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If you want to be a natural scientist, just learn to observe. Don't ask any questions, just observe. —Wilhelm Reich

Functional Vocal Training

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PREFACE

There once was a man who had a frog. He trained him and taught him to jump on command. Testing his ability, he was astonished to discover that his frog could leap twenty feet. Soon the man began to wonder about the amount of propulsion contributed to each hind leg. Accordingly, he cut one hind leg off and again urged the frog to jump. Struggling under his terrible handicap, the frog did the best he could, but was unable to manage more than seven feet. "Humph," said the man to himself. "Interesting. I wonder how far he can travel with no hind legs at all." Straightway he cut off the remaining leg and repeated the command. Naturally, the frog could not move. "Damn," exclaimed the man. "My frog must have gone deaf."

This story is, of course, analogous to the way vocal training has been practiced for much too long a time. Attitudes are employed as principles, opinions dignified as facts, theories accepted without challenge, and, frequently, whenever valid principles are embraced, they are misapplied. Unable to learn, the student is then blamed for all shortcomings because of an inherent lack of talent. The purpose of this monograph is to show a better, more logical path to follow for the fulfillment of vocal skills—one more consonant with natural order and functional logic.

FUNCTIONAL VOCAL TRAINING

In the short history of singing as a cultivated art form (circa 1600 to the present) it is curious that the high point of vocal virtuosity was achieved when there was a great dearth of technical knowledge related to the mechanics of function. Little or nothing was known in the seventeenth, eighteenth and early nineteenth centuries of anatomy, physiology, or acoustics, certainly not by the teachers of singing. Caccini,

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Tosi, Mancini, Porpora, and the elder Lamperti were musicians, and the concerns of science were totally removed from their sphere of interest. Yet it is a fact that, like the Roman Empire, the history of singing is notable for its dramatic and sudden blossoming, followed by a decline which, in the light of subsequent advances in technical knowledge, is not easily comprehended.

Careful examination of the available evidence related to early teaching practices yields some interesting testimony as to the "why" of this particular success. Through necessity, the founders of the art of *Bel Canto* became, in essence, natural scientists, in that they observed the manner in which the vocal organs were prone to respond and formed conclusions on the basis of those observations. Rather than inventing techniques which represented imposed disciplines, they studied vocal response patterns in terms of relationship. By simply observing, they were able to grasp the fact that the response was not always uniform, and that the lack of uniformity was obviously contained within the dynamics of the musical figure or phrase being sung. From this it was but another logical step to conclude that the functional habits of the vocal organs were predictable—that there was a definite correlation between stimulus and response.

The first functional principle to gain general acceptance was registration. As early as the fourteenth century, an Italian named Marchetto reported that one of the vocal tricks of his time was to pass from the chest register to the falsetto, after the manner of a yodel. The two registers were known at the time as the *vox integra* and the *vox ficta.* Many years later, Giambattista Mancini (1716-1800) corroborated this evidence, as he offered a more specific definition. "The voice," he stated, "ordinarily divides itself into two registers, one called the 'chest,' the other the 'head,' or falsetto. Every student, whether a soprano, alto, tenor, or bass, can easily know the difference between these two registers. The great art of the singer consists of acquiring the ability to render, imperceptible to the ear, the passing from one register to the other" (1). It is important to note that for many years the falsetto and head voice were synonymous.

Inasmuch as our concerns here will be with types of response patterns within the coordinative process, it might be added that the registers referred to are caused by the contraction of muscle groups which hold the vocal cords in tension to meet the demands of pitch and intensity. Traditionally, the gap between the falsetto and the chest registers has been known as the "break." To eliminate this gap between the mechanisms and unify the functional activities of the two registers, singers

were introduced to the art of the *messa di voce,* or swelled tone. Because of the discovery of a parallel relationship between patterns comprised of pitch, intensity, and, as we shall see later, the vowel, and the mechanics of registration, vocal training became a dynamic process in which a faulty technique can be totally restructured.

