# SOUND PATTERNS IN LANGUAGE

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There used to be and to some extent still is a feeling among linguists that the psychology of a language is more particularly concerned with its grammatical features, but that its sounds and its phonetic processes belong to a grosser physiological substratum. Thus, we sometimes hear it said that such phonetic processes as the palatalizing of a vowel by a following *i* or other front vowel ("umlaut") or the series of shifts in the manner of articulating the old Indo-European stopped consonants which have become celebrated under the name of "Grimm's Law" are merely mechanical processes, consummated by the organs of speech and by the nerves that control them as a set of shifts in relatively simple sensorimotor habits. It is my purpose in this paper, as briefly as may be, to indicate that the sounds and sound processes of speech cannot be properly understood in such simple, mechanical terms.

Perhaps the best way to pose the problem of the psychology of speech sounds is to compare an actual speech sound with an identical or similar one not used in a linguistic context. It will become evident almost at once that it is a great fallacy to think of the articulation of a speech sound as a motor habit that is merely intended to bring about a directly significant result. A good example of superficially similar sounds is the *wh* of such a word as *when*, as generally pronounced in America (i.e., voiceless *w* or, perhaps more accurately analyzed, aspiration plus voiceless *w* plus voiced *w*-glide), and the sound made in blowing out a candle, with which it has often been compared. We are not at the present moment greatly interested in whether these two articulations are really identical or, at the least, very similar. Let us assume that a typically pronounced *wh* is identical with the sound that results from the expulsion of breath through pursed lips when a candle is blown out. We shall assume identity of both articulation and quality of perception. Does this identity amount to a psychological identity of the two processes? Obviously not. It is worth pointing out, in what may seem pedantic detail, wherein they differ.

1. The candle-blowing sound is a physical by-product of a directly functional act, the extinguishing of the candle by means of a peculiar method of producing a current of air. So far as normal human interest is concerned, this sound serves merely as a sign of the blowing out, or attempted blowing out, itself. We can abbreviate our record of the facts a little and say that the production of the candle-blowing sound is a directly functional act. On the other hand, the articulation of the *wh*-sound in such a word as *when* has no direct functional value; it is merely a link in the construction of a symbol, the articulated or perceived word *when*, which in turn assumes a function, symbolic at that, only when it is experienced in certain linguistic contexts, such as the saying or hearing of a sentence like *When are you coming?* In brief, the candle-blowing *wh* means business; the speech sound *wh* is stored-up play which can eventually fall in line in a game that merely refers to business. Still more briefly, the former is practice; the latter, art.

2. Each act of blowing out a candle is functionally equivalent, more or less, to every other such act; hence the candle-blowing *wh* is, in the first instance, a sign for an act of single function. The speech sound *wh* has no singleness, or rather primary singleness, of reference. It is a counter in a considerable variety of functional symbols, e.g. *when, whiskey, wheel.* A series of candle-blowing sounds has a natural functional and contextual coherence. A series of *wh*-sounds as employed in actual speech has no such coherence; e.g., the series *wh*(*en*), *wh*(*iskey*), *wh*(*eel*) is non-significant.

3. Every typical human reaction has a certain range of variation and, properly speaking, no such reaction can be understood except as a series of variants distributed about a norm or type. Now the candle-blowing *wh* and the speech sound *wh* are norms or types of entirely distinct series of variants.

First, as to acoustic quality. Owing to the fact that the blowing out of a candle is a purely functional act, its variability is limited by the function alone. But, obviously, it is possible to blow out a candle in a great number of ways. One may purse the lips greatly or only a little; the lower lip, or the upper lip, or neither may protrude; the articulation may be quite impure and accompanied by synchronous articulations, such as a *x*-like (velar spirant) or *sh*-like sound. None of these and other variations reaches over into a class of reactions that differs at all materially from the typical candle-blowing *wh*. The variation of *wh* as speech sound is very much more restricted. A *when* pronounced,

for instance, with a *wh* in which the lower lip protruded or with a *wh* that was contaminated with a *sh*-sound would be felt as distinctly "off color." It could be tolerated only as a joke or a personal speech defect. But the variability of *wh* in language is not only less wide than in candle-blowing, it is also different in tendency. The latter sound varies chiefly along the line of exact place (or places) of articulation, the former chiefly along the line of voicing. Psychologically *wh* of *when* and similar words is related to the *w* of *well* and similar words. There is a strong tendency to minimize the aspiration and to voice the labial. The gamut of variations, therefore, runs roughly from *hW* (I use *W* for voiceless *w*) to *w*. Needless to say, there is no tendency to voicing in the candle-blowing *wh*, for such a tendency would contradict the very purpose of the reaction, which is to release a strong and unhampered current of air.

