approximated while, in unilateral clefts, much valuable material for this closure can be obtained from the Vomer. One or more sutures are passed through the edges of the nasal mucoperiosteum (*A*, Fig. 5) and their ends are held aside to be brought through the buccal flaps at a later stage. The nasal mucosal and mucoperiosteal edges are now approximated by catgut sutures so introduced that their knots lie in the nasal cavity (Fig. 5). The muscle and buccal mucosal edges of the soft palate elements are united by one or two end-on mattress sutures and a number of interrupted apposition sutures of finest silk-worm gut, while the mucoperiosteal flaps from the hard palate are rotated inwards and backwards and are approximated in their new position by similar sutures. The ends of the suture *A*, passed

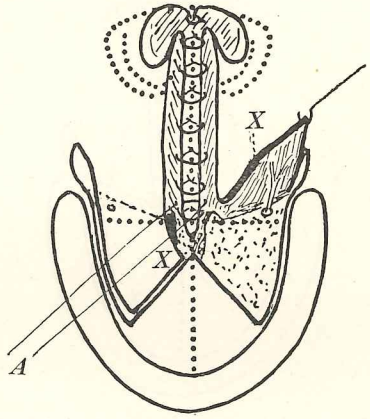


Fig. 5. The right Veau flap turned back to show clear access to posterior border of palatal process from which soft tissues have been separated without division of mucous membrane.
Sutures placed with knots on nasal surface for closure of nasal aspect of cleft. Suture *A* will be passed through buccal flaps.

through the buccal flaps immediately before their edges are sutured together, are now tied. This suture is an important one, for it draws up the buccal flaps into apposition with the nasal flaps and so obliterates that dead space, always present in the older procedures, where blood accumulated and scar tissue formed in abundance.

It should be noted that the flaps employed are not the sliding flaps of the older operations, dragged together often under tension in spite of ample lateral relaxation incision, but are true rotation flaps and give the elongation desired by virtue of the well-known "V–Y" plastic principle (Fig. 6). Further, the raw surfaces which they leave are on bone and are rapidly epithelialized without the production of the hidden scar tissue and inevitable contraction of the LANGENBECK procedure.

When lateral separation on the side wall of the pharynx (the inner aspect of the internal pterygoid plate) advocated by ERNST of Berlin and packing of the spaces so formed at the end of the operation



are added to these procedures, one is left wondering whether the patient will ever be able to breathe through the nose again and the necessity for the traction stitch in the tongue, which completes the operation, is very apparent.

Simple tests for palato-pharyngeal sphincteric efficiency have been suggested by WARDILL. Many are available but only two need be mentioned.

*Snorting*. Tongue protruded slightly between teeth—air sucked into nose as in clearing away pharyngeal mucus.

*Blowing exercises*. Bubbles, candle, balloons, trumpets, etc.

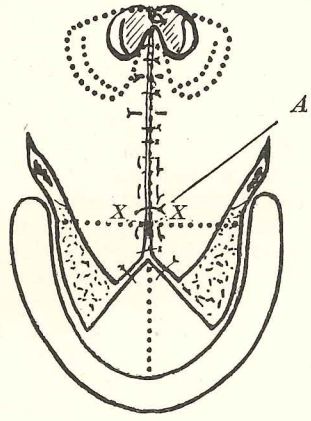


Fig. 6. The repair completed.
V–Y arrangement of flaps has transposed all tissues backwards. Note position of point *X* in this and in previous figure.
Suture *A* holds flaps up against nasal mucosa.
Gauze packing is inserted in the posterior parts of the lateral incisions where separation on the inner aspects of the internal pterygoid plates has been carried out.

*Summary*

Early provision of palato-pharyngeal control gives the best possible chance for the development of normal speech in cleft-palate cases. Successful results call for little, if any, expert speech-training.

59. ELENA GARNETTI (London): *The exercise of voice.*

Voice is exercised—whether for the practice of speech or for the practice of song—on the same physiological mechanism. The difference between the two phenomena lies in the degree of physical energy generated, that is, in the degree of vocal intensity.

The greater the bodily tensions the stronger the suctions induced. Exact correlation and co-ordination of these two physical factors determines the exercise of voice; for voice is a phenomenon excited through co-ordinate expression of somatic "energy" in relationship to the somatic skeletal "form".