Complete integration of the chest and falsetto voices into a functional entity reflects an extremely high level of technical refinement and skill. One of the primary goals of training is to coordinate these constituent parts, during which time there will be a gradual interchange of quality characteristics. The falsetto progressively loses its falseness and grows far more extensive in its tonal range, finally to become transformed into what is now recognizable as the head voice. For each functional arrangement (the possible combinations are virtually limitless), the stimulus pattern—that is to say, the pitch, intensity, and vowel pattern—acts as the catalyst. Just as bodily organs will recoil in horror at a terrifying sight, or become vibrant and expansive at joyous news, so, too, the vocal organs will similarly react to an external influence. In vocal training, the physical properties of the exercise patterns selected for use become subject to the laws relating to environment and organic health.

Once it was recognized that a proper selection of pitch-intensity patterns (a scale of tones sung at a given level of intensity on a particular vowel) would evoke a tonal texture attributable to a particular type of register reflex, a direct means of access to the seemingly inaccessible functional response of the vocal organs was assured. By careful selection of appropriate combinations, either a pure falsetto could be established, the chest register induced to respond, or a blending of the two effected in which the participation of one mechanism or the other could arbitrarily be made more or less dominant as desired.

From the standpoint of utility, the most impressive aspect of *Bel Canto* training is that the techniques employed were not mechanistic. There was a total absence of "do this" instruction and a natural phenomenon was dealt with in a natural way. Work on the voice apparently was done through the medium of tone, by getting at functional activities not subject to volitional control through their equivalent representations in registration. What is crucial to the training of the voice, then and now, is the insight provided by two important discoveries: 1) the theory of registration, which provided a means for influencing functional mechanics without recourse to methods of direct control, and 2) the reflexive nature of the vocal response, the fact that the vocal organs react to an outer stimulus.

The discovery of the interrelationship between the chest register and

the falsetto mechanism does not, on the surface, appear to have far-reaching consequences. On closer inspection, one sees, the vocal registers have a more powerful effect on the functional activities within the pharyngeal tract than one had supposed. On the basis of my own experience in attempting to duplicate the procedures promulgated during the formative years of the vocal art, it is evident that:

1. There are two registers: one, the falsetto; the other, the "chest."
2. Each register must be the product of a separate mechanical (muscular) action.
3. Each register appears as an automatic reflex to pitch and intensity.
4. When the falsetto merges with the "chest" register in a coordinate relationship to become the "head" voice, it considerably overlaps the lower, and the two share many notes in common.
5. Because of the overlap, the voice will often, when reasonably well coordinated, appear to be made up of *three* separate divisions.
6. Each tonal area, or division, is recognizable because it is represented by unique textures.
7. Each area owes its special tonal characteristics to the influence of a separated or combined register action.
8. By proper selection of pitch-intensity patterns the registers can be separated or combined on a rather arbitrary basis.
9. Even when operating as a unit, the ratio of registration can still be balanced and set up quite arbitrarily by the instructor, or by the singer himself if he is skilled enough, through proper use of pitch-intensity patterns. (This is only possible when the registers are already quite well balanced.)
10. The muscular response causing a particular register to predominate is purely involuntary.
11. The interplay of the registers, controllable through pitch and intensity patterns, represents the manipulative device to which the student can respond as an act of *will.*
12. As the reaction of the vocal organs to these simple patterns involves the involuntary movement of muscles, the movement of these supposedly inaccessible muscular reflexes can be brought under a very practical kind of control.
13. By skillful use of pitch-intensity patterns the registers can be separated, developed independently, or made to draw together and act as a unit in innumerable relationships involving a bal-

ance to be shared between them .

14. These factors, plus temperament, musicality, anatomical structure, and psychological attitudes, are the contributing elements making each voice and personality a unique problem (2).

The above listings contain some of the conclusions that naturally follow from pursuing a functional approach to voice training. Careful analysis of the implications contained within these relationships will force us to one conclusion: that to improve the "voice" one must improve the coordinative process which is the qualitative factor. This is what was done in former years, and it is the path to which we must return if the art of singing is to be revitalized.

For many years, little or no dissatisfaction was expressed over the validity of the basic principles discovered and applied during the early centuries of the vocal art. Many of the great teachers complained about the decline of vocal culture, but in analyzing their comments, it is clear that criticism was not leveled against accepted functional principles, but against inept teaching. Not even Garcia, who opened the Pandora's box which caused the gradual demise of an amazing era, found fault with traditional procedures. His only thought was to speed the training process.