Second, as to intensity. It is clear that in this respect the two series of variations differ markedly. The normal intensity of the candle-blowing sound is greater than that of the linguistic *wh;* this intensity, moreover, is very much more variable, depending as it does on the muscular tone of the blower, the size of the flame to be extinguished, and other factors. All in all, it is clear that the resemblance of the two *wh*-sounds is really due to an intercrossing of two absolutely independent series, as of two independent lines in space that have one point in common.

4. The speech sound *wh* has a large number of associations with other sounds in symbolically significant sound-groups, e.g. *wh-e-n, wh-i-s-k-ey, wh-ee-l.* The candle-blowing sound has no sound associations with which it habitually coheres.

5. We now come to the most essential point of difference. The speech sound *wh* is one of a definitely limited number of sounds (e.g. *wh, s, t, l, i,* and so on) which, while differing qualitatively from one another rather more than does *wh* from its candle-blowing equivalent, nevertheless belong together in a definite system of symbolically utilizable counters. Each member of this system is not only characterized by a distinctive and slightly variable articulation and a corresponding acoustic image, but also—*and this is crucial*—by a psychological aloofness from all the other members of the system. The relational gaps between the sounds of a language are just as necessary to the psychological definition of these sounds as the articulations and acoustic images which are customarily used to define them. A

sound that is not unconsciously felt as "placed"[1] with reference to other sounds is no more a true element of speech than a lifting of the foot is a dance step unless it can be "placed" with reference to other movements that help to define the dance. Needless to say, the candle-blowing sound forms no part of any such system of sounds. It is not spaced off from nor related to other sounds—say the sound of humming and the sound of clearing one's throat—which form with it a set of mutually necessary indices.

It should be sufficiently clear from this one example—and there are of course plenty of analogous ones, such as *m* versus the sound of humming or an indefinite series of timbre-varying groans versus a set of vowels—how little the notion of speech sound is explicable in simple sensorimotor terms and how truly a complex psychology of association and pattern is implicit in the utterance of the simplest consonant or vowel. It follows at once that the psychology of phonetic processes is unintelligible unless the general patterning of speech sounds is recognized. This patterning has two phases. We have been at particular pains to see that the sounds used by a language form a self-contained system which makes it impossible to identify any of them with a non-linguistic sound produced by the "organs of speech," no matter how great is the articulatory and acoustic resemblance between the two. In view of the utterly distinct psychological backgrounds of the two classes of sound production it may even be seriously doubted whether the innervation of speech-sound articulation is ever actually the same type of physiological fact as the innervation of "identical" articulations that have no linguistic context. But it is not enough to pattern off all speech sounds as such against other sounds produced by the "organs of speech." There is a second phase of sound patterning which is more elusive and of correspondingly greater significance for the linguist. This is the inner configuration of the sound system of a language, the intuitive "placing" of the sounds with reference to one another. To this we must now turn.

Mechanical and other detached methods of studying the phonetic elements of speech are, of course, of considerable value, but they have sometimes the undesirable effect of obscuring the essential facts of speech-sound psychology. Too often an undue importance is attached to minute sound discriminations as such; and too often phoneticians

[1] This word has, of course, nothing to do here with "place of articulation." One may feel, for instance, that sound A is to sound B as sound X is to sound Y without having the remotest idea how and where any of them is produced.

do not realize that it is not enough to know that a certain sound occurs in a language, but that one must ascertain if the sound is a typical form or one of the points in its sound pattern, or is merely a variant of such a form. There are two types of variation that tend to obscure the distinctiveness of the different points in the phonetic pattern of a language. One of these is individual variation. It is true that no two individuals have precisely the same pronunciation of a language, but it is equally true that they aim to make the same sound discriminations, so that, if the qualitative differences of the sounds that make up A's pattern from those that make up B's are perceptible to a minute analysis, the relations that obtain between the elements in the two patterns are the same. In other words, the patterns are the same pattern. A's *s*, for instance, may differ quite markedly from B's *s*, but if each individual keeps his *s* equally distinct from such points in the pattern as *th* (of *think*) and *sh* and if there is a one to one correspondence between the distribution of A's *s* and that of B's, then the difference of pronunciation is of little or no interest for the phonetic psychology of the language. We may go a step further. Let us symbolize A's and B's pronunciations of *s*, *th*, and *sh* as follows:

| | | | |
|---|---|---|---|
| A: | *th* | *s* | *sh* |
| B: | $th_1$ $s_1$ | $sh_1$ | |

