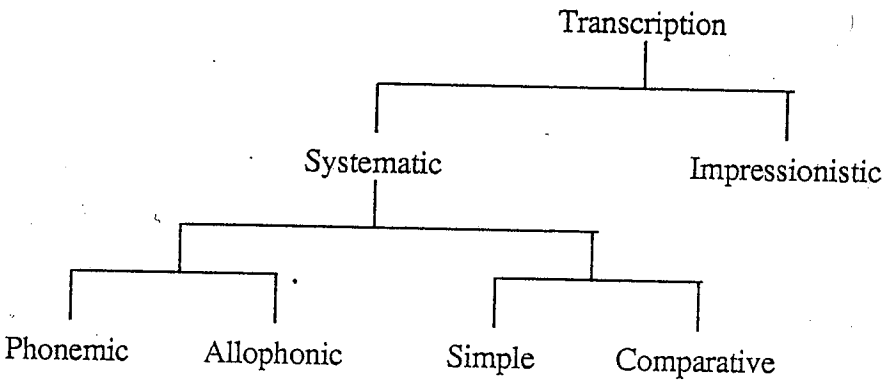

Figure 2. A schematic representation of the terms used by Abercrombie (1964) for different types of phonetic transcription.

The first distinction is between a transcription which in some way reflects the systematic, linguistic, facts of the utterance being described, as opposed to one in which the symbols are used just to provide an impressionistic record of the sounds as heard — the kind of record that might be made by a linguist totally without any preconceptions hearing the first few words in a language that had never been transcribed before. In theory, an impressionistic transcription is one in which the symbols represent intersections of general phonetic categories.

Few of us could ever make a totally impressionistic transcription. Generally, within a few minutes of starting to transcribe a language we have not worked on before, we begin to use symbols that rely on our linguistic hunches and preconceptions. We very soon stop noting small differences between repetitions of the same utterance, particularly if they are of the kind of which the speaker seems to be unaware. Virtually the only occasion when a completely impressionistic transcription is necessary is in the investigation of an infant's pre-linguistic babbling.

Within the class of systematic (phonetic) transcriptions there are two independent divisions. First a transcription may be phonemic or allophonic. There is little point in discussing here the meaning of the classic term phoneme, as current phonological theories are largely in a different domain. We may take it that a phonemic transcription is one in which, as Abercrombie (1964:19) says, "the smallest possible number of different letters [symbols] ... distinguish unambiguously all words of different sound in the language." An allophonic transcription is one that uses a larger number of distinct symbols, so that it can differentiate among systematic, allophonic, differences in the sounds of an utterance.

The IPA tradition for the last 60 or 70 years has been that phonemic and allophonic transcriptions are related to each other by a set of conventions (we would nowadays say "rules") that, by their application, convert the one form of transcription into the other. A phonemic transcription plus its conventions conveys exactly the same information as an allophonic transcription. The difference between these two types of transcription is simply whether the detailed phonetic information is made explicit within the transcription itself, or within the set of rules that accompanies the transcription.

The other kind of distinction among systematic phonetic transcriptions is that between a simple and a comparative use of particular symbols. The simplest IPA symbols are those that are ordinary letters of the roman alphabet. More exotic letters are often used to convey greater phonetic detail. As Abercrombie (1964:20) puts it: "romanic shapes have, by tradition, acquired a more *general* phonetic value than the exotic shapes which are alternatives to them." Again the IPA

tradition allows phoneticians to make a simple transcription (which may, or may not, be phonemic), using the most general symbols possible in the circumstances, and giving an account of the values of the symbols in the set of conventions (rules) accompanying the text; alternatively, phoneticians may use more specific symbols and have less information in the accompanying set of conventions. The use of more specific symbols is often a convenient way of expressing part of what phonologists regard as phonetic interpretation conventions (Keating 1985). Abercrombie (1964) uses the term comparative for this type of transcription on the grounds that the use of more specific symbols implicitly reflects a comparison between the general phonetic value of the simple symbols, and the more precise value of the exotic symbols.

