AN INVESTIGATION INTO THE PRESERVATION AND DEVELOPMENT OF THE HUMAN VOICE WITH SPECIAL REFERENCE TO CHILDREN AND ADOLESCENTS.

Thesis

submitted to satisfy the requirements for the degree of Master of Music in the Department of Music of Rhodes University by

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"Acknowledgement

"The assistance given by the National Council for Social Research is acknowledged with appreciation."

"God be wi' you; and God mend your voices."

William Shakespeare, "As you like it",

Act V, Scene 3.

P R E F A C E.

Some years ago while visiting a family with children in Cape Town my interest was aroused by the variations in sounds and actions of the young people of different ages. During the past five years I have been able to extend this interest to children of all ages from birth to adolescence. I started reading on this subject but found so many of my questions unanswered in the literature available that I was encouraged to make a systematic study of the problems connected with the development of speech and song.

In my investigations I have received the kind help of many people to whom I would like to extend my sincere thanks:

Various families with children who wish to remain anonymous. The Principals and Music Teachers of the following schools in Grahamstown: Oatlands Primary School, The Assumption Convent, Graeme College Junior School, Victoria Girls Junior School, P. J. Olivier Primere Skool. Mr. R. K. Kirby, Master of the Choristers to the Cathedral of St. Michael and St. George, the Members of the Rhodes University Chamber Choir and my own singing students.

In addition to the literature on this subject available in local liberaries, I was fortunate in being able to consult a number of rare publications, covering half a century, that

were either in private hands or obtained for me by the librarians of Rhodes University. In this connection I am indebted to Professor P. R. Kirby, Professor D. H. Morton, Professor G. J. Gerber, Dr. F. G. van der Riet and Mr. R. Musiker.

I. THE ORIGIN AND EVOLUTION OF THE HUMAN VOICE, AS TREATED IN MUSIC HISTORY.

The voice is the only natural and, when properly trained, also the most perfect instrument. Any other instrument, be it string, wind or percussion, is a separate entity, an object devised by man, and over the years, altered, improved and perfected. None of these from primitive pipes to the most intricate electronic apparatus can produce a single sound without human aid. It needs someone to play it manually and/or orally.

The amount of human influence, however, varies with the different instruments. The wireless needs merely the turning of a knob to reproduce prefabricated sound, the only choice left being that of the different stations. The record player leaves more choice to the individual as this depends on the records available. Keyboard instruments cannot alter the pitch. The organ tone is static, but volume and tone colour can be altered by adding stops. The pianoforte tone fades away but sound volume can be varied by touch. The woodwind instruments' pitch is basically set by the distance of the holes in the pipe but the player can, to a certain extent, sharpen or flatten the tone. He has complete control over sound volume, tone quality

2/and ...

and dynamics. On brass instruments the amount of human participation increases still further as the harmonics have to be produced by lip and breath control. With the consort of bowed string instruments we have finally reached the stage where the instrument surrenders nearly all the responsibility for sound production to the human element. It merely contributes four taut strings, a resonator and the bow. Pitch, volume, dynamics and tone quality depend entirely on the player.

The human voice, however, combines the properties of the necessary instrument with expressive sound production controlled by mind and intellect. It represents the oldest instrument, as old as mankind itself. In addition, it is also capable of producing articulate speech.

Long ago, man, compelled to give an orderly shape to the sound of his voice, found two different, opposite ways of expression.[1] One allows the words to dominate i.e. a simple, monotonous singsong which is word-born or logogenic. The

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[1]Kurt Sachs. "The rise of music in the Ancient World" London. J.M. Dent & Sons Ltd. 1944. p.52.

3/earliest ...

earliest logogenic melodies alternate between two notes at any distance from each other. This distance varies with the sexes, races and tribes but is constant within the same piece and also usually within all tunes of a tribe. Through the crystallization of other notes around the first two notes, the range of logogenic music has grown.

The other style is not centred around words but consists of passionate outbursts, discharge of excess force, irritation and tension and is therefore pathogenic or passion-born. In the pathogenic style, the voice starts at or leaps up to the top and falls again in shouts and wails in which, in the process of growing organization, some definite intervals, e.g. octaves, fifths and fourths or even thirds become a solid skeleton. Fausto Torrefranca[2] calls this the "Ur-schrei" which modified the pitch by raising or lowering it in accordance with the increase or decrease of the "causal effect".

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[2]Robert Lach : "Die Musik der Natur und orientalischen Kulturvölker" in "Handbuch der Musikgeschichte" ed. by Guido Adler, Frankfurter Verlagsanstalt A.G., Frankfurt am Main, 1924.

A combination of these two basic styles results in higher melogenic forms. The merging of these two elementary styles begins when the logogenic singsong exceeds the range of a fourth and resistlessly succumbs to the inherent urge of this interval to descend rather than to ascend. It often results in a form of singing in which the melodic line takes the lead in its own right thus going beyond the subservience to the words of the logogenic style and the unbridled emotion of the pathogenic style. It thus becomes melogenic. This must have gone concurrently with the development of "high civilization" as primitive man was not able to produce the mental process necessary to pass from imitative reproduction to conscious creation. One of the most important distinctions between primitive and civilized music is the conscious use of a musical system as defined by Kurt Sachs[3] "A system, generally speaking, is the specific organization of the musical space taken up by a certain national or epochal style."

The consonant intervals innate in man are fourth, fifth and octave. Melodies, therefore, generally crystallize around

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[3]Kurt Sachs : "The Rise of Music in the Ancient World" p. 64.

these intervals i.e. if the fourth acts as the shaping force, it settles down in a "tetrachord"; pentachordal melodies, (spanning a fifth) when expanded, fall under the influence of the octave. Thus, in the latter, there is a combination of a penta- and a tetrachord and not of two pentachordal structures. This is the highest possible form of organized scale units as it unites all the three natural intervals.

The oldest existing records of organized music are those of the Sumerians and Egyptians, who in turn influenced the Greeks. With regard to Sumerians, we have to rely on texts, written from the third millenium B.C. onwards, which refer to ecclesiastical music and to the training of vocalists and instrumentalists. In Egypt we derive information with regard to music from reliefs and murals which frequently depict singers and instrumentalists. On these pictorial representations appear the earliest indications of voice production and tessitura. The wrinkles between the eyebrows point to nasal singing from a compressed throat and probably at a high pitch. From murals and reliefs, however, no information whatsoever can be obtained with regard to melody and rhythm of the vocal style. Neither can we deduce such information from the contemporary instruments.

6/The ...

The only possibility of finding a solution to these problems lies in the comparative approach. Kurt Sachs refers in this connection to the discoveries of the Jewish Musicologist Abraham Idelsohn[4] who attempted to show similarities between certain traditional melodies of remote Jewish communities and Gregorian melodies. One may well accept the surmise that these ritual songs of Yemenite and Asia Minor origin resemble also the vocal music of the other ancient civilizations.

Asiatic and African music entered the West via the Greeks. Though no more than a dozen Greek melodies have been preserved, numerous literary sources provide us with a considerable amount of information. From these we know that Greek music was predominantly wordbound and consequently vocal, both soloistic and choral.[5] Greek music, in both the dythrambus and the attic tragedy is best described as a highly stylised "speech song". Greek culture, in which music held a dominant position,

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[4]Abraham Idelsohn "Hebräisch Orientalischer Melodienschatz" Leipzig 1914.

"Der Kirchengesang der Jakobiten" in "Archiv für Musikwissenschaft" IV, 1922.

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[5]The Greek word "Μουσική" connoted a combination of the fine arts, i.e. dancing, singing, instrumental playing etc. Music was an integrate and inseparable part of the whole.

has been one of the main factors in the shaping of the European mind.

The other influence on the formative period of Western music is that of the early Christian church. During the first centuries of its existence the new Christian Faith spread along the shores of the Mediterranean. In return the music of the church has, to a certain extent, absorbed various elements of their indigenous music. Apel's[6] comprehensive studies have proved that both rite and chant of the New Christian Church are rooted in the Jewish Liturgy. Jewish Synagogue Chants and the Christian Chant show stylistic similarities in the common absence of regular metre; psalmodic recitation, "mixed style"[7], antiphonal respectively responsorial

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[6]Apel op cit. p. 31 quotes a Yemenite psalm melody that is practically identical with the first mode of the Gregorian psalmody.

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[7]"mixed style" a mixture of 'concentus', i.e. word-bound or syllabic style restricted in range and 'accentus' melogenic and highly complex style.

FRITZ HEGLER : Geschichte der Musik, 1. Teil Wien 1951. p.55.

performance. The influence of ancient Greek music is restricted to the similarity of the scale systems and the unity of poetry and music. The latest influence is that of the Franconian period. According to tradition the organization of the Roman Chant is assigned to Pope Gregory I (590-604) but contemporary evidence is lacking. Historic indication rather supports the view that the "Gregorian Chant" represents an 8th-9th century fusion of Roman and Frankish elements.[8] Rome herself compiled the different influences and molded them into a universally accepted whole.

The Chant was designed for large buildings and therefore the lessons, too, were intoned, not read, to make them more audible. These formed part of what has been called "concentus",[9]

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[8]during these centuries, a strong relationship between the Frankish kings and the Roman Church developed.

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[9]Fritz Högler : op cit.

9/which ...

which constitutes the syllabic or word-bound section of the Gregorian repertory. This, together with the antiphonally chanted psalmody, does not present any new problems for the human voice. It may have contributed to the spreading of singing in general. The highly complex "accentus" or melismatic parts, e.g. Gradual, Alleluia and Offertory, however, ask for considerable vocal skill. To meet this demand, choir schools on the pattern of the Papal Schola Cantorum were founded all over Europe. They provide us with the first evidence of careful vocal training in Christian times.

The last important stage in the general development of the human voice appears with the changing over of Western music from Monody to Polyphony. Rudimentary polyphony exists already in primitive music. The group singing of the same melodic line, if not subjected to the discipline of modern choral singing, leads to a kind of pseudo-unison called "heterophony". Singing of the same melody at different pitches, e.g. parallel octaves when the sexes sing together or in semi-conscious fifths and fourths results in the same phenomena. Frequently occurring drones above or below the

10/melody ...

melody are the ancestors of the pedal point. A few tribes around the equator have developed canonic singing as a consequence of overlapping in antiphonal singing. With the peoples of the Ancient Western Orient and Greece, heterophony appears mainly when voices and instruments combine to make music.

In early medieval times diaphony appears in church music. These first "organa",[10] performed by soloists, were used as a kind of intermezzi between sections of the chant. The development of polyphony, however, depended on the introduction of strict rhythmisation which had not been necessary in the monodic chant and rudimentary diaphony. The metric modi of polyphonic music originated from the poetic metre. This transition from free to measured polyphony occurs in the Notre Dame school when Leoninus inserts clausulae in discantus style in his flowing organa. Perotinus extends the clausulae and applies this treatment to all the parts above the tenor throughout the whole organum.

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[10] first described in 9 C.A.D. The origin of the name "organum" is still an open question.

With regard to the particular demands made upon the human voice by polyphony, what was new and exacting was brought about by the transition from the standard three-part to that of four-part writing.