This diagram is intended to convey the fact that B's *s* is a lisped *s* which is not identical with his interdental *th*, but stands nearer objectively to this sound than to A's *s;* similarly, B's *sh* is acoustically somewhat closer to A's *s* than to his *sh*. Obviously we cannot discover B's phonetic pattern by identifying his sounds with their nearest analogues in A's pronunciation, i.e. setting $th_1$ = *th*, $s_1$ = variant of *th*, $sh_1$ = *s*. If we do this, as we are quite likely to do if we are obsessed, like so many linguists, by the desire to apply an absolute and universal phonetic system to all languages, we get the following pattern analysis:

| | | | |
|---|---|---|---|
| A: | *th* | *s* | *sh* |
| | ∧ | | |
| B: | $th_1$ $s_1$ | $sh_1$ | — |

which is as psychologically perverse as it is "objectively" accurate. Of course the true pattern analysis is:

| | | | |
|---|---|---|---|
| A: | *th* | *s* | *sh* |
| B: | $th_1$ | $s_1$ | $sh_1$ |

for the objective relations between sounds are only a first approximation to the psychological relations which constitute the true phonetic pattern. The size of the objective differences *th*—*s*, *s*—*sh*, $th_1$—$s_1$, $s_1$—$sh_1$, *th*—$s_1$, $s_1$—*s*, *s*—$sh_1$, and $sh_1$—*sh* does not correspond to the psychological "spacing" of the phonemes *th*, *s*, and *sh* in the phonetic pattern which is common to A and B.

The second type of variation is common to all normal speakers of the language and is dependent on the phonetic conditions in which the fundamental sound ("point of the pattern") occurs. In most languages, what is felt by the speakers to be the "same" sound has perceptibly different forms as these conditions vary. Thus, in (American) English there is a perceptible difference in the length of the vowel *a* of *bad* and *bat*, the *a*-vowel illustrated by these words being long or half-long before voiced consonants and all continuants, whether voiced or unvoiced, but short before voiceless stops. In fact, the vocalic alternation of *bad* and *bat* is quantitatively parallel to such alternations as *bead* and *beat*, *fade* and *fate*. The alternations are governed by mechanical considerations that have only a subsidiary relevance for the phonetic pattern. They take care of themselves, as it were, and it is not always easy to convince natives of their objective reality, however sensitive they may be to violations of the unconscious rule in the speech of foreigners. It is very necessary to understand that it is not because the objective difference is too slight to be readily perceptible that such variations as the quantitative alternations in *bad* and *bat*, *bead* and *beat*, *fade* and *fate* stand outside of the proper phonetic pattern of the language (e.g., are not psychologically parallel to such qualitative-quantitative alternations as *bid* and *bead*, *fed* and *fade*, or to such quantitative alternations as German *Schlaf* and *schlaff*, Latin *ăra* and *ārā*), but that the objective difference is felt to be slight precisely because it corresponds to nothing significant in the inner structure of the phonetic pattern. In matters of this kind, objective estimates of similarity or difference, based either on specific linguistic habits or on a generalized phonetic system, are utterly fallacious. As a matter of fact, the mechanical English vocalic relation *bad*: *bat* would in many languages be quite marked enough to indicate a relation of distinct points of the pattern, while the English pattern relation *-t*: *-d*, which seems so self-evidently real to us, has in not a few other languages either no reality at all or only a mechanical, conditional one. In Upper Chinook, for instance, *t*: *d* exists objectively but not psychologically; one says, e.g., *inat* 'across,' but *inad* before

words beginning with a vowel, and the two forms of the final consonant are undoubtedly felt to be the "same" sound in exactly the same sense in which the English vowels of *bad* and *bat* are felt by us to be identical phonetic elements. The Upper Chinook *d* exists only as a mechanical variant of *t;* hence this alternation is not the same psychologically as the Sanskrit sandhi variation *-t: -d.*