We should also note that if we follow the views outlined above concerning the nature of transcription (as many members of the IPA would do), then the term "systematic phonetic transcription" is a cover term for several types of transcription, including a simple phonemic transcription, and, by extension, current phonological representations. Once again it seems worthwhile emphasizing to phonologists that many phoneticians think of phonetics as, in some extended Jonesian sense, including phonology. Alternatively, this is simply a restatement of the view that phonology and phonetics are inextricably intertwined. It is true that phonology must rest on phonetic observations. But it is equally true that most phonetic observations are made in terms of a phonological framework. The only pure phonetic description is the instrumental data derivable from a high quality recording. As soon as the data is segmented or described in any way, then phonological considerations are bound to be present.

Next I will turn to another point that the IPA leaves unresolved. This is the question of whether there is a finite set of speech sounds, a matter that has been cogently discussed in a recent paper by Lindblom (1990). Most members of the Association would probably answer that there is such a set, and that it can be determined by observing the sounds to be found in the world's languages. They would thus reject Lindblom's notion that the study of what is a possible speech sound can only be pursued anthropophonically – starting from the study of what the human vocal organs are capable of producing (and the auditory system is capable of identifying). Of course there are prominent members of the Association, including J.C. Catford who gave us the term anthropophonics (Catford 1977), who clearly believe in a general phonetics divorced from the study of the sounds of languages. I do not know whether they believe that there is a finite set of sounds that could be used in languages, in the sense that they could be part of a linguistic system. But the majority of phoneticians probably would agree that a very substantial proportion of the possible sounds of the world's languages have now been recorded, and that, although there are doubtless a number of sounds as yet unobserved, this number is becoming smaller every year. As

we working linguistic phoneticians know, it is becoming harder and harder to mine the phonetic dross and come up with something new. There seems to be no danger that "the accumulation of more data will eventually make the IPA and various D[istinctive] F[eature] frameworks unmanageable and ultimately bring about their collapse." (Lindblom, 1990).

It is nevertheless true that the description of a very large proportion of the sounds of languages (or, a description of the features that characterize these sounds) is no substitute for an explanation of why these sounds (or these features) should be used and others not. Lindblom is correct in emphasizing that an explanation of these facts, and of nearly all the observations of phonology, must come from outside linguistics. An explanation of something is an account of that event in terms of general principles that are not themselves dependent on the event. This is, of course, what large numbers of phoneticians have been trying to do for years, to explain phonology in terms of the general physiological principles of articulatory phonetics or the properties of the auditory system that permit us to identify speech sounds. But we are at the moment a long way from being able to show whether the set of possible speech sounds is finite or not, and whether it has a particular form.

Very much related to the problem of deciding whether there is a finite set of speech sounds is the problem of deciding whether a sound in one language is the same as a sound in another. Most phoneticians would agree that it is possible to make such decisions, but the basis for them is by no means obvious. In answering the question whether a sound in one language is the same as that in another, one cannot test whether the use of the one rather than the other would change the meaning of a word. The two sounds in question do not exist in the same language, so any subtle differences between them cannot be heard in the same linguistic context. The best that one can do is to ask whether, if the one sound were to be used in the other language, it would cause the user to be considered as a non-native, or deviant speaker. But this is not the same as asking whether the two sounds are different in the sense that, if they did occur in the same language could they be used to distinguish words. Take the case of dental versus interdental [θ], for example, which we know (Ladefoged 1979) are used consistently differently by British (RP) and American (Californian) speakers of English; 90% of RP speakers use a dental [θ] without tongue protrusion in initial position, for example in 'think' and 'thin', whereas 90% of Californians have an interdental [θ], with the tongue clearly protruding between the teeth in these words. Nevertheless the use of an interdental [θ] by a British RP speaker is not regarded as marked in any way. It would certainly not cause the speaker to be considered to be a foreigner. So these two variants can presumably be considered to be the same sound.

