

PHONETICS IN RELATION TO SPEECH DEFECTS.

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Phonetics in its broadest sense means a study of the whole range of sounds, articulate, musical and otherwise. As usually understood, however, it may be defined as the science of speech air waves. It investigates the nature and causes of the changes that the articulate sounds of a language may undergo and studies the normal action of the speech mechanism in producing the varied body of sounds which go to make up articulate speech.

At first glance it might appear that we are merely stating a truism when we say that any teacher, whether engaged in teaching speech to children who have no pronounced defects, or engaged in correcting actual defects, such as have already been described, should have thorough knowledge of the science of phonetics. Yet we can state without fear of contradiction that the majority of teachers in our schools are woefully ignorant of even the simplest facts of phonetics. They are well grounded in the five formal steps of Herbart, at least just after leaving their training schools. They know Rousseau's *Emile* and all about the education of the Spartan youth, but the difference between voiced and voiceless sounds, the exact relation between *n*, *g* and *ng*, the positions of the organs of speech in the formation of the fundamental sounds of English are Eleusian mysteries to them. They know little or nothing about the anatomy or hygiene of the organs of speech.

Very little attention was paid to the science of phonetics before 1867 when Alexander Melville Bell with the publication of his "Visible Speech" started the movement by which Henry Sweet and other patient observers further developed and scattered abroad terminology and tenets which spread to Scandinavia, the United States and France, then to Germany, Italy and Spain.

The experimental study of the phenomena of speech was first started in 1874 by a French society for which Marey, Dr. Rosapelly, and Charles Verdin invented instruments and did much investigating. In time the Abbe Rousselot heard of the experiments and his laboratory at the College de France has been the best and the most famous in the world for the study of experimental pho-

netics ever since. Dr. Scripture's *Experimental Phonetics* in 1913 is the latest contribution to the science. At present, instruments exist for recording, among other things, the vibrations of the larynx, the movement of the soft palate, that of the lips, that of the lower jaw, the points of contact of the tongue against the palate, and the air pressure measured from within the mouth or from the lips.

Hundreds of phonetic alphabets have been proposed but the one that has made most progress and bids fair to become somewhat general is that of the "*Association Internationale Phonétique*" under the direction of Paul Passy of Paris, who between 1885 and 1889 adopted some letters from A. J. Ellis, the author of "*Early English Pronunciation*," and some notations from Bell and Sweet.

We shall now discuss what these fundamental sounds are and then their importance in relation to the correction of specific speech defects. We cannot disassociate the tones of a piano from the instrument which produces the sounds, nor can we disassociate the sounds of articulate speech from the mechanism which produces them. Just as a defect in the piano, such as broken strings, or a cracked resonance chamber, will affect the tones which the instrument produces, so any defect in the mechanism of speech will manifest itself in speech. It would be about as reasonable to attempt to restore proper tones to the defective piano, by placing it where it could hear the tones of a perfect instrument, as to attempt to correct a speech disorder due to an anatomical defect in the speech mechanism, by letting the patient hear and try to imitate the correct sound. The anatomical defect itself must be discovered and if possible repaired by surgery.

The first fundamental of phonetics is therefore a knowledge of the speech mechanism. This need not frighten anyone. It is not expected that the teacher be a laryngologist, or an ear specialist, or an orthodontist, but he ought to know at least as much about the speech organs as will enable him to decide what is wrong with the tongue or lips or palate or teeth and where to send the patient for treatment.

Having attained at least an elementary knowledge of the anatomy of the speech organs the teacher should master the formation of the sounds of the mother tongue. The main thing in the study of phonetics for the correction of speech defects is not the systematizing and naming of the sounds, but it is the ability to produce them accurately and *correctly*, and the ability to feel and describe

just how they are made so that others may be taught how to pronounce them.

It is not sufficient to pronounce a sound upon which a child lisps and ask him to imitate it. The child does not hear that sound correctly, no matter how accurate his hearing or how carefully it is pronounced, for every sound has its kinaesthetic as well as its auditory side and the two cannot be disassociated. Unless a child pronounces correctly he is incapable of hearing correctly for he lacks the proper kinaesthetic or movement images which are inseparably connected with the auditory images. The mind, then, and not the ear is the hearer of correct sound and as soon as the speech defective develops a critical faculty regarding the pronunciation, intonation and inflection, by proper training of the organs of speech he is well on his way toward correction.

Exercises for articulation must be based upon the action of the tongue, lips, teeth, etc., and these exercises must be patiently pursued. Careful attention of this kind, given in time, to the mechanism of the speech of children who exhibit a tendency to lisp, stutter, etc., is sufficient to prevent the development of such defects. The chief aim in teaching articulation and enunciation should be to train the organs of speech to accuracy and the organs of hearing to acuteness.