Individual variations and such conditional variations as we have discussed once cleared out of the way, we arrive at the genuine pattern of speech sounds. After what we have said, it almost goes without saying that two languages, A and B, may have identical sounds but utterly distinct phonetic patterns; or they may have mutually incompatible phonetic systems, from the articulatory and acoustic standpoint, but identical or similar patterns. The following schematic examples and subjoined comments will make this clear. Sounds which do not properly belong to the pattern or, rather, are variants within points of the pattern are put in parentheses. Long vowels are designated as *a·; η* is *ng* of *sing; θ* and *δ* are voiceless and voiced interdental spirants; *x* and *γ* are voiceless and voiced guttural spirants; ' is glottal stop; ' denotes aspirated release; *ɛ* and *ɔ* are open *e* and *o*.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| A: | *a* | (*ɛ*) | (*e*) | *i* | *u* | (*o*) | (*ɔ*) | |
| | (*a·*) | (*ɛ·*) | (*e·*) | *i·* | *u·* | (*o·*) | (*ɔ·*) | |
| | *'* | *h* | *w* | *y* | *l* | *m* | *n* | (*η*) |
| | *p* | *t* | *k* | | | | | |
| | *p'* | *t'* | *k'* | | | | | |
| | (*b*) | (*d*) | (*g*) | | | | | |
| | *f* *θ* | *s* | *x* | | | | | |
| | (*v*) (*δ*) | (*z*) | (*γ*) | | | | | |
| but B: | *a* | *ɛ* | *e* | *i* | *u* | *o* | *ɔ* | |
| | (*a·*) | (*ɛ·*) | (*e·*) | (*i·*) | (*u·*) | (*o·*) | (*ɔ·*) | |
| | (') | *h* | (*w*) | (*y*) | (*l*) | *m* | *n* | *η* |
| | *p* | *t* | *k* | | | | | |
| | (*p'*) | (*t'*) | (*k'*) | | | | | |
| | *b* | *d* | *g* | | | | | |
| | (*f*) (*θ*) | *s* | (*x*) | | | | | |
| | *v* *δ* | *z* | *γ* | | | | | |

We will assume for A and B certain conditional variants which are all of types that may be abundantly illustrated from actual languages. For A:

1. $\epsilon$ occurs only as palatalized form of $a$ when following $y$ or $i$. In many Indian languages, e.g., $y\epsilon = ya$.

2. $e$ is dropped from $i$-position when this vowel is final. Cf. such mechanical alternations as Eskimo *-e*: *-i-t*.

3. $o$ is dropped from $u$-position when this vowel is final. Cf. 2.

4. $\mathfrak{o}$ occurs only as labialized form of $a$ after $w$ or $u$. Cf. 1. (In Yahi, e.g., *wɔwi* 'house' is objectively correct, but psychologically wrong. It can easily be shown that this word is really *wawi* and "feels" like a rhyme to such phonetic groups as *lawi* and *bawi;* short $\mathfrak{o}$ in an open syllable is an anomaly, but $\mathfrak{o}'$ is typical for all Yana dialects, including Yahi.)

5. $\eta$ is merely $n$ assimilated to following $k$, as in Indo-European.

6. $b$, $d$, $g$, $v$, $z$, $\delta$, $\gamma$ are voiced forms of $p$, $t$, $k$, $f$, $s$, $\theta$, $x$ respectively when these consonants occur between vowels before the accent (cf. Upper Chinook *wa'pul* 'night': *wabu'lmax* 'nights'). As the voiced consonants can arise in no other way, they are not felt by the speakers of A as specifically distinct from the voiceless consonants. They feel sharply the difference between $p$ and $p'$, as do Chinese, Takelma, Yana, and a host of other languages, but are not aware of the alternation $p$: $b$.

And for B:

1. Long vowels can arise only when the syllable is open and stressed. Such alternations as *ma''la*: *u''-mala* are not felt as involving any but stress differences. In A, *ma'la* and *mala* are as distinct as Latin "apples" and "bad" (fem.).

2. ' is not an organic consonant, but, as in North German, an attack of initial vowels, hence *'a-* is felt to be merely *a-*. In A, however, as in Semitic, Nootka, Kwakiutl, Haida, and a great many other languages, such initials as *'a-* are felt to be equivalent to such consonant + vowel groups as *ma-* or *sa-*. Here is a type of pattern difference which even experienced linguists do not always succeed in making clear.

3. $w$ and $y$ are merely semi-vocalic developments of $u$ and $i$. Cf. French *oui* and *hier*. In A, $w$ and $y$ are organically distinct consonants. Here again linguists often blindly follow the phonetic feeling of their own language instead of clearly ascertaining the behavior

of the language investigated. The difference, e.g., between *aua* and *awa* is a real one for some languages, a phantom for others.