Voice is exercised as an acquired function of the whole body. During vocal exercise all the somatic suctorial activities are correlated and co-ordinated—by means of the great spinal machinery—for the purpose of exercising the (primary and supplementary) functional mechanism of the somatic orifice,...in relationship to *breath*, and in co-ordination with *movement*.

Prof. Sir GRAFTON ELLIOT SMITH points out how quiet, slow co-ordination of every physical development brought man to his present state of superiority over other animals. It was just this very co-ordination of physical energy which finally gave to man the power of "articulation", and engendered the evolution of a faculty of "speech", with all the concomitant reactions of voice and mind which have led to the development of the human being.

The functional mechanism of the human somatic orifice, that is, the extrinsic musculature of the neck and the intrinsic musculature of the throat, have been built up by the primary structures and correlative modifications of four functions, namely, those exercised by the respective suctions of the trunk, the lungs, the nose and the tongue. These functional suctions have to be correlated individually and collectively with each other and with "movement". Namely, the primary musculatures of the four functional suctions have not only to be correlated with each other, but also co-ordinated with the "motion" or spinal musculature; *for this musculature governs all exercise of the somatic skeletal frame and represents the only means by which the body can be exercised as a whole and in true co-ordination.*[1]

The suctions of the trunk and lungs may be considered as two "body" suctions, jointly governed by exercise of the spinal musculature. Co-ordinate exercise of these two suctions establishes the acoustic instrument of voice.

The suctions of the nose and tongue may be considered as two "perceptive" independent suctions. Co-ordinate exercise of these two suctions excites the "impulses" of the human voice, and sustains the "vocal form".

The four suctions are correlated extrinsically and intrinsically as a vocal mechanism, by means of the normal, orificial, functional machinery, in relationship to the mobility of the thyro-cricoid "tilting" adjustment.[2]

For a clearer exposition of the exercise of voice I have roughly divided the vocal "mechanism" into those stages which mark its natural physiological development and corresponding acoustic systems.

### Stage I. *The Acoustic Instrument*

By contraction of the erector spini and vertebral musculature, the body—as a whole—is *set on tension*, the degree of tension varying according to the stimulus. By this means the body becomes a resilient,

[1] Namely, to express the phenomena of motion and of emotion; of respiration and of circulation; of voice and of thought.

[2] This mechanism serves the human infant during the exercise of "suckling", e.g. when the olfactory-pulmonary partnership is correlated with a restricted function (lingual) of deglutition.



resounding instrument; and its resonances express the emotions or feelings, giving (through its potential variations of tension in relation to form) the "inflexions" to the words. Exercise of the great spinal muscles is essential to the exercise of voice; for only by this means can the tensions of the body, that is, the "couplings" of the instrument, be co-ordinated, and all the parts arranged to give the best acoustic effect.

Physically, all vocal effort is centred on the lumbar regions. This obviates strain on any delicate part, organ, or muscles, and prevents constriction of the intricate orificial vocal mechanism. The "tone-quality" of the animate instrument is dependent upon the "tonicity" of the whole body; which makes *co-ordinate mobility* the most important factor in training the body to serve as a vocal instrument.

The primary orificial suctorial mechanism of the trunk is exercised by the resistance between the "belly" or procreative musculature and the "abdominal" or visceral musculature;[1] which resistance can be traced physiologically in certain antagonisms of the para-sympathetic and sympathetic nervous systems.[2] This dual (invertebrate) exercise of the trunk, however, becomes passive in character, when subordinated by—and correlated with—the spinal musculature in relationship to "movement" (whether for purposes of "motion", or of "respiration", or of voice).

*The Hyoid Structure* represents the functional mechanism which correlates the three musculatures orificially, namely, the vertebrate or skeletal orificial musculature of the neck with the invertebrate or pharyngeal orificial musculature of the throat.

### Stage II. *The Air Chamber*

The suction of the lungs is exercised automatically by the spinal musculature through extension and retraction (relaxation) of the skeletal frame. The lungs dilate as the thoracic cage expands in response to the skeletal movement. The lung bags are not stretched-out. They are sucked-out by the diminishing degree of pressure surrounding them, and in turn they themselves exercise suction through the trunk orifice upon the atmosphere. In this way an air-tract is established and a "column of air" provided—irrespective of inhalation and exhalation—so long as the lungs have access to the atmosphere through the laryngeal orifice. This contingency is subject to the exigencies of respiratory exchange and, therefore, to the general mobility of the body.[3]

For vocal exercise (and indeed for all physical exercise) the air in the lungs is—and must be—maintained at more or less atmospheric pressure; the pulmonary suction being always in relationship to the degree of bodily tension. Bodily tension automatically includes

[1] The musculatures respectively of the "umbilical orifice" and of the later orificial "segmented rim". Both these orifices are represented in the development of the human embryo.