Phonetics includes not only the correct formation of single letters and sounds; but proper phrasing, inflection or modulation and emphasis. As already stated the kinaesthetic impression must be associated with the auditory impression. A printed word should suggest a definite series of motor reactions (speech) as well as a series of sounds, with associated meanings. Teachers must be able to detect wrong positions of the tongue, lips, etc., by the sound and to give the exact directions for correction. The value of the practice lies not in the ground covered but in its accuracy, range of application and self activity of the pupil. Incorrect phonetics are worse than none.

The science of phonetics can be found in the works of Bell, Sweet, Rippmann, Viator; and others whose names and works are contained in the appended bibliography. We shall, however, attempt to treat the subject very briefly here, with the idea not only of imparting knowledge, which is indispensable to every teacher interested in correct speech, but also to arouse an interest in the subject which will lead to further and more minute study on the part of the reader.

The first thing is to master certain general distinctions. The most important of these is breath and voice. In ordinary breathing or sighing the glottis or space between the vocal cords in the larynx is wide open, so that the air from the lungs passes through without any sound except that caused by its friction against the sides of the mouth and throat passages. The simplest breath sound is the aspirate *h*. If, on the other hand, the edges of the glottis are brought together so that the passage of air between them makes them vibrate, we have voice. If the passage at the back of the mouth into the nose is left open by lowering the soft palate, we get a nasal sound such as *m*, which by closing the nasal passage becomes *b* as in *amber*.

If the glottis is closed entirely, thus obstructing the outward passage of the air, and the air current suddenly breaks this closure we get what is known as the glottal stop. When we cough, as in clearing the throat, we produce a vigorous glottal stop. This is really a consonant formed in the glottis. This sound is unknown in normal English speech but is very common among stutterers especially so-called vowel stutterers. Before initial vowels the stutterer involuntarily shuts up the glottis in a spastic manner and has great difficulty in getting it open for the vowel. There is therefore really no such thing as vowel stuttering, inasmuch as the glottal stop, a consonant, is the basis of the difficulty. There are three ways of attacking an initial vowel: (1) Beginning with the glottal stop; (2) beginning with the audible *h*; (3) beginning with a soft breath or inaudible *h*. The first is the method used in German, the last is the English way.

The Vowel. This vibrant, changeful soul of our language can hardly be defined. A good definition is contained in "The Technique of Speech" by Dora Duty Jones: "Every correctly spoken vowel is a complete harmony in itself, consisting of a fundamental tone made by the vocal cords, resonant tones produced in the vowel chamber, and tones made by the resonators of the head and face." When the voiced sound proceeding from the larynx is modified in various ways by the shape of the mouth cavity which produces certain resonances, vowels result. Each vowel has a pitch of its own, aside from the pitch of the laryngeal tone. Differences in pitch may be easily noticed by whispering the vowels. The pitch of vowels varies with the size, as its character varies with the shape of its resonator and the importance of the tongue in regulating its shape. Pitch is demonstrated in whistling, for in whistling the tongue is brought forward for high notes, thus mak-

ing a smaller vowel chamber, and backward for low notes, thus increasing the size of the chamber.

Dr. W. A. Aiken in "The Voice" says: "indeed, since both the character and the pitch depend upon the shape and size of the vowel chamber which is chiefly regulated by the position of the tongue, it follows that if the tongue is properly controlled both the character and the pitch of the resonance will take care of themselves."

Any tenseness—straining the vocal cords too tightly by raising the chin, compressing the larynx by dropping the position of the head, or frowning—will detract from the purity of the vowel sounds. The upper jaw should remain at right angles to the properly erect spine, and the lower jaw only allowed to move. The tongue should be trained to enlarge the oral cavity within the mouth, leaving the lips free as possible for the expression of feeling. The corners of the lips must be well separated without grimacing.

Vowel quality is also largely dependent on the lips. The lips may be held in a natural, or neutral position; they may be spread out so as to leave a long narrow opening between them, or they may be drawn together so that the opening between them is more or less round. Vowels produced with the lips in the latter position are called rounded vowels. Others are called unrounded. If the spreading of the lips is very marked the vowels may be termed spread. Such spreading of the lips is, however, not usual in English and it is sufficient to distinguish the English vowels simply as rounded or unrounded. An example of a rounded vowel is *oo* as in *boot*; examples of unrounded vowels are *ee* as in *feet* and *i* as in *pit*. Another element which is of great importance in determining the vowel quality is the state of the tongue as regard muscular tension. Vowels produced while the tongue is in a state of considerable muscular tension are called tense vowels: example, *ee* as in *beet* and *a* as in *day*. Those produced while the tongue is not in a state of muscular tension are called lax vowels; example, *i* in *lip*. The soft palate may affect the vowel quality. In the articulation of normal vowels the soft palate is raised so that it touches the back wall of the pharynx. The result is that no air can pass through the nose. It is, however, possible to lower the soft palate so that the air can pass out through the nose as well as through the mouth. When the vowels are produced in this way they are said to be nasalized.