4. *l* arises merely as dissimilated variant of *n*.

5. *p'*, *t'*, *k'* are merely *p*, *t*, *k* with breath release, characteristic of B at the end of a word, e.g. *ap-a*: *ap'*. This sort of alternation is common in aboriginal America. It is the reverse of the English habit: *tame* with aspirated *t* (*t'e'ᵉm*) but *hate* with unaspirated, or very weakly aspirated, release (*heᵉt*).

6. *f*, *θ*, and *x* similarly arise from the unvoicing of final *v*, *δ* and *γ*; e.g., *av-a*: *af*. *z* and *s* also alternate in this way, but there is a true *s* besides. From the point of view of B, *s* in such phonems as *sa* and *usa* is an utterly distinct sound, or rather point in the phonetic pattern, from the objectively identical *as* which alternates with *az-a*.[2]

The true or intuitively felt phonetic systems (patterns) of A and B, therefore, are:

[2] If B ever develops an orthography, it is likely to fall into the habit of writing *az* for the pronounced *as* in cases of type *az-a*: *as*, but *as* in cases of type *as-a*: *as*. Philologists not convinced of the reality of phonetic patterns as here conceived will then be able to "prove" from internal evidence that the change of etymological *v*, *z*, *δ*, *γ* to *-f*, *-s*, *-θ*, *-x* did not take place until after the language was reduced to writing, because otherwise it would be "impossible" to explain why *-s* should be written *-z* when there was a sign for *s* ready to hand and why signs should not have come into use for *f*, *θ*, and *x*. As soon as one realizes, however, that "ideal sounds," which are constructed from one's intuitive feeling of the significant relations between the objective sounds, are more "real" to a naive speaker than the objective sounds themselves, such internal evidence loses much of its force. The example of *s* in B was purposely chosen to illustrate an interesting phenomenon, the crossing in a single objective phoneme of a true element of the phonetic pattern with a secondary form of another such element. In B, e.g., objective *s* is a pool of cases of "true *s*" and "pseudo-*s*." Many interesting and subtle examples could be given of psychological difference where there is objective identity, or similarity so close as to be interpreted by the recorder as identity. In Sarcee, an Athabaskan language with significant pitch differences, there is a true middle tone and a pseudo-middle tone which results from the lowering of a high tone to the middle position because of certain mechanical rules of tone sandhi. I doubt very much if the intuitive psychology of these two middle tones is the same. There are, of course, analogous traps for the unwary in Chinese. Had not the Chinese kindly formalized for us their intuitive feeling about the essential tone analysis of their language, it is exceedingly doubtful if our Occidental ears and kymographs would have succeeded in discovering the exact patterning of Chinese tone.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A: | *a* | | | | | | *i* | | *u* | | | | | |
| | *a·* | | | | | | *i·* | | *u·* | | | | | |
| | | ' | | | *h* | | | *w* | *y* | | *l* | *m* | *n* | |
| | | *p* | | *t* | | *k* | | | | | | | | |
| | | *p'* | | *t'* | | *k'* | | | | | | | | |
| | | *f* | | *θ* | | *x* | *s* | | | | | | | |
| B: | *a* | *ɛ* | | *e* | | | *i* | | *u* | | | *o* | *ɔ* | |
| | | | | | *h* | | | | | | | *m* | *n* | *ŋ* |
| | | *p* | | *t* | | *k* | | | | | | | | |
| | | *b* | | *d* | | *g* | | | | | | | | |
| | | | | *s* | | | | | | | | | | |
| | | *v* | | *δ* | *ž* | *γ* | | | | | | | | |

which show the two languages to be very much more different phonetically than they at first seemed to be.

The converse case is worth plotting too. C and D are languages which have hardly any sounds in common but their patterns show a remarkable one to one correspondence. Thus:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| C: | *a* | *ɛ* | *i* | *u* | | | |
| | *a·* | *ɛ·* | | | | | |
| | *h* | *w* | *y* | *l* | *m* | *n* | |
| | *p* | *t* | *k* | *q* (velar k) | | | |
| | *b* | *d* | *g* | *ġ* (velar g) | | | |
| | *f* | *s* | *x* | *ẋ* (velar x) | | | |
| D: | *ä* | *e* | *i* | *ü* | | | |
| | *ä·* | *e·* | | | | | |
| | *h* | *v* | *j*[3] | *r* | *m* | *η* | |
| | *p'* | *t'* | *k'* | *q'* | | | |
| | *β*[4] | *δ* | *γ* | *γ* (velar *γ*) | | | |
| | *f* | *š* | *x̂*[5] | *ḣ* (laryngeal *h*) | | | |

[3] As in French *jour*.
[4] Bilabial *v*, as in Spanish.
[5] As in German *ich*.