Although compositions for four and more part singing are found from Perotinus onwards, the changing over from the older trio-style (cantus, contratenor, tenor) to the modern four-part writing took place only in the 15th century. The old contratenor was divided into a contra altus which stayed above, and a contra bassus which moved below the tenor. Concurrent with this development, the old tenor began to adopt its modern meaning with regard to both, a certain range and timbre of voice.

This new style originally retained the practice that all parts save the cantus, were sung by male voices.[11] In due course, however, low pitched female voices were used for the contralto part and this practice has, in the course of time, come into general use. Both practices, however, can still

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[11] Acc. to Sachs' Short History of World Music p.110 the Imperial Chapel in Brussels still mentions as late as 1557 among its men singers "haut contres" and "basse contres".

be observed in our time, as in certain Italian and English churches the contraltus is sung mainly by baritone voices in the falsetto range, genuine "countertenors" being an exception to the rule. Owen Swiney wrote in 1730 that "Mr Handel desires to have a woman contralt."[12] No earlier reference as to the time when female voices were used for the first time as contraltos could be found in the available literature. It is, however, safe to assume that this intrusion took place in the field of secular music i.e. the Madrigal, both polyphonic and soloistic, and in Baroque Opera.

With both the solo Madrigal and Opera we have reached the transition from mainly choral to soloistic singing. The main achievement of this development in Italy is the bel canto style which has spread from there all over the western world. Even in our days, it is regarded as the climax of vocal art. Although the official term, bel canto, appears only in the mid-Baroque period its roots can be clearly traced to the Solo Madrigal.

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[12]Groves Dictionary, 5th edition 1954 London.

The development of the vocal soloistic style occurs, more or less, concurrently with the change over from the vocal to the instrumental media. Whereas early instrumental music is still based on vocal models, the process is, at least to a certain extent, reversed at the turn of the 17th and 18th centuries. This influence of instrumental treatment and style on vocal soloistic music can be clearly seen in the vocal works of J.S. Bach.

One and a half centuries later, Wagner's "Sprechgesang" confronts us with a new treatment of the human voice. Both, the influence of Bach's quasi-instrumental style and Wagner's expressive accompanied recitativo can be observed in the works of the second Viennese School and those of the composers of the "post Webernian period".

The interpretation of a contemporary song requires not only an exceptionally good ear but also a perfect vocal technique.

The problem of vocal technique and appropriate vocal training leading to this achievement is an old one and the earliest evidence can be traced approximately 4000 years back

14/to ...

to the Vedic Chant. According to Kurt Sachs[13] its archaic form is limited to three pitches of which the highest was combined with a raising, the middle with a levelling and the lowest with a lowering of the head. The author refers to these movements as metaphorical reflex motions. In view of the fact that all extant singing teaching methods use the raising of the head to relax a tense larynx and the lowering of the head to achieve a "heady tone", the Vedic co-movements may well represent the earliest attempts at placing the voice.

The first evidence of a conscious approach to vocal training in ancient Judea can only be found much later,[14] in both northern and southern treatises on music. The main information centres around "negative" advice i.e. what the singer has to avoid in order to sing correctly. A few examples testify the ageless validity of these ancient rules.

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13 Kurt Sachs op. cit. "The Rise of Music in the Ancient World, East and West." p.158-160.

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14 Kurt Sachs mentions as relevant source in op cit. p.183 C. Tirumalaya Naidoc "Gana Vidya Sanjivini 1896" p.12 but has unfortunately omitted to give any indication with regard to the date.

15/e.g. ...

e.g.: one should not sing with clenched teeth, with eyes tightly closed, with a nasal twang, with a contracted stomach, etc.

At the time of King David, Israel began to develop her first organization of professional musicians by appointing Levites as singers and instrumentalists. After the consecration of the temple by King Soloman, the chorus had a minimum of 12 men singers who, according to the Talmud, apparently had to undergo five years of training before being admitted to the choir. This is the earliest evidence referring to a singing school. Boys were added to the choir in order to add "sweetness to the singing". There is, however, no evidence whatsoever as to the way in which they sang. The Bible mentioned frequently the Jews as "crying aloud to God". In contrast to this insinuation that a considerable part of Jewish song could be well described as shouting one has to consider Idelsohn's[15] description of the

[15]A.Z. Idelsohn op cit.

16/singing ...

singing of contemporary Mennonite congregations as sweet and expressive and with excellent choral discipline. It is generally known that the Mennonites have for many centuries lived in diaspora and one may therefore assume that their tradition has remained comparatively unchanged.

In the second half of the first post-Christian millenium we are supplied with a wealth of information with regard to singing schools established all over Europe on the model of the Papal Schola Cantorum, the oldest of them being the singing school in Kent founded by St. Augustine in 597. The visit of Pope Stephen II to the court of the Franconian king Pepin the Short led to the foundation of the Schola Cantorum in Metz which developed into the main exponent of the Roman Chant in Franconia. Of equal importance for Germany became the monastery of St. Gallen. Both institutions represent the fusion of Roman and Germanic elements in the field of sacred song. Unfortunately however all information with regard to the training of singers is mainly confined to the following of melodic lines by mnemonic devices.[16] No

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[16] "Guidonian hand"; sequences and tropes also owe their origin to a mnemonic device.

reference whatsoever can be found relating to the actual vocal training.

The transition from the monodic chant to polyphony inaugurated the greatest development in Western music. The choir schools of the monasteries were in due course superceded by the court chapels appearing in the 14th and 15th centuries.

The Dukes of Burgundy who maintained at Dijon one of the most magnificent courts of Europe could justly be proud of their court chapels which had among its members such famous musicians as Dufay and Binchois. The Burgundian tradition was transplanted to Vienna when the Emperor Maximilian I[17] founded the Imperial Chapel in 1498. This institution still existed even after the fall of the Austrian Empire and does so today, but in the numerous books and treatises written on its history, again no reference is found regarding the vocal training of the male singers and boys. In view of the fact that the Imperial court choir boys up to

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[17]"The Last Knight" who married Mary the daughter of Charles the Bold, the heiress of Burgundy.

the fall of the Austrian Empire ceased to perform works of the Renaissance and Baroque periods and concentrated on the sacred compositions of the Viennese Classic and Romantic composers up to Anton Bruckner, it seems impossible to draw any conclusion with reference to their vocal training during the Renaissance and Baroque periods. Such endeavours, however, might be rewarding with the boys' choir of St. Thomas church in Leipzig who still devote their main efforts to the rendering of J.S. Bach's compositions.

For what concerns the early Bel Canto period we are wholly dependant on oral tradition. We know that the great contemporary composers of this style, e.g. A. Scarlatti, F. Durante and L. Leo were also famous singers. According to Kofler,[18] the greatest singing master of this period was Nicolo Antonio Porpora (1686-1766). As a singer he was employed by different courts of Europe. In 1760 he returned to Naples where he founded a world-renowned singing school. Among his pupils we find Johann Adolph Hasse, Joseph Haydn and Anton Hubert,

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[18]Leo Kofler : "The Old Italian School of Singing" E.S. Werner, Albany, N.Y. 1883.

19/generally ...

generally known under the name Porporino. Kofler[19] surmises that the first book on Bel Canto voice culture was Pietro Francesco Tosi's (1646-1732) "Opinioni de' cantori antichi e moderni, o sieno osservazioni sopra il canto figurato". It appeared in Bologna in 1723. After his death it was translated into English by Galliard as "Observations on the Florid Song, or Sentiments of the Ancient and Modern Singers" (London 1742) and into German by Agricola as "Anleitung zur Singkunst" (Berlin 1757). It is a practical treatise on singing, in which the aged teacher embodies his own experience and that of his contemporaries at a time when the art was probably more thoroughly taught than it has been ever since. Percy A. Scholes[20] lists Tosi's proper order of study as

1. placing of the voice
2. gymnastic vocalization on vowels

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[19]Kofler op cit.

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[20]The Oxford Companion of Music, 9th Edition, Oxford University Press, London, New York, Toronto, 1955.

3. study of ornaments

4. singing of songs with words.

The most important books on the theory and practice of Bel Canto were not written in Italy, where the style originated, but in Germany during the 18th century by F.F. Hannstein[21] and Sieber.[22] Their publications have considerably contributed to the fact that in the interpretation of German Lieder of the early Romantic composers up to our day the Bel Canto singing still occupies a prominent position.

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[21] F.H. Hannstein's books quoted:
(1) Das System der grossen Gesangsschule des Bernacchi von Bologna, Dresden 1835.
(2) Die gesamte Praktik des Klassischen Gesangs, Dresden 1839.
(3) Geschichte, Geist und Ausübung des Gesangs, Dresden 1839.
(4) Geschichte des Gesanges, 1845.
(5) Die grosse italienische Gesangsschule, 1848.

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[22] Ferdinand Sieber : "Gesamttheorie der Gesangskunst", 2 Bände, Berlin 1858.

In contrast to the true bel canto style, the principle of "Sprechgesang" introduced by Wagner in his Music Dramas lays the main emphasis on the word, demanding, however, at the same time, beautiful singing.

In view of the fact that a contemporary singer is expected to have a repertory reaching from the late Baroque to contemporary music, the modern method of training a professional singer as practised everywhere endeavours to achieve a perfect balance between the bel canto and the declamatory styles.

II. THE VOCAL ORGANS AND THEIR APPLICATION.

A. THE VOCAL ORGANS.

1. The Vocal Apparatus: The actual vocal instrument is the larynx (Plate 1) which is situated in the front of the neck. The vocal apparatus, however, comprises the trunk, from the pelvic floor to the shoulders, the neck and the head.

The larynx itself consists of a skeleton (Plate 2) formed by a number of cartilages which are connected by membranes and joints. This skeleton embraces a cavity within which are contained the false and true vocal cords. (Plate 3.)

The basis of the structure is the cricoid cartilage (g) which is connected to the uppermost ring of the trachea, or windpipe (h). It is narrow in front and raised at the back in a platform, in appearance somewhat like the seal of a signet ring. On top of the narrow edge of the cricoid, i.e. at the front of the larynx, is the thyroid cartilage (c) which consists of two symmetrical halves, which are open at the back where the cervical vertebrae prevent any damage to them. Both meet in an obtuse angle in front at the thyroid notch, a projection commonly called the "Adam's apple", which is usually more prominent in males than in females. The sides of the thyroid end at the top in horns which are suspended from the hyoid bone (b) by elastic bands, known as the thyro-hyoid membranes. The

23/hyoid ...