The entire Garcia family was truly remarkable. The father, Manuel del Popolo Vincente, was a brilliant composer, singer, conductor and teacher. As a teacher, he had many celebrated pupils, principal among whom were his two daughters, Maria Malibran and Pauline Viardot, and his son, Manuel. It was the son (1805-1906) who was to become one of the most noted teachers in history. A learned man in many disciplines, his curiosity was immense. Impatient with time, he was fascinated by the idea of studying the chords during phonation in order to better understand the process. As a consequence, he invented the laryngoscope.

The invention of this device proved more useful to the field of medicine than to music and was responsible for the introduction of mechanistic methods. Voice teachers, medical doctors, and scientists all peered into the laryngeal area, each group arriving at different conclusions as to what was going on. Without troubling to distinguish between healthy and unhealthy functional activities, each group propounded a new theory of voice "production" based upon what had been observed. Traditionalists backed off. After all, how can one dispute an *observed* phenomenon! Consequently, the earlier theory of registration was discarded in favor of newer theoretical propositions; propositions which declared unequivocably that the voice was comprised of but one

register, no registers at all, three, four or, as Emil Behnke suggested, five (3).

An example of mechanistic training is positioning the uvula. When a tone is well formed, the uvula will recede into the roof of the mouth, while at the same time the pillars of the fauces will broaden. To duplicate this physical arrangement, students were advised to raise the uvula and make space in the back! Having responded to this suggestion, it was only natural for the vocal organs to stiffen or, in vocal terminology, become "tight." In order to counteract the tightness (a feeling of the tone being caught in the throat), the next piece of instruction was to place the tone forward at the lips. At this point, a great tradition began to disintegrate, and mechanistic methods became the hope of the future.

The end result of this turn of events can be summed up by a statement made by the great tenor Jean De Reszke (1850-1925) to the effect that "I find the great question of the singer's art becomes narrower and narrower all the time, until I can truly say now that the great question of singing becomes a question of the nose!" (4). This priceless piece of rhetoric refers to a theory De Reszke developed in collaboration with Dr. H. Holbrook Curtis, a noted throat specialist. Discarding previous experience, they believed resonance to be the answer to all functional problems, and singing *dans la masque* is now a widely accepted training method. Unfortunately, what was thought at the time to be the hope of the future became the frustration of the present.

As it has always been a rarity to find musicians who have had a solid background in the sciences, it was quite natural for the majority of voice teachers to follow in the path laid out by Jean De Reszke and, in one form or another, adopt practices which tended to move farther away from the functional principles set forth at an earlier time. Increasingly, attention was directed to the sensations of vibration awakened when the register mechanisms were operative until, finally, the terms falsetto, head voice, and chest voice lost all significance. With the functional importance of the registers almost totally obscured, training methods became "sensation" centered. Subjective feelings were made to supplant functional principles, and the search for the right symptom of vibration, its locale, "ping" and "point," became the new fashion.

While it may seem to many that the link to traditional techniques that gave rise to the first Golden Age of Singing has been completely severed, upon closer inspection they will find this is not so. The vocal jargon of today still has its roots firmly grounded in the past. It *is* possible to retrace the way, and it *is* possible to rediscover the functional

principles from which the terms of reference evolved. Let us, for a moment, examine some of the probabilities.

Expressions familiar to most members of the singing community would include "head" voice, "chest" voice, "hooking" for the acquisition of high tones, and "forward" placement and "low" placement, with tones being described as being "heavier" or "lighter." Another fashionable term is "focus." Although as functional representations these terms are without meaning, nevertheless, it is evident that they are all natural derivatives of those working principles contained within the concept of registration developed from an earlier time; they are symptoms of a specific type of functional activity.

What immediately captures the attention when comparing older terms of reference with contemporary nomenclature is that most of the expressions indicate some kind of polarity. With great consistency, "high" is placed in opposition to "low." "Hooking" the tone certainly implies an impetus whose intent is to initiate a change from one type of physical arrangement that can only be described as lower, to that of another that is higher. "Heavy" and "light" surely point to the certainty of there being at least two mechanical factors present to account for the differences in tonal weight. Perhaps most interesting of all is the reference to the "half" voice. Of course, this could merely indicate a reduction in the level of tonal volume, but if this were true one would, more likely than not, refer to half "volume," rather than half voice.