The difference between bilabial [ɸ] and labiodental [f] is non-contrastive in English, and in that respect has the same status as the difference between dental and interdental [θ] in English. Most speakers of English use labiodental [f], but use of bilabial [ɸ] is not regarded as marked for speakers of any kind of English. I habitually use [ɸ] and [β] in virtually all contexts in which others use [f] and [v]; but nobody has ever commented on it, even in phonetic circles discussing accents. But we have long known that bilabial and labiodental fricatives are phonologically distinct in many languages (e.g. Ewe; Westermann 1930), so we regard them as distinct speech sounds. Given these facts, why should dental and interdental [θ] not be regarded as distinct speech sounds, just because no known languages uses them contrastively?

Cases of differences that are often noticed as socially marked but are probably never distinct speech sounds within a language also occur. For example the Canadian vs. western American pronunciation of the vowel in 'out', or various shades of London vs RP pronunciations of the vowel in 'say', are clearly marked for those who know the speech of these groups. But these small variations in diphthongal quality are not known to be phonologically contrastive in any language. It may be that in order to be contrastive, a difference has to be above some auditory threshold. But for most speech sounds we do not know what this threshold is, nor why bilabial [ɸ] vs labiodental [f] is above it, noe whether dental vs interdental [θ] is not. There is no principled way in which we can determine whether two sounds in different languages are sufficiently similar to be considered to be the same sound.

We have already noted that the general atmosphere at the Kiel convention was one of pragmatism. We were there to make practical changes and not to argue theoretical points. Certainly issues of the philosophy of science were very far from our minds. But behind even the most mundane description there are philosophical assumptions about the nature of knowledge. Facts do not exist in isolation but only as part of an interpretive whole, as has been cogently argued recently by Rosaldo (1989). His view is that we can understand what we are observing only by recognizing that we are part of what we are observing. Nowhere is this truer than in linguistics. For us there is no absolute scientific reality. Once a language has been learned one is living in a room with a limited view. Even the greatest polyglot, who can think clearly in a dozen languages, has only a limited set of windows through which the world can be observed. There is no way in which one can answer questions such as which speech sounds are most alike, or what articulations are most difficult to make without being severely affected by one's linguistic biases. A Navaho can make an ejective more easily than a dental fricative. A !Xóõ Bushman can distinguish over 80 different clicks, but would have problems with [v] and [w].

It may be theoretically possible to set up a procedure for measuring the degree of articulatory effort involved in producing a sound. One might, for example, claim that sounds that require a greater deviation from the neutral position required a greater degree of articulatory effort, as Lindblom (1990) has advocated. But procedures for making measurements of this kind are virtually impossible to put into practice. Even if we knew whether the neutral position of the speech organs was itself a language dependent notion, there is virtually no way in which we can assess whether a movement of the lips required more or less effort than a movement of the tongue; or even whether raising one part of the tongue is more difficult than lowering another. Theoretically we could assess the calories involved in producing each action, but this is beyond the scope of present day physiological techniques. Phonetic principles based on pseudo procedures of this sort are uninteresting, as they are not scientifically testable.

It is not even technically possible to devise a measure of auditory distinctiveness among speech sounds without becoming entangled in the problem of observer bias; which speech sounds are most distinct depends on the observer's linguistic background. Even skilled phoneticians will fail to recognize auditory distinctions to which they are completely unaccustomed.- The nearest approach to an unbiased observer is a new born infant. Observations of the order in which sounds are learned by native speakers of different languages are of some relevance in investigating questions of articulatory ease and auditory distinctiveness. The fact that Bushman children learn to articulate click sounds later than many other consonants (Traill, p.c.) presumably shows that these sounds are in some sense harder to say. But this source of evidence has its own problems. The semantic weight and frequency of occurrence of the words containing these sounds will affect the rate of learning; and it is always difficult to tell whether a sound is learned later because it is more difficult to produce or more difficult to hear. In addition, even infants are not living in an unbiased phonetic environment. We cannot devise a universal hierarchy of articulatory difficulty or auditory similarity from scattered observations of very beginning language acquisition in discrete languages, none of which uses more than a small proportion of the total available sounds.