[2] Confirmed by experiments reported in 1935 from the laboratory of Prof. Sir GRAFTON ELLIOT SMITH, University College, London.

[3] See researches of Prof. J. B. HALDANE, reference, respiratory exchange.

diaphragmatic tension, because the great central muscle of the diaphragm automatically *resists* the circumferential expansion of its fibrous rim by the skeletal movement, in order to safeguard the integrity of the somatic form and to preserve the life-principle.

*The Laryngeal Structure* represents the mechanism correlating the orifice of the lung with the orifice of the trunk. The laryngeal musculature is co-ordinated with the hyoid musculature—in relationship to the spinal movement—by means of the arytenoids and postici muscles. The rotation of the arytenoids governs the "vocal process" and (tensioning the vocal cords, namely, the edges of the glottal bands) prevents closure of the glottis. By this means the integrity of the air-tract is maintained, and the diameter of the "bore" is sustained in relation to the degree of spinal tension.[1] Unless the bore of the human sound-tube be maintained the column of air cannot be sustained.

The animate instrument, the sound-tube and the column of air are all automatically co-ordinated (if all the parts and muscles be elastic and mobile) by exercise of the great spinal musculature; namely, "breath" is co-ordinated with "movement" in relationship to the (individual) somatic form, in due response to stimuli from within and from without.

## Stage III. *Phonation*

The suction of the nose owes its origin to the spinal movement. It was first exercised perceptively (through a tiny sac) in relationship to cranial vibrations, then to the ethmoid regions and to the eustachian tubes. The nose itself developed in relationship to the function of smell; and later, the olfactory suction took on a secondary function in relationship to breathing, acting as an independent, auxiliary, inspiratory agent, in order to meet the exigencies of "motion".

The functional mechanism of smell (e.g. the palato-pharyngeal sphincter, etc.) exercises the nose suction; and involuntary acoustic exercise of this suction in relationship to the pulmonary "column of air" (in the duly tensioned body) led to its voluntary or "acquired" use for the purpose of creating those primary "impulses" of voice known as "Phonation".

The evolution of an "epiglottis" to co-ordinate smelling with breathing,[2] and the subsequent modifications to correlate a restricted

[1] The degree of spinal tension automatically governs the degree of pulmonary suction; but the ensuing degree of "pressure" in the lungs (e.g. the volume of air)—being always in relationship to the elasticity of the lung-bags and the general mobility of the body—is also subject to the exigencies of respiratory exchange, especially to the $CO_2$ content.

It should be noted that over-tension creates "rigidity" and defeats its own ends!

[2] Contact of the epiglottis (tip) with the loose-fold of the palate shut off the mouth-cavity and established the pulmonary air-tract through the nose, affording a straighter and therefore more convenient passage as well as establishing an *auxiliary* inspiratory agent



function of deglutition,[1] led to new developments in the orificial mechanism. Through this partnership between the nose and lung suctions—a partnership which arose primarily in relationship to "motion" or movement—more efficient closure of the lung-tube became necessary whenever auxiliary aid was *not* required by the lungs to meet the exigencies of a gradually developing, and intricate, respiratory system, even though exercise of the olfactory function were still convenient. In certain species the larynx itself developed sharper "inlet" edges; but in other animals (where efficient laryngeal closure had been lost, yet to whom bodily mobility[2] was of paramount importance, such as the tiny burrowing mammals and the small tree mammals) a "glottal valve" developed.

The ledges of the glottal valve are known as the vocal "cords", but serve no such acoustic principle. Many animals exercising voice have no vocal cords! The "impulses" excited by the olfactory stream of air in the "column of air" sustained by the lung suction induce the phenomenon of phonation or primary voice in the sound-tube of the vertebrate body or animate acoustic instrument; for when the impulses excited by the nasal "jet" of air (as the latter issues from the "slit" of the palato-pharyngeal sphincter) strike the edges of the "lateral palatine folds", they are marshalled into vocal order through the little known acoustic principle of "edge-tones".[3] In man these folds have been replaced by the "posterior pillars of the fauces". The development of a faucial structure—which distinguishes man from the higher primates—is described as the next stage of vocal development.