VERTICAL CROSS SECTION OF THE INTERIOR OF THE LARYNX

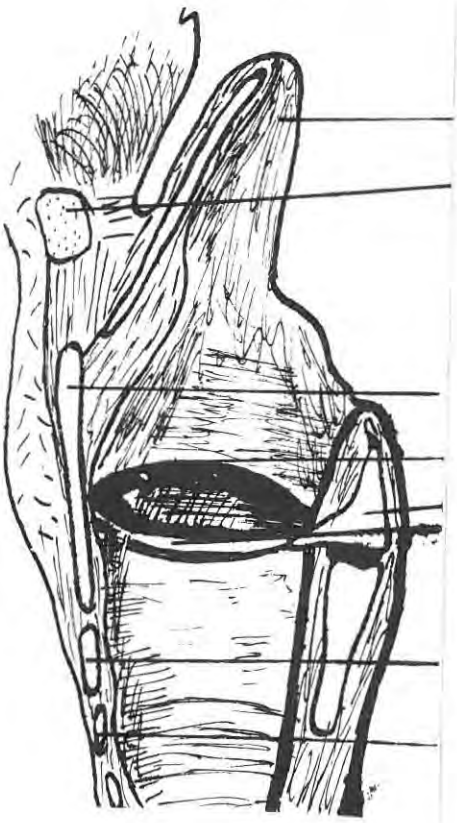

PLATE 1

SKELETON OF THE LARYNX

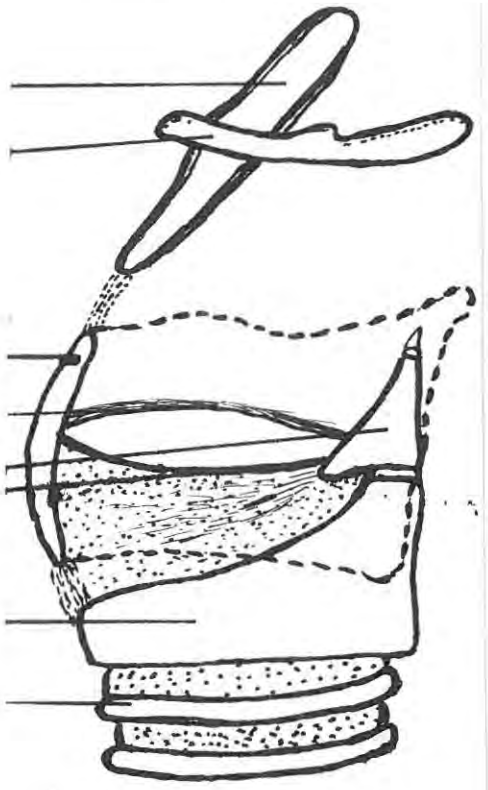

PLATE 2

LARYNGOSCOPIC VIEW

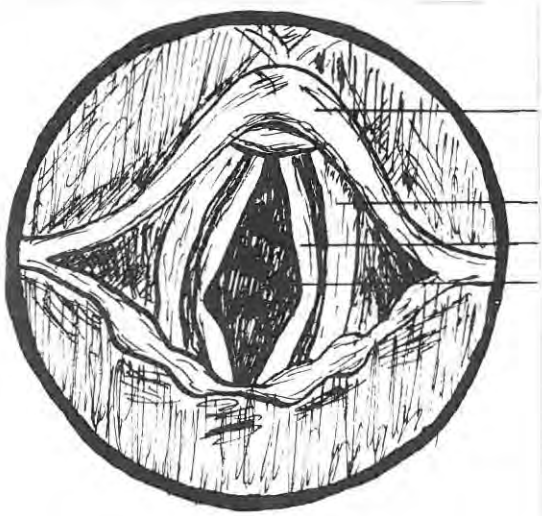

PLATE 3

hyoid bone is horseshoe-shaped and lies at the root of the tongue. The whole larynx is suspended from this bone. Also situated at the top of the thyroid cartilage is the epiglottis (a), the actual lid of the larynx, which is thus in a position where it can close the entrance to the larynx when food passes into the oesophagus, and where it can seal off the oesophagus when air is to go down into the larynx. At the back of the larynx, between the open shields of the thyroid cartilage, lies the raised part of the cricoid cartilage. On top of this platform rest the two arytenoid cartilages (e). Each cartilage is shaped like a triangular pyramid, with its base on the upper rim of the "seal" of the cricoid and an elongated upward projecting apex. It also has a forward process to the tip of which a true vocal cord (f) is attached. The true vocal cords are two semi-lunar sheets made of fibro-elastic membrane (conus elasticus) each capable of covering half the windpipe. The aperture between the free edges of the vocal cords is known as the "glottis". Continuing along the arytenoid cartilages, the glottis is about one inch in length in males and two-thirds of an inch in females. The free margin of the vocal cords has thickened edges. In front, the vocal cords are attached, approximately half-way up, to the thyroid cartilages. Above the true vocal cords lie two strands of fibro-elastic tissue

24/called ...

THE RESPIRATORY SYSTEM

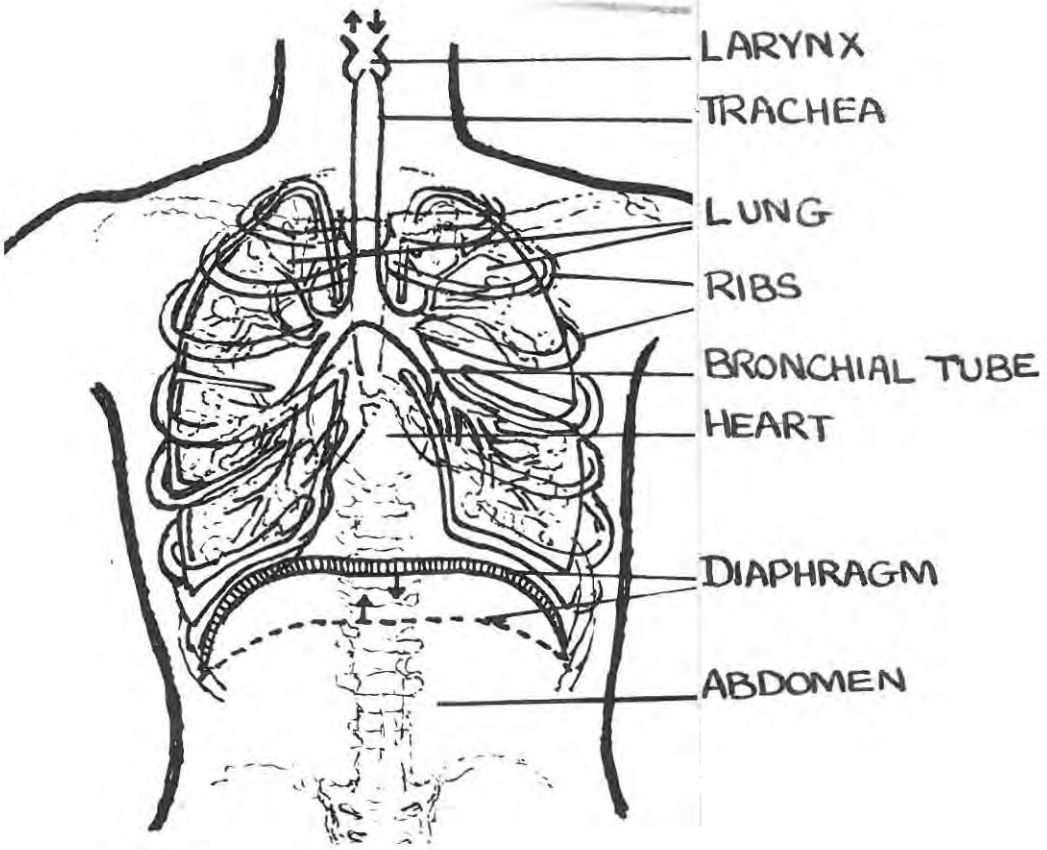

PLATE 4

called the false vocal cords (d). They also extend from the arytenoid cartilages behind to the upper rim of the thyroid cartilage in front. These, however, do not normally meet, but hang loosely. During certain types of vocalisation, however, they come closely together to help to relieve the pressure on the true vocal cords. The cavity between the false and true vocal cords is called the ventricle.

2. The Respiratory System: The respiratory system consists of the air passages i.e. the nose, the mouth, the larynx, the trachea, the bronchial tubes and the lungs.

The nose is divided into two parts by a vertical partition. Each nasal cavity leads back into the naso-pharynx. A number of recesses lead off from each nasal cavity (Plate 5); the largest are the frontal sinuses (a) extending up into the frontal bone of the forehead; the maxillary sinuses (b) are situated in the upper jaw, and the sphenoidal sinuses (c) lead back into the sphenoid bone in the base of the skull.

The mouth, the aperture between the upper and lower jaw, is bounded by the lips.

The pharynx, or throat, is divided into three parts, the naso-pharynx behind the nose, the bucco-pharynx behind the

25/mouth ...

DIAGRAMS SHOWING LARGEST RESONATING CHAMBER

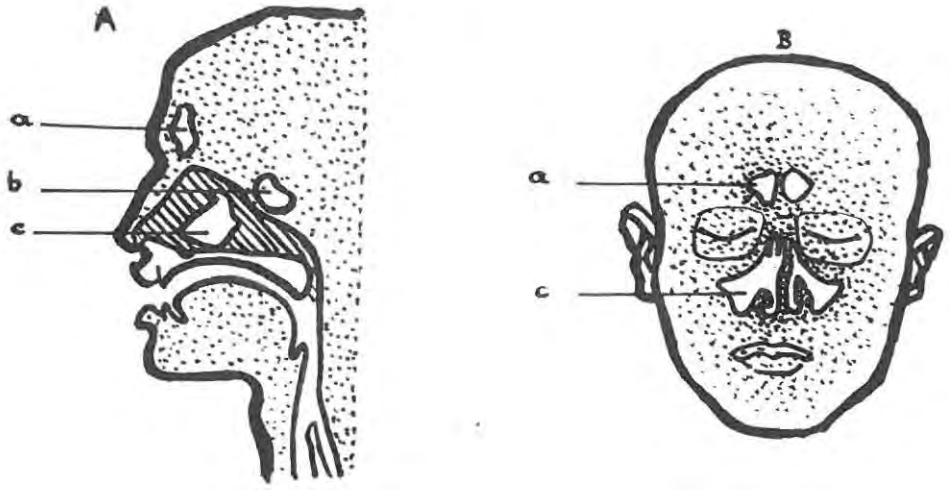

PLATE 5

mouth, and the laryngo-pharynx behind the larynx. The pharynx as a whole is bounded at the back by the pharyngeal wall and leads down to the oesophagus; the laryngo-pharynx leads forward into the larynx.

The trachea or windpipe consists of 15 to 20 horseshoe-shaped cartilages united by membranes. At the entry to the thorax it divides into two bronchial tubes which lead to the two separate parts of the lungs.

The lungs are surrounded by the rib-cage of the thorax which forms the upper half of the trunk. The diaphragm, the floor of the thoracic cavity, separates the thorax from the abdomen. Its upper surface is convex, and its lower surface is concave. The level of the dome of the diaphragm varies, reaching its lowest point during inspiration, thus increasing the dimensions of the thorax and diminishing the air pressure in the lungs.

3. <u>The Organs of Speech</u>: (Plate 6.) The organs of speech are situated in the buccal cavity. They can be divided into two groups: (a) Movable and (b) Immovable organs of speech.

26/(a) ...