Languages C and D have far less superficial similarity in their sound systems than have A and B, but it is obvious at a glance that their patterns are built on very much more similar lines. If we allowed ourselves to speculate genetically, we might suspect, on general principles, that the phonetic similarities between A and B, which we will suppose to be contiguous languages, are due to historical contact, but that the deeper pattern resemblance between C and D is an index of genetic relationship. It goes without saying that in the complex world of actual linguistic history we do not often find the phonetic facts working out along such neatly schematic lines, but it seemed expedient to schematize here so that the pattern concept might emerge with greater clarity.

An examination of the patterns of C and D shows that there is still a crucial point that we have touched on only by implication. We must now make this clear. We have arranged the sounds of C and D in such a way as to suggest an equivalence of "orientation" of any one sound of one system with some sound of the other. In comparing the systems of A and B we did not commit ourselves to specific equivalences. We did not wish to imply, for instance, that A's *s* was or was not "oriented" in the same way as B's, did or did not occupy the same relative place in A's pattern as in B's. But here we do wish to imply not merely that, e.g., C's *p* corresponds to D's *p'* or C's *h* to D's *h*, which one would be inclined to grant on general phonetic grounds, but also that, e.g., C's *w* corresponds to D's *v* while C's *b* corresponds to D's *β*. On general principles such pattern alignments as the latter are unexpected, to say the least, for bilabial *β* resembles *w* rather more than dentolabial *v* does. Why, then, not allow *β* to occupy the position we have assigned to *v*? Again, why should D's *j* be supposed to correspond to C's *y* when it is merely the voiced form of *š*? Should it not rather be placed under *š* precisely as, in C's system, *b* is placed under *p*? Naturally, there is no reason why the intuitive pattern alignment of sounds in a given language should not be identical with their natural phonetic arrangement and, one need hardly say, it is almost universally true that, e.g., the vowels form both a natural and a pattern group as against the consonants, that such stopped sounds as *p*, *t*, *k* form both a natural and a pattern group as opposed to the equally coherent group *b*, *d*, *g* (provided, of course, the language possesses these two series of stopped consonants). And yet it is most important to emphasize the fact, strange but indubitable, that a pattern alignment does **not** need to correspond exactly to the more obvious

phonetic one. It is most certainly true that, however likely it is that at last analysis patternings of sounds are based on natural classifications, the pattern feeling, once established, may come to have a linguistic reality over and above, though perhaps never entirely at variance with, such classifications. We are not here concerned with the historical reasons for such phonetic vagaries. The fact is that, even from a purely descriptive standpoint, it is not nonsense to say that, e.g., the *s* or *w* of one linguistic pattern is not necessarily the same thing as the *s* or *w* of another.

It is time to escape from a possible charge of phonetic metaphysics and to face the question, "How can a sound be assigned a 'place' in a phonetic pattern over and above its natural classification on organic and acoustic grounds?" The answer is simple. "A 'place' is intuitively found for a sound (which is here thought of as a true 'point in the pattern,' not a mere conditional variant) in such a system because of a general feeling of its phonetic relationship resulting from all the specific phonetic relationships (such as parallelism, contrast, combination, imperviousness to combination, and so on) to all other sounds." These relationships may, or may not, involve morphological processes (e.g., the fact that in English we have morphological alternations like *wife*: *wives*, *sheath*: *to sheathe*, *breath*: *to breathe*, *mouse*: *to mouse* helps to give the sounds *f*, *θ*, *s* an intuitive pattern relation to their voiced correlates *v*, *ð*, *z* which is specifically different from the theoretically analogous relation *p*, *t*, *k*: *b*, *d*, *g;* in English, *f* is nearer to *v* than *p* is to *b*, but in German this is certainly not true).