All of the above terms are plainly derivative. When referred to their functional origin, these expressions will convincingly demonstrate that the registers clearly operate, or are potentially operative, as a functional unit in all voices, high or low, male and female. It is these two mechanisms which create the *illusion* of "headiness" and "chestiness," of depth, of a feeling of heaviness or lightness, of a sense of tonal "position." Without the phenomenon of registration, the voice would be seamless and the mechanism inaccessible to training.

On a functional basis, it is demonstrable that the vocal mechanism is accessible; that either the head register or the chest register can be tonally extracted at will. By simply knowing the formula which evokes a register response, the feelings of vibration which are their sensual equivalent will appear. The chest register, when dominant, will exhibit a quality which Tosi observed to have come from the breast by strength, a quality of weightiness; while the head register will exhibit qualities of "lightness," "height," flexibility, and general buoyancy, each texture and symptom of vibration being the result of the registration (1). To reverse this equation is to invite pedagogic disaster.

THE MECHANISM

If voice training techniques are to be reestablished on a practical basis, the first step to be taken in that direction would be to determine the kind of mechanism we are dealing with and the possible means at our disposal for assisting that function. Superficially, we are concerned with the organs of voice, but a far more comprehensive view of the subject will be possible if the mechanism is recognized for what it truly is—a respiratory organ. Due to the fact that the respiratory system possesses those elements necessary for making tone, it can be readily converted into a sound-producing instrument. As such, it is being used as an adaptive mechanism. There are two phases to this process: 1) a series of muscular contractions which cause the vocal cords to adjust to the required length and tension for pitch, and 2) the positioning of the entire pharyngeal tract to answer the needs of resonance.

In rather simplistic terms, the vocal cords become vibratile by means of antagonistic tension having been brought to bear on the thyroarytenoid and the crico-thyroid and arytenoid muscles. The ratio of tension shared by these muscle groups determines the registration. On the other hand, the laryngeal pharynx is moved into a position favorable to resonance by a forward movement of the base of the tongue, a movement made possible by simultaneous tension having been brought to bear on the genio-hyoid, hyo-glossus muscles, as well as the anterior and posterior fibres of the genio-glossus. Another factor in open-throated resonance is proper relaxation of the swallowing muscles. Thus, the act of phonation is comprised of separate yet totally integrated activities.

"Voice," therefore, is a product of function and has no mechanical function of its own. It is the end result of a coordinative process involving a complex of laryngeal and pharyngeal muscles, and all devices and techniques employed to improve the tone after the coordinative pattern has been set are useless. What a constructive program of vocal study *should* attempt is the discovery of a technique whereby the coordinative process of the muscles engaged in phonation can be improved and perfected. As no vocal technique is faultless, success in teaching and learning depends in large part upon a program given over to changing an habitual coordinative process.

The means available for employment as a stimulus control in singing are not hard to find. Because of the phenomenon of registration and its relationship to specific patterns of pitch and intensity, the vocal organs can be made to respond beyond the singer's power of volitional

control, or, for that matter, even his preconcept. Consequently, new and predictable coordinative patterns of response are easily induced. By this process changes can be brought about in the way in which the air spaces surrounding the vocal cords are set into motion. When training techniques succeed in bringing the functional alignment of the coordinative response into harmony with nature's laws, the end result, "voice," will show marked improvement. In the profoundest sense, this is the meaning of vocal training. It is the point of beginning where functional laws reveal themselves to those who observe (2).

FUNCTIONAL STUDIES

To facilitate the discovery of functional laws, it is necessary to project a wide variety of stimulus patterns. In this way one can discover similarities and dissimilarities within the dynamics of the process, namely, stimulus, organic response, and tonal texture. A procedure of this kind raises important questions. Is the response always the same? Are there textural differences which can be equated with a particular type of stimulus? If so, what kind of relationship can be discovered?

Analyzing reflex responses assumes that a better than average vocal technique is being studied. Poor reflexive responses obscure nature's laws, and all attempts to discover functional truths will fail if conclusions are arrived at on the basis of inadequate material. Only free voices, expressing a consonance with nature, will reveal the mechanical principles upon which a correct vocal technique is founded.

To begin, suppose the student, a soprano, has been instructed to sing a descending C major scale at a comfortable level of intensity on the vowel "ah," with the further request to preserve at all costs (even at the risk of sacrificing tonal vitality) the textural properties established on the topmost tone. If this instruction is carried out faithfully, only one course will be left open—she must gradually decrease the amount of pressure applied, and consequently, the intensity.