ORGANS OF SPEECH

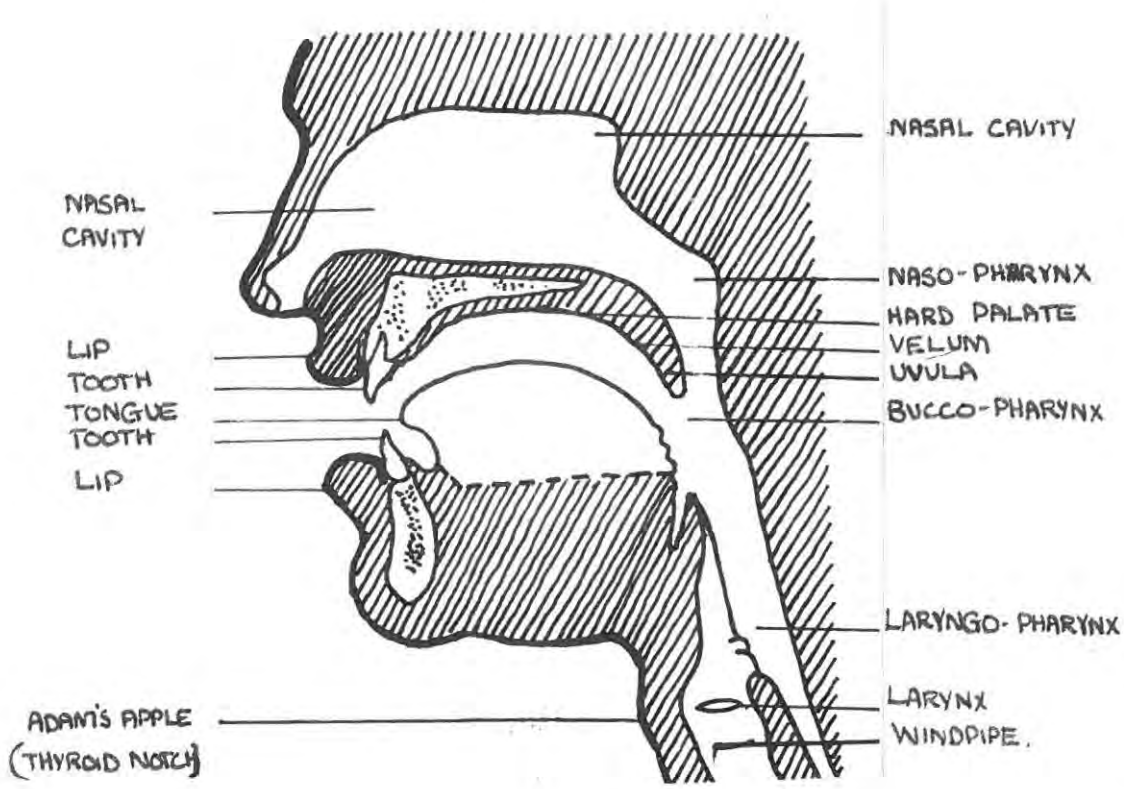

PLATE 6

(a) Movable Organs: Lower jaw or mandible
Lips
Tongue
Velum

(b) Immovable Organs: Upper mandible
Teeth
Hard palate.

The framework of the mouth is formed by the upper and lower jaws. The former contains the upper teeth and the latter the lower teeth. The mouth aperture is bounded by the upper and lower lips. The hard palate forms the roof of the mouth. Behind the hard palate is a soft curtain called the velum; from the centre of the free margin of the velum hangs the uvula. The uvula is capable of closing or opening either the nose or mouth. The floor of the mouth is almost completely occupied by the tongue. The body of the tongue is firmly rooted to the floor of the mouth, but its margins and its tip are free. The tongue muscles are attached below to the hyoid bone.

27/B ...

B. APPLICATION.

1. Breath control: During normal respiration air enters through the nose or mouth, passes down the pharynx into the larynx - the epiglottis closes the oesophagus to open the air passages - via the glottis into the windpipe thence into the bronchial tubes which lead to the lungs, where it inflates the bronchioles and air sacs (small tubes and cavities inside the lungs). The lungs expand, depressing the diaphragm within the rib-cage, and after the oxygen has been utilized by the same passages, they collapse again and the diaphragm moves back to its resting position. This action takes place constantly and automatically, that is to say subconsciously. The amount of air breathed in and out varies. During normal breathing, 500 ccs are breathed in and out, ("tidal" air). A deep inspiration can add 1500 ccs to the intake (complemental air). After the tidal and complemental amounts of air are expelled an additional 1600 ccs can be expired (supplemental air). Even after the fullest effort of expiration there still remain 1600 ccs of air in the lungs (i.e. residual air which is constantly renewed and expelled only after death). Normally a person utilizes only the diaphragm and flanks in breathing. With deep breathing, however, the rib-cage is lifted to enlarge the chest cavity and larger amounts of air are sucked

28/in ...

in. Through a gradual enlarging of the chest cavity the negative pressure within it is increased. This in turn leads to a more intensive working of the suction activity of the heart.

During tone production, the act of inspiration remains the same, but expiration has to be controlled, i.e. the outflow of breath has to be restricted.

Inspiration can take four different forms: clavicular or shoulder breathing, in which only the upper part of the lungs is used; intercostal - pertaining to the ribs, involving rib movement; diaphragmatic breathing - involving movement of the diaphragm; abdominal breathing - the compression and expansion of the abdomen.

For correct voice production, a combination of intercostal and diaphragmatic breathing is essential.[23] The reason for this will be dealt with later. As the lungs fill with air they expand, distending the ribcage both forwards and backwards, and also laterally. To relieve the pressure in the lungs, the diaphragm moves downwards, enlarging the thoracic cavity.

Expiration sets in with a contraction of the abdominal

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[23] Both men and women use a combination of the two simultaneously and constantly. Due to anatomical reasons, men use more diaphragmatic and women more intercostal breathing.

29/muscles ...

muscles, pushing the diaphragm back to its original position. The pressure thereby exerted on the lungs would normally lead to their collapse, thus forcing out the air. Retention of the air, however, is imperative for voice production. To counteract the natural outflow of breath caused by the contraction of the abdominal muscles, the ribcage has to be raised by a contraction of the intercostal muscles resulting in a glottal closure. The diminution of the thoracic cavity, still holding the same amount of air, leads to a compression which forms the air-column.

2. Phonated Breath in Speech and Singing: In the middle of the eighteenth century, Ferrein[24] postulated the theory that the vocal cords were set into vibration by the airstream during expiration. This was accepted up to the middle of the present century when systematic research on the part played by the larynx during voice production[25] revealed that the

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[24]According to Raoul Husson : "Der gegenwärtige Stand der physiologischen Phonetik", PHONETICA Vol. 4, 1959, pp. 1-29.

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[25]Goertler, Husson, Moulonget, Piquet, etc. according to Raoul Husson : "Der gegenwärtige Stand der physiologischen Phonetik", PHONETICA Vol. 4, 1959, pp. 1-29.

30/rhythm ...

rhythm of the "nervus recurrens" impulses (recurrent laryngeal nerve impulses) corresponded to the vibration of the vocal cords, thereby proving that the so-called "vibration" of the cords is a "neuro-motoric" (neuro-motorisch) phenomenon controlled impulsively by the recurrent laryngeal nerve i.e. a stimulus response. When a phasic recurrent laryngeal nerve impulse reaches the thyro-arytenoid muscles, the vocal cords are pulled apart by a contraction of the muscle fibres. After a spurt of air has passed through the glottis, the vocal cords return to the original "tonus"[26] position until the next laryngeal nerve impulse causes them to open again. The periodic airflow puffs emitted via the glottis raise periodically the pharyngo-oral pressure thus forming the voice.

During singing the recurrent laryngeal nerve impulses have a stable frequency. Vowels are the result of two or three formants, either one pharyngeal and two oral, or vice versa. These configurations may produce the 12 pure basic English

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[26] Tonus: State of partial contraction that is characteristic of normal muscle, maintained, at least in part, by a continuous bombardment of motor impulses originating in the reflex, and serves to maintain body posture and to hold the musculature in a state of readiness for specific demands.

31/vowels ...

vowels. Above a certain intensity, the pre-vocalic basic timbre[27] reduces the basic vowels to three.

The frequencies of the impulses during speech fluctuate momentarily with each period.[28] Speech vowels are short, and consist of a combination of two transitory periods occuring at the beginning and at the end of the vocalization. The speaking voice has thus no clearly defined pitch but only an approximate one, i.e. approximate to the emotional state of the speaker.

The articulation of consonants is basically the same in both speech and singing. Consonants are classified according to the point of articulation in relation to the respective organ of speech, and to whether there is an initial laryngeal impulse or not, the former being voiced, the latter unvoiced.

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[27] Pre-vocalic basic timbre: The timbre, or tone colour, of the voice originates in the glottis through which flows the air-stream which, even at that stage, contains the desired frequency of the note aimed at, together with the basic elements of its quality, before they are moulded into final shape by the organs of speech.

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[28] period: time taken for each impulse in regular succession.

Volume, both in speech and singing, depends on the amount of vibratory energy contained in the air passing through the pharyngeal cavity, and on the intensity of the subglottal pressure. The latter regulates the actions performed during expiration; these must be adapted for each tone. This adaptation can become semi-automatic through training. The maximum power of subglottal pressure depends on the ability of the laryngeal sphincter to counteract the pressure, on the strength of the abdominal muscles and on the vital capacity of an individual.

The basic timbre of the voice is imparted to the airstream, by the initial laryngeal impulse, and is further influenced by the "circumscribed spectral region" (Beschneidungsfrequenz) with high and low frequencies cut off. G. Beckmann recorded and analyzed these phenomena in 1956 and found that the number of overtones present in the voice depend on the length of the opening of the glottis. The narrower the opening, the richer the content of overtones.

The quality of the sounds emitted during speaking and singing depends, to a large extent, on the acoustic peculiarities of the surroundings. Each room is a "circumscribed spectral region", reflecting or deflecting certain overtones. Acoustic

33/quality ...

quality depends on the amount of sound being "conducted" and reflected.

The vocal range can now be determined by means of a simple measurement whereby the person to be tested holds the anode of the Chronaxie[29] in his hand. The cathode is applied to the sterno-cleido-mastoid muscle. Husson and Chenay published in 1954 the following table of recordings relating to professionally trained, semi-trained and untrained voices, both male and female.

[29] A "Chronaxie" is the measure of time taken for inducing the electrical incitability of an organic structure. To determine the electrical incitability of a nerve or a muscle it is necessary for the current to be of a certain minimal strength. The term "Chronaxie" would appear also to be applied to the apparatus used to determine such measurement.

34/...

TABLE OF THE CORRESPONDENCE BETWEEN CHRONAXIE OF THE M. RECURVENS AND THE VOCAL CLASSIFICATION OF A PERSON.