An example or two of English sound-patterning will help us to fix our thoughts. *P*, *t*, and *k* belong together in a coherent set because, among other reasons: 1, they may occur initially, medially, or finally; 2, they may be preceded by *s* in all positions (e.g. *spoon*: *cusp*, *star*: *hoist; scum*: *ask*); 3, they may be followed by *r* initially and medially; 4, they may be preceded by *s* and followed by *r* initially and medially; 5, each has a voiced correspondent (*b*, *d*, *g*); 6, unlike such sounds as *f* and *θ*, they cannot alternate significantly with their voiced correspondents; 7, they have no tendency to be closely associated, either phonetically or morphologically, with corresponding spirants (*p*:*f* and *t*:*θ* are not intuitively correct for English; contrast Old Irish and Hebrew *t*:*θ*, *k*:*x*, which were intuitively felt relations—Old Irish and Hebrew *θ* and *x* were absolutely different types of sounds, psychologically, from English *θ* and German *x*). These are merely a few of the relations which help to give *p*, *t*, *k* their pattern place in English.

A second example is $\eta$ of *sing*. In spite of what phoneticians tell us about this sound ($b$:$m$ as $d$:$n$ as $g$:$\eta$), no naïve English-speaking person can be made to feel in his bones that it belongs to a single series with $m$ and $n$. Psychologically it cannot be grouped with them because, unlike them, it is not a freely movable consonant (there are no words beginning with $\eta$). It still *feels* like $\eta g$, however little it sounds like it. The relation *ant*:*and* = *sink*:*sing* is psychologically as well as historically correct. Orthography is by no means solely responsible for the "*ng* feeling" of $\eta$. Cases like -$\eta g$- in *finger* and *anger* do not disprove the reality of this feeling, for there is in English a pattern equivalence of -$\eta g$-:-$\eta$ and -*nd*-:-*nd*. What cases like *singer* with -$\eta$- indicate is not so much a pattern difference -$\eta g$-:-$\eta$-, which is not to be construed as analogous to -*nd*-:-*n*- (e.g. *window*:*winnow*), as an analogical treatment of medial elements in terms of their final form (*singer*:*sing* like *cutter*:*cut*).[6]

To return to our phonetic patterns for C and D, we can now better understand why it is possible to consider a sibilant like $j$ as less closely related in pattern to its voiceless form $š$ than to such a set of voiced continuants as $v$, $r$, $m$, $\eta$. We might find, for instance, that $š$ never alternates with $j$, but that there are cases of $š$:$\delta$ analogous to cases of $f$:$\beta$ and $x$:$\gamma$; that *ava*, *aja*, *ara* alternate with *au*, *ai*, *ar*; that combinations like -$a\beta d$, -$a\delta g$, -$a\gamma d$ are possible, but that combinations of type -*ajd* and -*avd* are unthinkable; that $v$- and $j$- are possible initials, like $r$-, $m$-, and $\eta$-, but that $\beta$-, $\delta$-, $\gamma$-, $\gamma$- are not allowed. The product of such and possibly other sound relations would induce a feeling that $j$ belongs with $v$, $r$, $m$, $\eta$; that it is related to $i$; and that it has nothing to do with such spirants as $š$ and $\delta$. In other words, it "feels" like the $y$ of many other languages, and, as $y$ itself is absent in D, we can go so far as to say that $j$ occupies a "place in the pattern" that belongs to $y$ elsewhere.

In this paper I do not wish to go into the complex and tangled

[6] Incidentally, if our theory is correct, such a form as *singer* betrays an unconscious analysis into a word of absolute significance *sing* and a semi-independent agentive element *-er*, which is appended not to a stem, an abstracted radical element, but to a true word. Hence *sing: singer* is not psychologically analogous to such Latin forms as *can-: can-tor*. It would almost seem that the English insistence on the absoluteness of its significant words tended at the same time to give many of its derivative suffixes a secondary, revitalized reality. *-er*, for instance, might almost be construed as a "word" which occurs only as the second element of a compound, cf. *-man* in words like *longshoreman*. As Prof. L. Bloomfield points out to me, the agentive *-er* contrasts with the comparative *-er*, which allows the adjective to keep its radical form in -$\eta$g- (e.g., *long* with -$\eta$: *longer* with -$\eta g$-).