The musculature of the epiglottic structure has become part of the general orificial musculature; but in the higher apes and man the epiglottis itself has degenerated and is practically functionless, that is, no longer capable of making contact with the velum or loose-fold of the soft palate.

## Stage IV. *Articulation*

Degeneration of the epiglottis led to development of the body of the tongue, and certain duties of the function of smell in respect to deglutition were relegated to this organ. Although the epiglottis was no longer able to make contact with the soft palate, the smell suction could still be used to assist breathing; but some new means had to be found to restrict deglutition in order to safeguard the two important functions of breathing and feeding, during mastication.

Constant protective arching of the dorsum of the tongue to the soft palate *re*-co-ordinated a "restricted deglutitive" function with the correlated functions of smelling and breathing, *and led to the*

[1] See *The Mechanism of the Larynx*, by V. E. Negus (Heinemann, 1927).

[2] The body cannot be mobile if there be too great pressure (e.g. volume of air) in the lungs!

[3] For edge-tones, see *The Acoustics of Orchestral Instruments and of the Organ*, by E. G. Richardson (Edward Arnold, 1929).

*development of a "lingual", or linguo-palatal*[1] *suction.* Exercise of this suction in relationship to breathing reinforced the palatal movement and therefore increased the naso-pharyngeal suction.[2]

When man took to ground-life and the erect stance, this reinforcement became a habit, because the skeletal frame was no longer extended by "suspension", and the supported position of the trunk made auxiliary assistance to both body suctions extremely convenient. Hence, the practice was adopted of *articulating*, or jointing the smell and taste suctions for *the exercise of breathing* as well as for deglutitive purposes, *especially in relationship to movement*, and it was soon discovered that phonation could also be conveniently reinforced by the same means.

As a result of this functional correlation, the faucial structure gradually evolved with the soft-palate-membrane as a bridge or "isthmus" connected locally, below and anteriorly by the glosso-palatine folds, and above or posteriorly by the pharyngo-palatine folds, that is, by the faucial "pillars". This modification served primarily to regulate and shape the bolus of food and strengthened the palatal resistance for that purpose.

From this time onwards the exercise of voice became something more than a matter of suctorial "articulation" of the two breath-streams for phonatory reinforcement. The faucial pillars had established a new and variable orifice to the sound-tube, across the centre of which stretched the isthmus of the fauces. The pharyngo-palatine folds regulated the naso-pharyngeal half of the new orifice and the

[1] A negative pressure is normally present in the oral cavity during inactivity, and "the loss of the normal negative pressure in the mouth is associated with impaired action of the tongue, lips, cheeks, etc." (*Mouth Breathing and Nasal Obstruction*, by W. W. JAMES, F.R.C.S., and SOMERVILLE HASTINGS, M.S., *Proceedings of the Royal Society of Medicine*, June 1932, vol. XXV).

The linguo-palatal suction was presumably initiated when (the mouth being open and the dorsum of the tongue raised to the palate) the olfactory or functional suction of the nose exercised the soft palate in relationship to the raised dorsum. The *wave-movement* of the tongue—now exercised by the normal human being—in relationship to functional co-ordination of the smell, taste and breath suctions—represents a gradually acquired suctorial exercise from the tongue tip (in relation to teeth or hard palate) along the dorsum and up to the fauces.

In *The Mechanism of the Larynx* (Heinemann, 1927), p. 188, NEGUS observes in reference to the exercise of deglutition in certain vertebrates: "It would seem more likely that a wave travels backwards along the tongue and that a bolus is thus moved backwards; such a wave has been seen by the writer (i.e. NEGUS) in a man whose cheek had disappeared as a result of disease. Milk or other food placed on the tongue was carried backwards by this movement and was thus thrown into the cavity."