Male voice	Chronaxial value in Milliseconds.	Female voice
	.055	ultra high soprano
	.060	ultra high soprano
very high tenor	.065	very high soprano
high tenor	.070	high soprano
tenor	.075	soprano
low tenor	.080	low soprano
intermediate voice	.085	intermediate voice
intermedary voice	.090	high mezzosoprano
high baritone	.095	mezzosoprano
baritone	.100	low mezzosoprano
low baritone	.105	intermediate voice
intermediate voice	.110	high mezzo contralto
intermediate voice	.115	mezzo contralto
high bass	.120	low mezzo contralto
lower bass	.130	intermediate voice
bass	.140	intermediate voice
bass	.150	contralto
low bass	.160	contralto
very low bass	.170	low contralto

The difference in range between men and women, is approximately an octave. This is due to the fact that a man normally uses the one-phase register and a woman uses the two-phase register. If the motoric impulses in all axons[30] innervating the vocal cords are in phase, one speaks with the chest voice. Its highest frequency is the same in men and women and does not depend on the incitability of the laryngeal recurrent nerve (n. recurrens). It is achieved if two successive impulses are separated by a refractory period (in the relationship of two-and-a-half millisecs. for the bass and one-and-three-quarter millisecs. for the tenor). In order to sing higher, the motoric action must become two-phased, i.e. the axons leading to the vocal cords must split into two parts which are displaced phasically by half a period. The frequency is thus twice as high as the previous one, i.e. the falsetto in men and the head-register in women. The splitting of the axons into three groups results

[30]An axon is a nerve-cell process that is typically single and long, terminating in short branches relatively far from the cell body and, as a rule, it conducts impulses away from the cell body.

in the high soprano register, and that of four groups in that of the high coloratura soprano.

Those discoveries are of greatest importance but I would venture to suggest that they are not complete. Further research is likely to reveal even more specific data regarding the differentiation of the various voices.

III. THE DEVELOPMENT OF ARTICULATE SPEECH AND SINGING FROM THE INFANT TO THE ADOLESCENT.

During the forty weeks of its intra-uterine development, the foetus undergoes all the evolutionary stages from a single cell structure to the highly complex organism of the human body. Similarly, the infant from the cry emitted after birth to the stage of articulation, reflects the evolution of human speech and singing, as singing is merely sustained speech.

Breathing, circulation and digestion are primary automatic functions. The infant's first cry falls within these categories as it represents "phonated breath" caused by involuntary reflex. As the child leaves the mother's body its lungs are completely collapsed as hitherto it received the necessary oxygen through the umbilical cord. The first respiratory reflex pulls down the diaphragm and pushes out the rib cage resulting in a negative pressure within the thorax. This negative pressure causes a suction by which air enters the lungs. The process of inspiration is further conditioned by the lack of oxygen of the central nervous system and a build up of carbon dioxide which was previously eliminated via the umbilical cord.

A considerable effort is required to inflate the lungs[31] and to establish the expanded position of the thorax. On elastic recoil, part of the air is forced out.[32]

At some stage during the initial respiratory efforts, the infant achieves the first quasi-musical sound. The vocal cords begin to vibrate and the emerging sound varies according to the shape of the mouth, ranging between "o" and "a". The first cry of the infant, to which the "Ur-schrei" of primitive man corresponds, is purely a reflex action to which the change of temperature could well be a contributory factor.

Normally, for the first few weeks, the healthy infant will spend most of its time asleep, breathing soundlessly through the nose. Any unpleasant sensation such as discomfort and pain will, however, induce the infant to make use of its

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[31] In his "Combined Textbook of Obstetrics and Gynaecology" 5th edition, E. and S. Livingstone Ltd., Edinburgh 1950, Dugald Baird states on page 129 "The lungs appear to be inflated not all at once but bit by bit. Three days may be required for full expansion."

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[32] The air remaining in the lungs is known as "residual air". It is constantly renewed during respiration and only expelled after death.

39/vocal ...

vocal apparatus. His crying is at first only a reflex action caused by a sensory impulse stimulating the brain.

According to Gordon[33], "research clearly indicates that an infant's senses are functional at birth." His skin is sensitive to and can differentiate between certain stimuli i.e. temperature and pain. His eyes are sensitive to light and within a few weeks he can set them at an object held at close range. At birth, the middle ear is filled with amniotic fluid excreted by the amnion to buffer the foetus against mechanical shock. As soon as this is drained off the child is able to hear and will respond in a few days to loud noises. A neonate[34] is also sensitive to its own internal stimuli to which its responses, however, are not adequate as it cannot change its position and has to stay mainly in the original intra-uterine position.

From birth on it begins to explore its environment through

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[33]Ira J. Gordon : "Human Development from birth through adolescence", Harper and Brothers, New York, 1962, p.36.

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[34]An infant less than a month old.

tactile communication which is concentrated for some time around the mouth, the organ of its survival. Already during the first months, an infant when lying awake with no source of discomfort to distract it will move its tongue over the lips and generally begin to note changes in sensation arising in its own as well as other people's actions.[35] Soon its fingers will be used in addition to its tongue to reveal by touch the qualities of objects. Movements of the head, arms and legs, spontaneous in the initial stages, lead during the first three months to the beginnings of sensory motor control through a combination of perception and habit.[36] Tactile communication and increased motor control enable the infant to establish order in its immediate surroundings. It can give expression to its physiological and psychic states but is as yet unable to communicate them.

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[35]Such as bathing and feeding the infant, changing its napkins etc.

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[36]Paul Henle : "Language, Thought and Culture" The University of Michigan Press, 1958, p. 37. "The earliest non-hereditary behaviour is the consolidation of the sucking reflex by means of practice ... the infant learns to reject the finger in favour of the nipple ..."

During the first months of life the infant emits inarticulate cries which show no differentiation according to the cause. This may be due to the fact that the causes of crying are only concerned with wants and discomforts.

The Russian phonetician Tonkova-Yampolskaya[37] has employed modern acoustic devices such as intonograph and spectrograph in her analysis of the shouting of thirty healthy one-to-six-day-old babies. This experiment led her to deduce that the frequency and dynamic range of a baby's shouting is similar to the analogical speech range of an adult. Thus the newly-born child enters the world with its basis of articulation already formed and sufficiently prepared for the utterance of human sounds. The absence of cerebral-control, however, prevents such utterance.

Diamond[38] states that "Children - like primitive men - are

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[37] R.V. Tonkova-Yampolskaya : "On the development of speech", PHONETICA, International Journal of Phonetics, S. Kanger, Basel, Vol. 12, No. 3-4, 1965, p. 216.

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[38] A.S. Diamond : "The History and Origin of Language", London, 1959.

born wholly without the power of speech, and they must learn by degrees to co-ordinate and adjust the vocal organs for the production of speech and language ..."

The infant's first "speech sounds" are rather unselectively employed during the first few months of life, i.e. it uses the same set of cries whether hungry, thirsty or afflicted with pain.

Stern[39] concludes that "An innate differentiation of affective states may arise within the first three months, with a corresponding differentiation of utterance." The differentiation of affective states arises with the infant's increasing ability to discriminate between affects such as hunger being stilled, pain and discomfort being relieved etc. The corresponding differentiation of utterance leads to a modification of the infant's cries into a continuously improving approximation to speech. It acquires new "speech-signals" to express comfort or pleasure. At this stage the baby advances beyond the hitherto strictly functional use[40] of

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[39] M.M. Lewis : "Infant Speech", Kegan Paul, Trench, Trubner & Co. Ltd., London, 1936, p. 21.

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[40] i.e. for satisfying its primary needs only.

43/its ...

its vocal apparatus. According to Tonkova-Yampolskaya[41]: "The basis of articulation is improved through shouting, the motion of the vocal cords gets synchronized, the shouting frequencies and intensities become reduced to the effect that maximum sound-production energy is transmitted into special ranges."

With regard to the origin of intonationally differentiated speech-signals, all writers on this subject agree that the infant's earliest sounds are vocalic. Diamond[42] states that the vowel [a] predominates throughout the first years and lists [x, R, m, n, ŋ, g, l] as the earliest consonants. C. and W. Stern[43] observed the appearance of [Kr] at the

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[41]R.V. Tonkova-Yampolskaya op cit.

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[42]A.S. Diamond op cit.

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[43]Clara and William Stern : "Die Kindersprache", Verlag J. A. Barth, Leipzig, 1928.

44/age ...

age of six weeks, [r] contained in babbling ( ) at nine weeks and explosive (dada) at five months. Jespersen[44] mentions labials and explosives as the earliest consonants due to the fact that the labial muscles used to produce consonants like (b) and (m) have been developed by the baby while sucking the breast or the bottle. Lewis[45] distinguishes between early consonants uttered in discomfort (h, l, ŋ ,) and such uttered in comfort, (g, x, k, r).

Notwithstanding the differences of opinion with regard to the order in which the consonants appear in the infant's earliest utterances, the pre-speech sounds of all children are similar. The later conversion of these sounds into the different languages, however, is the result of environmental influences.

Grewel[46] writes "It is certain that a child of three months

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[44]Otto Jespersen : "Language, its Nature, Development and Origin", London, 1925, p. 106.

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[45]M.M. Lewis op cit. p. 24.

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[46]F. Grewel : " ow do Children Acquire the use of Language?" PHONETICA, Vol. 3, 1959, p. 197.

responds to the human voice, or speech, and one can demonstrate the fact that a baby 'echoes' as it were the voice of his mother, making use of her voice and speech contact in the same way as it echoes other forms of behaviour such as a smile. In other words, in the initial stages of its language the child echoes that of its mother. The mother talks to the infant while nursing and soothing him. The child, responding to the stimulus, gradually acquires the command of the principles of his mother-tongue.

Lewis[47] describes definite stages in the child's first year at which the appearance of successive modes of response to speech can be observed. By the end of his first month the normal child responds to various intense noises by crying, among such noises being the sound of another child crying. At the same time the sound of an adult voice has the effect of soothing him. In his second month he responds to an adult voice by smiling and often by speaking[48] i.e. the beginning of

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[47] M.M. Lewis op cit. p. 24.

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[48] "speaking" to be understood here in the sense of "vocalizing".

46/positive ...

positive response to friendly tone and negative response to angry tone. The infant, at this stage, does not respond to phonemic language patterns but only to intonation. Intonation must therefore be regarded as the primary factor for invoking infantile response. At six months, the child begins to show a neutral, non-affective response to either affective tone. Towards the end of the first half-year the influence of phonetic forms appears in conjunction with intonational patterns. In Lewis' own words: "In the child's linguistic growth intonational forms evoke their typical responses increasingly as a result of their occurrence in conjunction with phonetic forms." At ten months there is a new increase of positive response to either affective tone.

Speech is dependent upon its functioning as a sign to someone else. Malinovski[49] states "In its primitive uses language functions as a link in concerted human activity, as a piece of human behaviour. It is a mode of action and not of human reflection." The infant whose organism cannot interact with its inanimate environment to achieve satisfaction for its requirements, needs a linguistic community able to interpret the sounds it produces instinctively.

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[49]P. Henle op cit. p. 57.

Grewel[50] notes that "differentiations in pitch, but no melody, are apparent in the lulling monologue of a baby of about six months." Till then vocalising is usually accompanied by whole-body movement.

Stern[51] observed imitation of familiar sounds at seven-and-a-half months and of unfamiliar sounds at approximately eight months.

The development of linguistic achievement runs concurrently with that of motor control. Halverson[52] states that "in this development there is no step as crucial as the first achievement of hand and eye co-operation." Contact with a cube starts to be successful at twenty-four weeks, and hand grasps of a cube at twenty-eight weeks, i.e. approximately at the same stage as the conscious imitation of sound.