problems of the nature and generality of sound changes in language. All that I wish to point out here is that it is obviously not immaterial to understand how a sound patterns if we are to understand its history. Of course, it is true that mechanical sound changes may bring about serious readjustments of phonetic pattern and may even create new configurations within the pattern (in Modern Central Tibetan, e.g., we have *b-*, *d-*, *g-*: *B'-*, *D'-*, *G'-*,[7] while in classical Tibetan we have, as correspondents, *mb-*, *nd-*, *ŋg-*: *b-*, *d-*, *g-*; *mb-*, *nd-*, *ŋg-* are here to be morphologically analyzed as nasal prefix + *b-*, *d-*, *g-*). But it is equally true that the pattern feeling acts as a hindrance of, or stimulus to, certain sound changes and that it is not permissible to look for universally valid sound changes under like articulatory conditions. Certain typical mechanical tendencies there are (e.g. *nb* > *mb* or *-az*> *-as* or *tya*> *tša*), but a complete theory of sound change has to take constant account of the orientation of sounds in our sense. Let one example do for many. We do not in English feel that *θ* is to be found in the neighborhood, as it were, of *s*, but that it is very close to *δ*. In Spanish, *θ* is not far from *s*, but is not at all close to *δ*.[8] Is it not therefore more than an accident that nowhere in Germanic does *θ* become *s* or proceed from *s*, while in certain Spanish dialects, as so frequently elsewhere, *θ* passes into *s* (in Athabaskan *θ* often proceeds from *s*)? In English *θ* tends to be vulgarized to *t* as *δ* tends to be vulgarized to *d*, never to *s;* similarly, Old Norse *θ* has become *t* in Swedish and Danish. Such facts are impressive. They cannot be explained on simple mechanical principles.

Phonetic patterning helps also to explain why people find it difficult to pronounce certain foreign sounds which they possess in their own language. Thus, a Nootka Indian in pronouncing English words with *ŋ* or *l* invariably substitutes *n* for each of these sounds. Yet he is able to pronounce both *ŋ* and *l*. He does not use these sounds in prose discourse, but *ŋ* is very common in the chants and *l* is often substituted for *n* in songs. His feeling for the stylistic character of *ŋ* and for the *n-l* equivalence prevents him from "hearing" English *ŋ* and *l* correctly. Here again we see that a speech sound is not merely an articulation or an acoustic image, but material for symbolic expression in an appropriate linguistic context. Very instructive is our attitude towards the English sounds *j*, *ŋ*, and *ts*. All

[7] *B*, *D*, *G* represent intermediate stops, "tonlose Medien." In this series they are followed by aspiration.

[8] The slight objective differences between English and Spanish *θ* and *δ* are of course not great enough to force a different patterning. Such a view would be putting the cart before the horse.

three of these sounds are familiar to us (e.g. *azure, sing, hats*). None occurs initially. For all that the attempt to pronounce them initially in foreign words is not reacted to in the same way. *ŋa-* and *tsa-* are naïvely felt to be incredible, not so *ja-*, which is easily acquired without replacement by *dja-* or *ša-*. Why is this? *ŋa-* is incredible because there is no *mba-*, *nda-*, *ŋ(g)a-* series in English. *tsa-* is incredible because there is no *psa-*, *tsa-*, *ksa-*, series in English; *-ts* is always morphologically analyzable into *-t* + *-s*, hence no feeling develops for *ts* as a simple phoneme despite the fact that its phonetic parallel *tš* (*ch* of *church*) is found in all positions.[9] But *ja-* is not difficult, say in learning French, because its articulation and perception have been mastered by implication in the daily use of our phonetic pattern. This is obvious from a glance at the formula:

| | | | |
|---|---|---|---|
| *-j-* | *-z-* | *-ð-* | *-v-* |
| — | *z-* | *ð-* | *v-* |

which is buttressed by:

| | | | |
|---|---|---|---|
| *-š-* | *-s-* | *-θ-* | *-f-* |
| *š-* | *s-* | *θ-* | *f-* |

Is it not evident that the English speaker's pattern has all but taught him *j-* before he himself has ever used or heard an actual *j-*?

There are those who are so convinced of the adequacy of purely objective methods of studying speech sounds that they do not hesitate to insert phonetic graphs into the body of their descriptive grammars. This is to confuse linguistic structure with a particular method of studying linguistic phenomena. If it is justifiable in a grammatical work to describe the vocalic system of a language in terms of kymograph records,[10] it is also proper to insert anecdotes into the morphology to show how certain modes or cases happened to come in handy. And a painter might as well be allowed to transfer to his canvas his unrevised palette! The whole aim and spirit of this paper has been to show that phonetic phenomena are not physical phenomena *per se*, however necessary in the preliminary stages of inductive linguistic research it may be to get at the phonetic facts by way of their physical embodiment. The present discussion is really a special illustration of the necessity of getting behind the sense data of any type of expression in order to grasp the intuitively felt and communicated forms which alone give significance to such expression.

[9] Obviously we need not expect *-ts* and *-tš* to develop analogously even if *s* and *š* do.

[10] Needless to say, such records are in place in studies explicitly devoted to experimental phonetics.