For the phonetician there is no universal truth independent of the observer. What we choose to represent in our phonetic transcriptions is a product of our biases, just as our whole view of language and society depends on our observational stance. Elsewhere (Ladefoged 1982) I have argued that language is like morality in that it is a property of an institution, not of an individual mind. I also suggested that, just as a moral code may be seen as the product of conflicting forces such as the pressure for individual liberty versus the prosperity of the society as a whole, so speech communication depends on the balance between the need for auditory distinctiveness and the desirability of articulatory economy. But when looking at morality cross-culturally we find that

there is no universally applicable notion of individual liberty, nor of what is needed to make a society prosperous. And, just as there is no absolute morality valid for all cultures, so there is no linguistically useful notion of auditory distinctivesness or articulatory economy in absolute terms. There is no phonetic absolute valid for all languages. There are a myriad different events that might have been speech sounds needing phonetic representation.

This leaves us with three possibilities. We could either follow the earlier linguists such as Hockett (1955) and Joos (1950), who advocated ad hoc descriptions for each language. Hockett thought it "impossible to supply any general classificatory frame of reference from which terms can be drawn in a completely consistent way for the discussion of every individual language." The second possibility is that we could adopt the anthropophonic approach advocated by Lindblom (1990). Taken to its extreme, which Lindblom does not do, but which he logically should do, this would lead to considering as distinct speech sounds every possible articulation, including presumably every conceivable vowel at every conceivable pitch and at every conceivable loudness and with every conceivable voice quality. This does not seem an appropriate set of data to study if we are concerned with linguistic phonetics. Nor would the situation be sufficiently simplified if we restricted ourselves to studying the dimensions in what Lindblom (1990) terms a 'universal phonetic space.' There would still be a plethora of dimensions, including all the diverse activities of the different parts of the glottis, the epiglottis and root of the tongue, the gnashing of the teeth, the vibrations of the cheeks, and the twisting of the lips.

Many phoneticians (myself included) would agree with Lindblom's view that it is best to consider contrasting sounds as occupying ranges within each of the phonetic dimensions (parameters, features, scales, or however else the variables are named). Keating (1984) has suggested that certain ranges form major phonetic categories within a given dimension; and Stevens (1989 and references therein) has discussed why certain ranges are more favored by languages than others. All these views are in some form part of the stock in trade of most phoneticians. But none of them is likely to be able to answer the question: what is a possible speech sound?

The third possibility, listing the speech sounds that have been observed in all the world's languages, is all that is left to us It is a useful approach for those of us concerned with studying linguistic phonetics. If we take it that we now know virtually all the possible sounds, we can then start looking for reasons why this set of sounds is all that can be found in our circumstances. We must assume that there is some balance between the various functions such as articulatory ease, auditory distinctiveness and other factors that lead to languages being what they

are. We can then look at the data and try to derive what these functions must be. It is the biased observed data that will lead us to the locally appropriate principles that determine the phonetic structure of languages. There is no way in which we can start from a set of principles that will lead us to delimiting speech sounds. It is not possible to begin by considering the nature of functions such as articulatory ease and auditory phonetic similarity in a language independent way. Of course there are a few valuable general constraints of articulatory and auditory physiology that will grossly limit the class of possible speech sounds; but these will not help us unravel the delicate locally woven fabric of individual languages, so that we can understand why things are the way that they are. All we can do is observe as many languages as possible, describe the data in terms of categories that seem appropriate for the situation, derive the principles that produce these data, and wonder at what else might have been.

Where, then, does this leave the IPA? Is it bound to be an unscientific enterprise? If one believes that there is such a thing as absolute scientific truth, the answer is yes. But this is not an appropriate view of science. Science, like beauty, is in the eye of the beholder; and the comment made by Keats (1820) on the possession of beauty is equally true of scientific knowledge:

> "When old age shall this generation waste,
> Thou shalt remain, in midst of other woe
> Than ours, a friend to man, to whom thou say'st
> 'Beauty is truth, truth beauty,' – that is all
> Ye know on earth, and all ye need to know."

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