As unnecessary body movements decrease with more advanced sensory and muscular control, so does babbling start to resemble

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[51] C. and W. Stern op cit. p. 16.

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[52] Victoria Hazlitt : "The Psychology of Infancy", Methuen & Co. Ltd., London, 1933, p. 31.

conventional speech. Hazlitt[53] mentions that "throughout the literature there are scattered records of children of six months and onwards having odd words ... By six months practically all the different vowel and consonantal sounds have been made.[54] Association of meaning with a verbal symbol is likely to occur at any time after this age.

In view of the fact that, in all the literature available to me, Grewel's paper on "How do Children Acquire the use of Language?"[55] seems to be based on the most recent research in this field, I will give a brief summary of his views.

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[53]Victoria Hazlitt op cit. pp. 54 and 57.

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[54]According to P. Henle op cit. p. 59 "These may extend beyond the language of his parents to include sounds from other languages as well as noises that challenge phonetic transcription." Later, however, when the child learns to speak properly his extensive phonetic repertoire narrows down to those sounds which are produced in the language of his community.

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[55]PHONETICA 1959 Vol. 3, pp. 193-202.

At the end of the first year, the infant passes from the period of lulling to the use of certain individual sound complexes expressing certain wishes or urges, some months later he applies the first "words" adequately. These stages require a "double performance" in the field of sound production. The child tries to manipulate the phonemic system of the mother-tongue. In addition, he must acquire articulation which as a development in the field of motor co-ordination. As these two concurrent developments do not evolve with complete parallelism, two distinct groups of disorders can be outlined - the linguistic and articulatory ones.

Adults speaking to infants use very short sentences that may be described as metrical and which show a characteristic tendency toward reiteration similar to that in infants' speech (dada, mama, gigi, etc.). Nursery language, hitherto explained as an adaptation of adult speech to the infant idiom, may, to a certain extent, be due to an underlying biological principle which conditions the language behaviour of women with infants.

In their second year children often, even before they are able to express themselves properly in words, imitate conversations with adults. Producing sounds resembling sounds of adults they use at the same time a sentence melody similar to

50/the ...

the adult sentence melody in which statement, question and argument are clearly manifest. With such pseudo-sentences which have no "meaning" and contain no real informative material infants ask a question or imitate an answer. They endeavour, however, to make contact in an adult manner by imitating verbal and linguistic relations.

The fact that infants make use of sentence melodies long before the use of real language is possible seems to indicate that they acquire speech-melody first of all. Words and syntax are only fitted at a later stage into the sentence melody.

Is the melody itself a primordial part or requisite of the syntax? Does it exist independently, having no directive force in itself?

To conclude in Grewel's own words: "Many problems mentioned above require systematical research. Comparative study in different languages and cultures is necessary to acquire sufficient material for comparison and to demonstrate how far biological, sociological and educational factors play a part in the child's acquisition of language."

Learning a language is a process that goes far beyond acquiring the ability to produce a set of vocal skills. It

51/involves ...

involves using these skills in an appropriate manner which fits into the communal patterns and habits thereby influencing and developing both perception and conception. Perception, however, is not conditioned by sensory experiences only but in addition is influenced by mental set. Bruner and Goodman[56] summarize the effects of mental set "... subjects can be conditioned to see and hear things in much the same way as they can be conditioned to perform such overt acts as knee jerking, eye blinking or salivating. Pair a sound and a faint image frequently enough, fail to present the image, and the subject sees it anyway when the sound is presented ...". Language must therefore be regarded as one of the main factors that influence perception and the general organization of experience. Everywhere in the world exists a close relationship between language and culture. According to Sapir[57] "... the complete vocabulary of a language would be a complex inventory of all the ideas, interests and occupations that take up the attention of the community ..."

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[56]Paul Henle op cit. p. 6

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[57]Paul Henle op cit. p. 5.

Returning to the child's linguistic development we have to consider the growth of concepts as the acquisition of a language involves forming concepts expressed by or in it. According to Honle[58] "... A child is said to achieve an adequate concept when he develops a standard concept, that is, one which is socially determined and shared by most adult members of a given culture. Children learn and acquire a standard concept by successive approximations ..."

New concepts are either the result of new experiences or of the child's new approach to and re-evaluation of previous experiences. Responses to new concepts take the form of re-adaptations. Piaget[59] says that "... the individual acts only if he experiences a need, i.e. if the equilibrium between the environment and the organism is momentarily upset and action tends to re-establish the equilibrium, i.e. to re-adapt the organism. Response is thus a particular case of interaction between the external world and the subject ..."

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[58]Paul Honle op cit. p. 31

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[59]Paul Honle op cit. p. 32

Imitation plays an important part in all speech development. M. Guernsey[60] reports in "Zeitschrift für Psychologie 1928 pp. 105-178" the results of her research tests with 200 children. She found that infants begin to imitate single tones from seven months onward, series of two tones at ten months, and of three tones at one year. This process increases and develops steadily until, during the second year, the child begins to establish a vocabulary of his own. This consists at first of single words which, however, at the age of eighteen months acquire the force of full sentences.[61] By the end of the second year two word sentences appear. Weir[62] recorded pre-sleep monologues of her two-and-a-half year old son talking to himself while lying alone

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[60] requotation from Lewis op cit. p. 91

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[61] Ira J. Gordon op cit. p. 77 gives the following example : "What does 'dog' mean? Depending on the tone of voice, the gestures, and bodily movements it may mean, 'I'm scared, get me away, hold me and comfort me' or 'I want to pet the dog, I like dogs, Come here, dog' ..."

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[62] Ruth Hirsch Weir : "Language in the Crib", Mouton and Co., The Hague, 1962.

54/in ...

in his crib. She found that two and three word sentences were the most frequent, four and five word sentences occured occasionally, and longer sentences were exceptions to the rule. No true sentence exceeded seven words. She also indicates that imitation is not the only factor in language acquisition as the child actually practises his linguistic achievements.[63] "He becomes his own interlocutor and produces the equivalent of a dialogue spoken by a single person. He asks a question and provides the answer,[64] he performs a linguistic task and commends himself on the accomplishment, he produces a linguistic event and explicitly corrects himself."

In view of the fact that Weir's findings are based on her observations of one child only, no general conclusions can be arrived at until further research has been conducted along these lines. If this research substantiates the validity of her observations then this can be referred to as a preliminary stage

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[63]Ruth Hirsch Weir op cit. p.

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[64]cf p. 11: her observation may well be a consequential development from the imitation of a sentence-melody.

to later "thinking before speaking".

According to Gordon[65] "... language activity grows as the infant finds a warm, accepting, emotional climate in the home. Again we have the cyclic pattern repeated with acceptance; the child takes over the sounds of speech, then the understandings of the meanings of the words, then the use of the words themselves ..."

At first, when the child uses and responds to adult words referentially, he is not referring to a single object but to the situation as a whole. A reference made by adults using the same words will therefore not correspond with the child's utterance. Lewis states[66]: "... This correspondence - which is essential if the child's language is to acquire a fully symbolical function - is the result of a further process which, beginning even before the child first uses and responds to adult words, extends throughout the period of his education ..."

Echoism, another important factor in the development of

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[65]Ira J. Gordon op cit. p. 77

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[66]Lewis op cit. p. 163.

language acquisition is a form of imitation i.e. repetition of sound complexes to which the children do not attach any meaning. They may repeat aloud a very short sentence or, more commonly, part of it, mainly the last words i.e. as much as they can retain in their short memories. Echoism is also the reason for the use of mutilated words and possibly of inverted word orders.[67]

Frequently children feel the urge to express something for which their vocabulary is, as yet, inadequate. This inadequacy results in analogous constructions.[68]

Children delight in playing at language long after they have learnt to talk properly. They enjoy varying sounds of real words, and this results in the rounding-off of vowels and in alliteration. Adults must have taken these tendencies into consideration when writing nursery rhymes e.g.

Sing a song of sixpence ...

Polly Piper plucked a pigeon ... etc.

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[67] Otto Jespersen op cit. p. 136 quotes : 'Not eat this' as a child's echo of 'You mustn't eat that.'

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[68] Otto Jespersen op cit. p. 130 quotes among others : hunged, catched, buyed.

All these features occuring in the development of language fall within the categories of the metalingual and poetic aspects of linguistics.

When reaching the age of three years, some children are sent to nursery school. At this age, the traits of a child's character are basically established. In addition it is already stamped with the behaviour patterns of his environment as each social group expects its precepts to be passed on by parents to their children. Children of different social classes show also a marked divergence in the progress of linguistic development. Children from families of high socio-economic status tend to be advanced. The language of only children, developed by conversation with their parents rather than with siblings, shows precocity. The linguistic development of children of lower social strata is usually retarded. If this retardation, however, is not due to mental deficiency, it will gradually diminish in the course of schooling.

The entry into nursery school marks the first big step from individual to community behaviour, from egocentricity to socialization.

Piaget[69] conducted the following test in a nursery-cum-

[69] C. and W. Stern op cit. p. 148.

58/imitat- ...

infant-school with children ranging from three to seven years. During a full month he recorded all their utterances. From these he determined the "differential coefficient of egocentricity" i.e. the percentage of egocentric utterances: he observed approximately 60% with children aged three and four years, less than 50% with five and six year olds and a drop to 30% with those aged seven. Piaget's findings prove not only the positive influence of early group education towards the achievement of a true communal spirit but also, in a more general sense, as a counter-influence to disturbing individualistic tendencies.

During the two years preceding compulsory schooling, a considerable increase of concepts through experience and, consequently, of the corresponding vocabulary occurs. At the age of four, children still answer questions with long imaginary stories. They are incapable of accepting words as mere symbols, and associate words of identical structure but different meaning e.g.: 'Mr. White must be white.' This etymological stage in their linguistic development continues until school entry. In the course of the fifth year, however, they begin to explore the differences and common features existing between familiar and unfamiliar things. This process, which transplants them from the world of magic into reality continues throughout

their years of schooling. The exploratory spirit widens their range of interest, enriches their knowledge and furthers their mental development; they begin to understand the causal relationship.

The mere accumulation of vocabulary which, hitherto, held an important position in the acquisition and development of articulate speech, gives way to the logical and connected use of words. Sentences increase in length and complexity providing us with a measure of mental capacity.

To conclude with Gordon's[70] words: "These two major functions of language, the clarification of meanings and the expansion of interpersonal horizons, continue long past the period of infancy, as long as we live. What occurs in further development is increased complexity and higher levels of organisations, but the dynamics remain the same."

The origin of singing can be traced back to the sentence melody.[71] From the earliest stage i.e. the child's first

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[70] Ira J. Gordon op cit. p. 79

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[71] cf pp. 49-50

endeavours to produce still unarticulated speech sounds in babbling, "speech" and "singing" form an inseparable unit. With the mental development leading to the growth of concepts and the acquisition of language through imitation and improvisation this unit of "speech-song" is dissolved and speech and singing become two separate entities.

The earliest utterances of the baby might be classified as "pathogenic" as its cries during the first three months express its emotional states, i.e. its needs and wants, its discomforts and pains. At the age of three months, it begins to voice "positive response", i.e. pleasurable sensations which can still be classified under the same category.