[2] In quiet ordinary exercise of the phenomena of motion and of respiration, air is inhaled through the olfactory channels of the nose and exhaled through the posterior nares. In extraordinary exercise of motion and of breath the lips part and the mouth opens. In this way the negative pressure of the mouth is increased, and the palatal movement is reinforced in relationship to nose-breathing. At the same time, a nearer and larger orifice is provided for the emission of surplus carbon dioxide from the lungs. Therefore in all extra-ordinary physical exercise (such as running, singing, etc.) the lips should be parted and the dorsum of the tongue raised towards the soft palate—the size of the faucial passage being relative to the physical condition of the individual and the stress of the exercise. Singing is an extraordinary physical exercise!



glosso-palatine folds regulated the oro-pharyngeal half; and their co-ordinate contractions could give *five distinct vocal forms* to the pharyngeal orifice, in relationship to the "column of air" sustained by the pulmonary suction. Sustained movement of the isthmus of the fauces over this orifice—through articulation of the nose and tongue breath-streams upon the soft palate—sustains the vibrations of the column of air in relationship to the orificial form, that is, sustains the specific vocal or "vowel" sound. This is the basis of co-ordinate utterance and the fundamental *focus* of all human "expression".

The faucial structure is correlated with the hyo-laryngo-glottal structure through the pharyngeal, glossal and postici muscles—by means of the thyro-cricoid automatic "tilting" adjustment.

### Stage V. *Language*

It has been shown that vocal articulation is exercised by jointing the two perceptive suctorial breath-streams in relationship to the pulmonary sustained breath-stream, during which process the pharyngo-faucial orifice can be given five distinct forms (pure vowels) which are audibly "true" *so long as all three suctions are exercised in due correlation by means of their functional mechanism.*

For the practice of "language", these vowel-forms can be sustained in relationship to movements of the tip and dorsum of the tongue; that is—in relationship to various recognisable consonances of the mouth-cavity or "horn"—through alterations in its size or shape. In this way *consonants* are superimposed upon the vowel-form and syllables are generated. In this way, too, varied "deformation" can be given to the pure vowel-sound, which explains the idiosyncrasies of Vowels in relation to Language.

In qualification of the opening statement, it should be noted that vocal articulation for the purpose of speech, as distinct from song (that is—for a limited range of pitch and a "lowered" voice) is exercised effectively by the linguo-palatal breath-stream alone, *if the column of air be sustained effectively by the pulmonary suction through the naso-pharyngeal channel.*

The mouth serves as an "exponential horn", the spacing between the jaws responding to the degree of spinal tension. When the three functional orificial suctions are correlated at the faucial orifice in relationship to "breath", the "cushions of the soft palate" close the posterior nares, and the sound-waves pass out into the atmosphere through the mouth only. When the three breath streams are not functionally correlated, the lowest nose passages can serve as "inverted horns", and give a nasal tone to the voice.

Consonants are superimposed upon the vowel-form (just as clothes are put over the nude body) and affect the vowel-form accordingly. They are "carried" by the vowel. These are the elements of language from which speech and all the other "arts" of voice have evolved.

### Stage VI. *Human Speech*

The vocal impulses are computed aurally through the eustachian tubes; for when the three suctions are co-ordinated vocally (that

is, when the three breath-streams are articulated exactly) the ensuing three-way tension of the pharynx causes the pharyngeal inlets of these tubes to open. Through these inner passages the vocal impulses and the vibrations of the column of air can be computed, correlated and registered; namely, pitch and form can be recorded aurally as "frequencies". The resonances (over-tones and under-tones) of the body, and the consonances (highest frequencies) of the mouth cannot be registered, however, until the complex sound-waves have emerged into the atmosphere and been detected through the outer ear passages. This is the reason why no one can judge his or her own voice quality or "vocal tone" correctly; and why every singer must learn to vocalize by coenaesthetic and kinaesthetic sensation, rather than by ear. Failure to tension open the eustachian tubes explains why incorrect articulation and uncertain pitch are sometimes to be found in conjunction with a finely discriminating aural faculty!

In conclusion: when the body is *muscularly co-ordinated on a more or less mean tension*, and all the orificial suctorial activities are *correlated functionally on a happy mean* in relationship to "breath", the physical energy of the individual form "finds vent" in vocal expression. This constitutes the natural exercise of the body for establishing the vocal instrument and inducing the phenomenon of voice.

A technology of vocal exercise can be re-established on its natural basis of "respiration". It can be shown how the mysterious conceits and tenets of the ancient Athenian vocal tradition and of the old Italian "Bel Canto" tradition are really based upon natural physiological laws; and, moreover, how this "acquired" exercise of respiration leads to that co-ordinate development of body and mind which is the aim of all "education", and the intangible substance of all "arts".