As we have just said vowels are the result of different shapes of the voice passage, each of which molds the laryngeal tone into a different vowel, mainly by different positions of the tongue and lips, but without narrowing the passage enough to cause friction of any kind which would produce a consonant. The number of possible vowels is as unlimited as the number of organic positions which produce them. But if we select certain definite positions as fixed points, it is possible to determine intermediate points and thus classify the vowels according to positions.

For the sound *oo* (boot) the back of the tongue is raised almost to the soft palate. At the same time the lips are rounded. For *ee* (feet) the middle of the tongue is raised close to the middle of the hard palate. The lips may or may not be drawn back, and the teeth are close together. For *ah* (father) the mouth is wider open than for any of the other vowels and the middle of the tongue is slightly raised; *oo* is farthest back of all vowels, *ee* is farthest front and *ah* occupies an intermediate position between the two.

The Consonant. As the etymology of the word indicates a consonant sound is a sound made with and by the help of another sound, the other sound being a vowel. Consonants are formed by obstructing or stopping vowels by the correct use of some of the speech organs. If, instead of letting a vowel out naturally through the mouth, the lips are closed and the sound is turned up through the nose, the nasal consonant *m* is formed. If the tongue and palate are used to turn the sound into the nose the sound *n* or *ng* is formed and so on with the stops employed in producing *g*, *k*, *y*, *q*, etc. Bell says that the consonants are the articulations or joints upon which vowels and syllables turn. A syllable is a group of sounds containing a vowel, or vowel-like consonant, uttered with one impulse of stress. A syllable may consist of one or more vowels, or of vowels and consonants combined, but each group must be enunciated on a single voice impulse.

The consonants have more easily defined distinctions than the vowels, and distinctions that can be more readily observed by the eye. The visual images, then, observed by the constant use of a mirror aid greatly in the formation of correct habits for the speech defective.

Each aspirate or voiceless consonant has a corresponding vocal or voiced consonant and in the cases of *t*, *p*, *k*, two correspondences—a vocal and a nasal. The same muscular movement of the tongue is used for both the aspirate and its correspondences; but in the

case of the latter the breath is vocalized; these are termed sonants, sounding letters. These consonants in which the vocal cords do not vibrate are called surds (p, t, f, s, k, sh, th).

In the case of *t*, *d*, and *n*, we have a marked instance of the beautiful economy of nature, whereby the same muscular movement accompanied by modified conditions of breath, produces three distinct consonant sounds. The same relation holds good in the case of *p*, *b*, *m* and *k*, *g*, *ng*.* Special attention must be directed by the teacher to the essential differences between *b* and *m*, *d*, and *n*, and the movements of the soft palate in each case. The trying and unusually prevalent fault of nasality, which renders English speech piercing and harsh to the musical ear, is due in the majority of cases to a dropping of the soft palate. One of the fallacies of speech due to the constant confusion of the written symbol with the spoken sound is the so-called "dropping of the g"; e. g.—in the substitution of "sinin" for "singing," of "dancin" for "dancing." The error arises from the assumption that the sound *ng* equals the sound of *n* and the sound of *g*, instead of recognizing that *ng* is an arbitrary symbol to represent one single, indivisible sound. A perfect *r* is produced by a vibration of the tip of the tongue against the front palate just above the roots of the upper teeth. In the case of the final *r*, so purely vocal that it almost belongs to the vowel group, the tongue is raised enough to meet gently the hard palate. The movement must be smooth and without the slightest vibration or "burring." If this soft *r* is used in positions other than final, e. g. in heart, horse, art, curse, etc., it must be sounded very delicately. *Ch* is a simple occlusion with an explosion following it, but the explosion is more gradual than the explosion for *t* and *d*, and the explosion is of quite a different character from the rush of air for *sh*. The region of the contact of the tongue for *ch* and *j* is larger than for *t* and *d*.† *Zh* results when vocalized breath is substituted for mere aspiration.

Projection of the tongue. In the formation of *th* and *dh* the tongue should not be placed between nor projected beyond the teeth. The sounds can be formed between the teeth, but the appearance of the mouth is greatly improved when the tongue is not constantly obtruding itself. In the production of the sound *w* the lips from the vowel *oo* with a slightly more contracted opening and are then forcibly jerked apart. In the voiceless formation of *hw*,

*"Graduated Exercises in Articulation," Samuel Arthur King. Small, Maynard & Co., Boston.