As in the case of primitive races, the child's language originates as play, and babbling might therefore be described as an intermediate stage in which rudimentary logogenic elements combine with the original pathogenic ones and lead to the first appearance of melogenic forms in the sentence melody. These first "melodies" of the infant show striking similarities to the music of primitive peoples. No definite intervallic order comparable to the different mode- and scale-systems of western music can be distinguished. Microtones[72], partly due to the

[72] intervals smaller than an equally tempered semitone.

natural portamento[73] and the constant repetition of "melodic patterns" appear in both infants' babbling and primitive music. Werner[74] gives examples of "Lallgesänge" (i.e. babbling songs) of small girls aged 2½ years. One and the same motif, consisting of two tones only, is repeated over and over again. Only two notes are used, i.e. the basic reciting note and another a lower minor third. The same melodic material he finds also with boys aged three. Repetition and slight variations of this motif occur, generally, with gradual "flattening" of the original pitch. Werner's book, although written half-a-century ago is still regarded as a "classic" in this field. He records these deviations from the original pitch approximately in quartertones. These flattenings are mainly due to the natural decrease of energy through loss of breath.

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[73] passing through the whole vocal range with no definite intervallic steps.

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[74] Heinz Werner : "Die melodische Erfindung im frühen Kindesalter", eine entwicklungspsychologische Untersuchung. Aus den Sitzungsberichten der philosophisch-historischen Klasse der kaiserlichen Akademie der Wissenschaften in Wien, 182. Band, 4. Abhandlung, separat abgedruckt. 1917.

62/The ...

The emergence of the minor third from the microtonal maze is of equal importance in the development of singing as the first successful attempt at articulation is for the development of speech. This "two-tone scale" does not only dominate the childrens' earliest attempts at singing, it also serves as the basis of other tones which, added to it bring about a gradual expansion of "musical space".

Werner[75] defines the minor third as the source of all melody. It represents the primordial principle of all aesthetic endeavours i.e. to realize the maximum aesthetic effect with a minimal motoric effort. He describes singing within the range of whole tones or semitones as secondary forms due to the insensibility of the child's ear to recognise and reproduce a semitone.

In a similar sense, he mentions an "articulated primordial rhythm" (artikulierter Urrhythmus) as originating from regularly recurring "expiratory cries" (Expirationsschrei) of the neonate which are interrupted by "rests" conditioned by inspiration. He contends that rhythmic expression exists already sub-consciously. Repetition and accentuation are elements of a rhythmic structure. Combined with periodic tonal synthesis,

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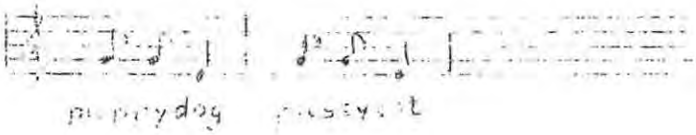
[75]Werner op cit. p. 71.

63/they ...

they lead to rhythmic forms, termed by Werner "melodic rhythm". Further development leads to alterations in pitch and duration which introduce the dynamic element.

The minor third is used both ascending and descending, depending on the word accent. Children's early "speech-song" shows a marked preference for trochaic and dactylic metres and therefore tends to use the descending or falling minor third for both calls and questions e.g.



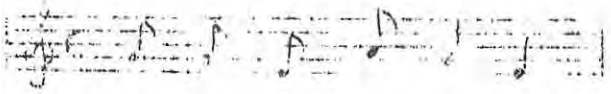
The interesting fact that children who had, a year earlier, copied the sentence melody of adult's questions, answers and statements are now using "affirmative" sentence-melodies for questions is due to two facts. Although they are able to accentuate words correctly, they lack as yet the command of syntax which would enable them to differentiate between the affirmative and interrogative inflection. On the other hand, their intonational patterns are strongly influenced by their inherent feeling for metre (metric feeling).

During the fourth year, the child's vocal range increases

64/to ...

to a fourth, though only three tones are used in different intervallic combinations. The most frequent is the addition of a whole tone above the original minor third.

When watching such children at play, one can hear them repeating this pattern



ad infinitum until they stop from mere exhaustion using either nursery rhymes e.g. Oranges and lemons ...

Ring a ring a rosies ...

or improvised verses of their own. Their improvisations are not confined to word structures only. They make even their own rhythmic-melodic patterns. The creative urge inherent in children of this age group is, unfortunately, not encouraged by their adult environment as grown ups tire of the monotonous presentation.

An analogous stage of development can be observed in the indigenous music of the Bantu peoples of southern Africa. They too, repeat short patterns in slightly varied forms and have not yet discovered the technique of extending musical forms by contrasting sections.

65/The ...

The downward extension of the three tone scale through the addition of two wholetone steps leads to the unhemitonic pentatonic scale which corresponds closely to both the mentality and vocal range of children of infant school age. All civilized peoples passed through the pentatonic stage before reaching musical systems of higher organizations, such as the diatonic and chromatic scales.

With the emergence of the "I" and the appearance of the "ego", i.e. during the fourth year, the hitherto existing unit of "speech-song" begins gradually to dissolve. Speech becomes a means of communication and environmental control and the increasing mastery of language serves educational purposes. Concurrent with this development, the children lose the gift for improvisation. They are taught both recitation and songs.

At school entry, the range of both girls' and boys' voices comprises approximately an octave upwards from "d" above middle "c". Due to the fact that the boys' larynx is slightly larger than that of the girls, the boys' voices are clearer and stronger. Up to the stage when puberty sets in, both boys' and girls' voices extend in range to approximately one-and-a-half octaves. Volume and dynamics increase with the general growth of the body and the strengthening of the muscles.

66/Adolescence ...

Adolescence is initiated by the higher centres in the brain. According to Tanner[76] "The time of the beginning of adolescence seems to depend on the brain reaching a certain stage of maturation. The fundamental physiological and psychological changes in both sexes entail the penultimate stage in the development of the human voice. Hitherto, the ranges of both boys' and girls' voices were almost identical. The further development, however, leads to a difference in range of approximately one octave until recently attributed to the different rate of growth within the vocal apparatus. The vocal cords of boys were believed to extend to approximately one-and-a-half times the original length and to thicken considerably. Recent research described by Raoul Husson[77] however, has revealed

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[76]"Discussions on child development", edited by J. Tanner and Bärbel Inhelder, Vol. 1, Tavistock Publications Limited, 1956, printed in the Netherlands by N.V. Grafische Industrie Haarlem. p. 36.

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[77]Raoul Husson : "Der gegenwärtige Stand der physiologischen Phonetik", PHONETICA Vol. 4, 1959, pp. 1-29.

hitherto unknown features of the vocal apparatus. Due to research conducted since 1950, the following facts have emerged. Both male and female voices tend to have the same "Rekurrenschronaxie" (cf p. 33 footnote 29) nevertheless their respective vocal ranges differ by one octave. As J. H. Amado[78] has shown, the vocal cords of a man do not respond as easily to two-phase recurrent stimuli (Zweiphasige Rekurrensreize) as those of a woman because of histological and hormonal influences. A woman normally uses the two-phase, the man the one-phase register. The recurrent incentive seems to become fixed in children of four to five years. If the mutation of the voice takes place normally, the adult attains the same "Rekurrenschronaxie" he had in childhood. As in the case of string instruments, the pitch of the singing voice depends on length and thickness of the vibrating cords. The transition from the boy's to the man's voice lowers its pitch by approximately an octave. The girl's vocal organ shows only a minimal growth and, consequently, her voice remains within the original range.

The male voice may evolve along two different lines, either through gradual lowering of the range or by sudden

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[78] J. H. Amado

"breaking". The latter is characterized by the simultaneous existence of treble and baritone elements. In both speech and singing the voice alternates involuntarily between the two ranges which may be due to physiological or psychological impulses.

The change over from the boy's to the man's voice takes approximately three to four years. During the last years at school, boy's voices settle temporarily in a range of approximately a fifth which gradually increases to one-and-a-half octaves. The majority of male voices finally settle within the middle range, i.e. the baritone range. Tenor voices settle usually later than baritones. In the beginning there may be little difference in range and only the timbre of the voice indicates the future tenor. The upper register extends only after leaving school. The low bass is the latest to emerge. Just as in the case of the organ, where a pipe producing a lower note necessitates extension in both length and diameter, a real bass voice develops only in consequence of physical growth.

The transition from the schoolgirl's to the fully developed woman's voice entails an increase in volume caused by the development of the female form, expressiveness caused by rapid

mental development, and flexibility due to the relatively small dimensions of the vocal cords combined with the newly-reached maturity.

The majority of mature female voices remain in the old treble range now termed "mezzo-soprano". The development of high soprano and contralto voices runs along lines similar to those of tenors and basses.

With regard to this further development of mature singing voices in general, extension of range, increase in volume and conscious control of the vocal apparatus can only occur as a consequence of additional physical and mental development, and constant, careful use of the most perfect instrument.

IV. AN APPROACH TO CORRECT SPEECH AND SINGING.

On hearing the cries of an infant, one can but marvel at the volume of sound which emerges from the small body. In the infant the ratio between sound volume and body size differs considerably from that found in the adult; the infant produces relatively more sound. This is due to the fact that in early infancy all vocal sounds are subconsciously produced by perfect co-ordination of the parts of the vocal apparatus.[79] Therefore, the natural state from birth onwards is characterized by perfect voice production. This natural perfection goes through various stages of deterioration as incorrect speech and singing are noticeable in most people at a later stage in life.

The earliest deterioration sets in with the first attempts at sitting up. If not supported at the back, the child tends to sit slightly hunched forward, thereby compressing his internal organs and forcing out the abdomen. This results in faulty abdominal breathing, i.e. the air is compressed in the abdominal region instead of being concentrated towards the larynx. This may be eliminated when the child begins to

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[79] In addition, the infant acquires during the first three months of his life maximum sound production energy within special ranges, cf p. 6.

walk, as maintaining the equilibrium requires contraction of the abdominal muscles. This abdominal contraction forces the compressed air upwards and leads to a combination of intercostal and diaphragmatic breathing. If, however, the child sits up unaided, the breathing remains predominantly abdominal.

The most harmful stage of deterioration begins with the child's first attempts at articulate speech. From this moment, until the child is subjected to compulsory group-education at school, he is dependent upon the imitation of the speech patterns used by those around him. The first conscious imitation occurs between the ninth and the fifteenth month. During the first two years the mother's speech behaviour will be the primary formative influence, as the child will readily respond to the emotional stimulus provided by the mother's attitude towards him. Love and indifference, patience and impatience, placidity and excitability, all these will be conveyed by the mother's voice and will have their effect on the child's response. Adverse states of mind are apt to distort the voice. Strain raises the pitch to above the normal level because of added tension in the vocal cords. Flexibility being impaired by constriction, speaking becomes more difficult and results in incorrect pronunciation. All these faults in the parent are copied by the child and retained in his vocabulary.

72/Babbling ...

Babbling continues concurrently with the development of articulate speech for the first three to four years. During this period of subconscious activity, the vocal apparatus is still used correctly.

With the wider environment the influence of older children and adults is added to that of the mother with similar effects.