## FRIDAY, 26 JULY. AFTERNOON

## PEDAGOGICAL SESSION

*Chairman:* Prof. J. S. KENYON

60. Prof. J. S. KENYON (Hiram, Ohio): *Phonographic records of American dialects.*

The phonographic records that were demonstrated were made, some by the Columbia Phonograph Co. under the direction of a committee from the Modern Language Association of America, and some by the Victor Talking Machine Co., under the direction of Professors HARRY M. AYRES and W. CABELL GREET, of Columbia University. With one exception they represent cultivated American speech of the different regional varieties (Eastern, Southern, and General American) with, however, considerable admixture of local



and dialectal features. The reproduction of the small parts of these records that the very limited time permitted was mostly confined to certain particular features to which attention was called. The general effect of the different types can be experienced only by hearing the records; hence only a few points will be mentioned.

Records from all the regions showed the preservation of the o sound before *r* pronounced or silent, as in *more* mor, *board* bord, boəd, etc. The Eastern records showed the occasional, but rather inconsistent, use of a or ɑ in words of the *ask* type, as ast, ant, gras, last, kant, haf; but ænsə, kænt, ræftəz; the New England ɑ for ɔ in *undaunted* ʌndɑntɪd, *haunted* hɑntɪd; and the New England local aː for ɑː, as in *barn* baːn, *marched* maːtʃt, etc.

Some of the Southern records showed the use of ðə before vowels (or occasionally the glottal stop), which normally occurs only before consonants, as *the idea of it* ðə aɪdiəvɪt, *the order* ðə ʔɔdə, *the old rat* ðə ʔold ræt; the suppression of the non-syllabic element of the diphthong aɪ or ɑɪ, as *I don't know* a do no, ma maːnd, mɑːnd, *line* lɑːn; the South western mixture of forms with and without r (not before vowels) characteristic of some border regions between r-less and r territory, as *answer* ænsə, but *bear* bær; the Virginian differentiation of the aʊ diphthong according as it occurs before a voiceless or a voiced sound or a pause, as *out* oʊt (varying as ʌʊt, oʊt, ʊʊt)—*ground* græʊnd, etc.—a distinction also heard in bordering regions and in Canada, and suggesting interesting connexions with the similar behaviour of the aɪ and aʊ diphthongs in certain Scottish dialects, as well as the history of the development of these diphthongs from Middle English iː and uː. The diphthongization advanced more rapidly in positions where the vowel was longer (before voiced sounds and finally), so that some of these diphthongs before voiceless sounds are similar to the seventeenth-century form in standard speech.

Resemblance to the Scottish "stopped vowels" is heard in the record of a South Carolina speaker of maternal Scotch descent, in the short close vowels of *make* mek, *chief* tʃif, *roof* ruf (also rʊf), *place* ples, *wait* wet. In the same region there are apparent echoes of the breaking of long vowels shown by WRIGHT from Cumberland to Dorset, as in *unsafe* ʌnsɛəf, *rain* rɛən, *face* fɛəs, *came* kɛəm, etc., which somehow strike the ear quite differently from the more recent Southern diphthonging of "short" vowels, as in *yes* jɛəs, *said* sɛəd, often referred to as "the Southern drawl".

In the dialect record of an East Side New Yorker there is a distribution of a and æ˖ sounds along unusual lines; as in *rat* rat, *carry* karɪ, *back* bak, *that* ðat, *exactly* ɪgzaklɪ, *happened* hapnd, *had* had; but *asked* æ˖skt, *answer* æ˖nsə, *aunt* æ˖nt, *care* kæ˖r, *grass* græ˖s, *crash* kræ˖ʃ, *rather* ræ˖ðr, *rafters* ræ˖ftəz, *last* læ˖st, *stamping* stæ˖mpɪŋ, *half* hæ˖f.

In this record also appears the well-known New York variety of the ɜr sound, popularly described as an *oi* sound, as in *bird* "boid", *thirty-third* "toity-toid", which is not at all an ɔɪ diphthong, but something nearer to ɜɪ, as in *shirk* ʃɜɪk, *shirker* ʃɜɪkə, *certain* sɜɪtn,