†"The Sounds of Ch and J," Winifred Scripture.

the same movements are made with a strong initial aspiration. In *hy* and *y*—the sound of *y* is formed on the basis of the vowel *ee*, and the jaw is then dropped. The aspirate form *hy* heard in *Hugo* (*hyoogo*) and *human* (*hyooman*), etc., is very similar in sound to the Scotch *ch*. As *h* in the articulations is a mere forcible expulsion of breath, it does not represent any fixed formation. The *h* before *w* and *y* produces respectively a whispered *w* and a whispered *y*.

King says that "for purposes of effective and musical speech the differences between the three classes of consonant sounds can be emphasized by showing that the vocals and nasals are capable of receiving musical expression. They can be (a) prolonged on a note, (b) varied in pitch, either by (1) a musical slide or by (2) going up and down the scale on single notes. Instead of being, therefore, mere whisperings incapable of being dwelt upon, these vocal and nasal consonants are of equal importance with the vowels in the equipment of a good speaker. Here we have one of the great secrets of beautiful and effective speech. The power of dwelling on the vocal consonants is, in the majority of cases, the result of deliberate practice alone. The uncultured speaker is immediately betrayed by his curtailment of the vocal consonants. His attention never having been directed to their power in speech, they are in his mouth deprived of their due share of voice, and differ only slightly from their corresponding aspirates; e. g., *supstance* for *substance*, *secont* for *second*, *recoknize* for *recognize*, etc. The cultivated speaker on the contrary dwells upon these vocals, throws into them all the voice they are capable of receiving, and thereby mellows his whole enunciation.

If this matter were uniformly attended to, there would be an end to the reproaches heaped upon the head of the poor neglected English by the foreigners upon the ground of the lack of musical qualities in the language. We have not, it is true, a great preponderance of the more open vowel sounds, so suited to the notes of song; but our clusters of consonants, when not neglected and deprived of their due vocality, give a strength and dignity that well compensate for the lack of open vowel sounds in the language."

Consonants admit of twofold division by form and by place. By *form* we distinguish first continuants or fricative sounds (such as *f*, *v*, labial fricatives; *s*, *z*, *sh*, *zh*, *th*, *dh*, front lingual fricatives) sounds in which a channel permits a current of air to issue with a rushing sound; second, stopped or occluded or plosive sounds

(such as *b, t, k*); third, nasal sounds (such as *m, n*, and *ng*); fourth, lateral or divided consonants (such as *l*, formed by stopping the middle of the passage and leaving it open at the sides); and fifth, rolled or trilled consonants, which are the result of vibrations of flexible parts of the tongue, thus in the trilled Scotch *r* the point of the tongue vibrates against the gums, the English *r* in "red" being the corresponding open consonant without any trill.

By *place* we distinguish first velar consonants, formed by the contact of the root of the tongue and the soft palate (such as *k, g*); second, palatal (such as *y* in you); third, dental (such as *t, d, n, s, z*), formed by the point of the tongue touching back of the upper teeth, from which the blade point (*sh*) in she and (*zh*) in rouge are formed by raising the point of the tongue toward the *r* position; fourth, bi-labial (such as *p, b, m*); fifth, labio-dental (such as *f, v*); sixth, velar (such as *wh, w*), formed by narrowing the lip opening and raising the back of the tongue at the same time.

Beside the main positions, front, back, etc., there are an infinite number of immediate positions, which we distinguish roughly as inner or nearer the throat, and outer or nearer the lips. Thus *r* is inner point; *th*, as in thin, and *th* as in then, are outer point or teeth point; the ordinary English *t, d, n, l*, being formed in an intermediate position.

Syphilis as a Factor in Diseases of the Thyroid Gland. T. G.

SIMONTON, *Pennsylvania Med. Jour.*, Feb., 1918.

The author reports five cases of exophthalmic goiter all of which were of syphilitic origin. All the patients were women, none of them gave a history of syphilis but in all of them the blood Wassermann reaction was positive (in three of the patients 4 plus, in two of them 2 plus) and all of them showed (except in one patient, a girl of 19, who disappeared before treatment was instituted) marked improvement under specific treatment. The author accordingly makes the following recommendations: 1. In all cases of tumor or disturbances of function of the thyroid a Wassermann test should be made. 2. Before operative measures are considered in any given case the specific or non-specific nature of the tumor should be determined. 3. The iodides should be withheld as a routine measure until a Wassermann has been taken. Ed.