Modern psychologists suggest that constant correction of speech at an early stage could lead to speech inhibitions. Knowledge of this fact tends to discourage enlightened parents from correcting bad speech habits.

Children of three years of age, if sent to nursery school, are for the first time subjected to group-education. At that age, however, they are primarily influenced by their peers. Throughout their school years, they generally tend to be captivated by bad examples which they emulate to the detriment of their speech. When the children have reached the age of four, the teacher should attempt to guide them towards correct speaking.

"No single 'correct' standard of pronunciation, but rather many acceptable pronunciations, exist ... standard speech is not the average speech of the community - halfway between the illiterate and the literate - but rather the habitual speech used by

73/cultivated ..

cultivated members of our society."[80] This should be the guiding principle for the language teacher right throughout schooling. Little can be achieved, however, before the stage of compulsory education is reached. The nursery school teacher must confine himself to initial steps in this direction. He should speak slowly, distinctly, and correctly, thereby setting a good example. Excitement, aroused by the competitive spirit, causes the children to shout unnecessarily in trying to make themselves heard in order to attract the teacher's attention. Any such straining is detrimental to the voice. The children must be disciplined to speak softly, to open their mouths and to articulate clearly. Much damage may be prevented by observing these basic rules. If the teacher notices that they have difficulty in pronouncing certain words, especially those containing consonant clusters involving quick adjustments of the organs of speech, he must devise appropriate exercises for them. These exercises should provide for the synchronisation of the necessary movements of the speech organs. Alliterative nursery rhymes may help in such cases.

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[80]Eisenson and Ogilvie, "Speech Correction in the Schools", Macmillan, New York, 1957 and 1963, pp. 41-42.

74/Approximately ...

Approximately two-and-a-half years before compulsory schooling begins, speaking and singing have become two separate entities and are treated as such in nursery school. Any singing activities should take into consideration the limited vocal range of a child at that age. At three-and-a-half years the vocal range comprises approximately a fourth, extending from "c" to "a" above middle "c"; a year later, a major sixth from "d" to "b" above middle "c". Voice training should not be attempted at this stage of physical and mental development of the child, as one would also not expect it to do weight-lifting. The correct pronunciation of the text ought to be achieved by rote; correct speaking will lead to correct singing.

During the first few years at school the child is subjected to basic speech correction. The services of specialized elocutionists are available only to certain schools. Here, speech correction is applied mainly during periods specially set aside for this purpose. In the other schools it takes place during language classes. These classes aim at the acquisition of a standard pronunciation by the children. This ideal could, however, only be realized if speech correction would take place in all subjects and not only in language classes. From

75/prescribed ...

prescribed books, discussions with teachers and my own observations I am led to believe that emphasis is generally laid on the formation of vowels as these bear the linguistic characteristics of intonation, stress and pitch, whereas consonants, in general, remain unchanged. This approach seems to me to overlook the fact that only a correctly produced consonant will guarantee the correct production of the following vowel. It therefore seems advisable that the pronunciation of consonants be corrected before the formation of vowels is taken into consideration.

The ability to discriminate between different types of vowel sounds has to be achieved before corrections can take place. Templin[81] studied the development of the ability of sound discrimination in children of preschool age and pupils in the infant school "the (test) scores for the eight-year old boys approximate those of the seven-year old girls. Here, as in the articulation of speech-sounds, the boys are about one year behind the girls at the oldest age included in the study."

Diction is the primary factor in eliciting response from

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[81] Mildred C. Templin : "Certain Language Skills in Children", University of Minnesota, 1957, p. 72.

people in the child's environment. Muffled speech, too high a pitch in speaking, and breathiness, all hinder communication. As speech is phonated breath, breath-control has first to be established. Posture influences breathing directly. "Walk tall, speak tall, sing tall", is the simplest rule for achieving this. In order to walk straight, the abdominal muscles and the trunk muscles must be contracted. (This prevents abdominal breathing as the air is directed up towards the larynx.) When the back is straightened, the ribcage is slightly raised, and the shoulders depressed (thus clavicular breathing is prevented), the back contracted, the abdominal muscles contracted and pulled upwards. Through these actions the air column is formed, and acts as a support for both speaking and singing. The voice can now be projected by means of muscle control. A correct posture thus involuntarily prepares the body for correct vocal attack through subglottal air compression, and ensures a combination of intercostal and diaphragmatic breathing.

This preparation will also result in a loose larynx, as a stiff larynx will tire the child very quickly. The supraglottal actions are involuntary during normal speech but have to become conscious to enable speech to be corrected. The

77/extent ...

extent of the mouth opening and the point of articulation are decisive in the formation of both consonants and vowels. As explosive front (p, b, t, d) and back (kg) consonants have latent vowels depending on the extent of the mouth opening, they should be established first of all, though always in combination with definite vowels. The nasals (m, n, ŋ) must not be produced through clenched teeth. The fricatives (f, v, s, z, ʃ, ʒ) and the aspirant (h) tend to be produced too breathily. They should be rendered as precisely and intensely as possible. The aim is to get the maximum result with the minimum of effort. The breath-stream must be directed upwards by abdominal contraction and constricted by lip contraction for bi-labials (w), by the tongue and teeth for sibilants, (s, ʃ) and by the upper teeth and lower lip for labio-dentals (f, v). Affricates require a double approach. They are combinations of an explosive and a fricative. These may present difficulties for some time (ts, dz, tʃ, dʒ). Further consonant clusters involving quick adjustments will take longer to be mastered (str, kts, pθs, dθz), i.e. triple approaches are the most difficult, especially those involving two consecutive fricatives. (w) and (j), usually termed "semi-vowels", are treated as consonants by phoneticians and the same treatment applies to them i.e. precise and intense production.

78/The ...

The inside of the mouth is regarded as being divided into sections called "points of articulation". Each consonant requires a certain tongue and mouth position. The tongue should always touch either the upper or lower teeth, i.e. it should never be retracted as it is directly connected with the position of the larynx since the hyoid bone is the axia for both tongue and larynx. The mouth must also be opened to a certain extent, usually to the width of two fingers, to enable the sound to be "carried". Muffled tones will then disappear naturally.

I have already stated that consonant production is basically the same for speaking and singing, but for singing both front and back consonants must be produced as far forward as possible in order to avoid throaty singing.

Too high a pitch in speaking is generally due to emotional strain which causes the larynx to constrict thus raising the voice unnaturally. This is usually the case with children who are highly strung. For these children relaxation exercises for both tongue and larynx should be given. "Lolling" of the head relaxes the neck muscles including those of the larynx, and the tongue loosens at the same time.

The action of the soft palate (Plate 7) is subconscious while one is speaking, but in singing it is imperative that

79/it ...

INTERIOR OF MOUTH SHOWING
MOVEMENT OF SOFT PALATE

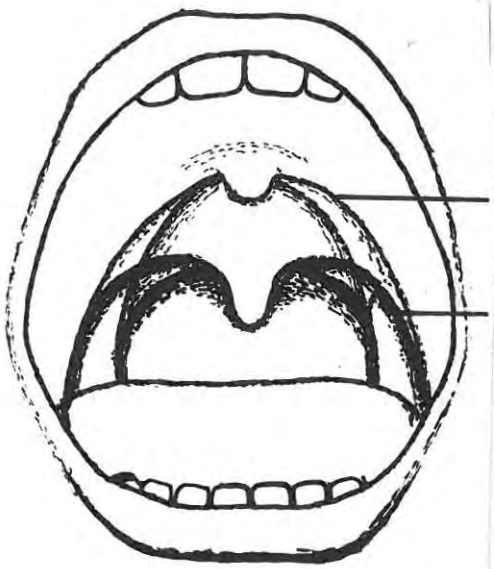

PLATE 7

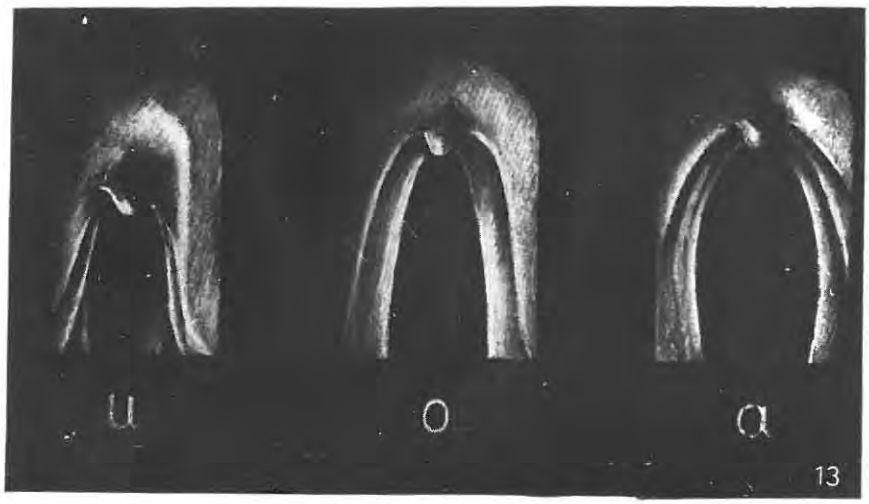

PLATE 8

it should be moved voluntarily. As singing contains sustained vowel sounds, the soft palate must be retained in the position relevant to the particular vowel during the whole period of its utterance. The shape of the soft palate alters with the different vowels and the simplest way of explaining this to children is to tell them to keep it approximately in the position it occupies while yawning (Plate 8).

From eight years on, children can understand these actions and by ten years, they should have been acquired. This accounts for the fact that children of that age can appropriately become members of choirs.

Once these requirements have been established, there is no need for further correction. The voice will expand, and become stronger, and the prosodic features of speech will be systematical as the brain develops.

During adolescence, further problems arise, not with regard to articulation as such, but rather with regard to the control of the voice. This is especially the case with boys, as their vocal cords grow faster than does the body (cf p.). As the boys naturally continue speaking, singing should not be stopped completely. The vocal range, however, alters constantly, thus individual attention is necessary to prevent

80/excessive ...

excessive strain in both the high and the low register. Boys need careful guidance in attaining control over their vocal apparatus. The mutation period may take up to four years. For approximate ranges during this time refer to Chapter III. At approximately school-leaving age, i.e. 16 years, the voices of young people are usually basically settled. Further training in speech and singing will only be necessary for those contemplating a professional career.

CONCLUSION.

In my preface I gave my reasons for undertaking this investigation. I have found the subject a controversial one with a variety of ideas presented by different authors but with no practical conclusions which could be applied in education in schools.

The child is born with perfect co-ordination of all the organs of speech. At different stages deteriorations set in. If these were prevented or corrected in the earliest stages the original perfection could be preserved. Systematic attention given to these principles would ensure the correct, natural development of speech and song during school years. Higher training in these skills would only be necessary for future professional actors and singers after they have left school. In the schools it would be enough for the teacher to know that correct breathing produces both correct speaking and correct singing. As William Shakespeare, the noted singing teacher of the 19th century says in his book "The Art of Singing", part I, p. 24.

"Chi sa parlare erespirare, sa cantare."

("He who knows how to speak and to breathe, knows how to sing.")

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