Carrying this experiment further, it will be discovered that exactly the same reaction occurs, under the same set of conditions, while singing other vowels. Of added interest is the fact that the noticeable point of difficulty always seems to be located in the vicinity of F, immediately above middle C. Now a question arises. Why do the lower tones of the scale, provided the textural properties of the upper tone are maintained throughout, grow progressively weaker?

Before answering, let us revise the scale pattern and investigate other alternatives. Of particular interest is the pitch area below middle C.

Using a single tone on the vowel "ah" and commencing at B flat, or perhaps A, the student is now requested to raise the intensity and sing at a comfortable forte. Now what happens? The entire structure of the preceding tonal texture will automatically and reflexly undergo a radical change! Sweetness will have given way to a rugged, almost masculine sound, a quality which can be recognized as the chest register.

Having made the discovery that within certain tonal areas the reflex response of the vocal organs is predictable, and having further discovered that an equation exists between response and stimulus, we may now be said to have made contact with a natural functional activity. At no point in the instruction was the student asked to "produce" a specific kind of sound; the sound produced itself. It emerged as a logical, natural reaction to an environment. This is the essence of functional training. It leads to tonal naturalness, to spontaneity, and to self-awareness.

Suppose, now, we try to discover whether or not the student is able to connect these two characteristically different sounds she has been made aware of. This will, of course, necessitate the use of a larger musical figure, so an arpeggio covering a range of one octave and a fifth will be useful. The vowel to be used is "ah," the starting note A, below middle C, the intensity forte.

In attempting this figure, the student soon finds that a smooth connection is impossible and that a disruption of the tonal flow occurs between the first and second notes. Thus, we learn that there is a "break" in the voice. As the student was requested to sing smoothly, it again becomes clear that the break is also reflex to a specific arrangement within the stimulus pattern. What transpired is this: The chest register responded willingly on the tonic because the pitch-intensity pattern prompted its emergence. As the voice moved upward, however, the third above the tonic proved unmanageable, a situation to which the vocal organs readily accommodated by changing registers. Again the conclusion is unavoidable—that a change in the pitch-intensity pattern is naturally accompanied by a corresponding change in the registration.

Examining the cause of the break will reveal that the crossing of the two registers occurs in the upper portion of the tonal range of the chest register where the intensity is always high, and in the lower portion of the head register where the intensity is quite low. This fact is of great importance to the training program, because it enables the teacher to manipulate the *interior processes* of the mechanism and revitalize its function. If there were no such thing as a register response to correlative patterns of pitch and intensity, very little could be accomplished toward

promoting an improvement in the functional condition of the vocal organs.

Other interesting possibilities soon suggest themselves. If the student is instructed to execute the identical musical figure, with the single exception that it be sung at a strong mezzo piano, or a slack mezzo forte, yet another type of involuntary response will take place. As a reaction to this type of change within the stimulus pattern, the vocal organs will display a reflex tendency *to combine the two textures* recognized as belonging to the chest and head register, first minimizing, then eliminating, the break. Keeping the textural properties of the registers in mind, it is immediately evident that, with the break between the registers bridged over, a third tonal texture has made its appearance. Again, this texture was not sought after, but appeared reflexly in response to the changed stimulus pattern. This condition might advantageously be called a coordinated registration, combining as it does the activity of *both* registers, which now operate as a functional entity.

In establishing the concept of registration as a functional reflex, it develops that three separate sets of conditions can be induced by rearranging the stimulus patterns. They are: 1) the falsetto, or head register, 2) the uncoordinated chest register, and 3) a combined, or coordinated registration. Shortly, a fourth possible arrangement will be brought under discussion, a mixed registration.

We have now seen that under specific conditions vocal organs habitually respond in a manner both consistent and predictable. We have also discovered that the responses are reflex to a specific type of stimulus, the stimulus itself being comprised of pitch, intensity, and the vowel. Some of these arrangements tended to create tonal textures which divided the mechanism into two separate units, while others obliterated the inner mechanics and unified the function.

So we have discovered a correspondence between a given pitch-intensity pattern and the texture of tone yielded. Therefore, the question raised earlier as to why both the tonal texture and the intensity soften with the descent of the C major scale can be answered. In our first experiment with a stimulus pattern, the head voice was encouraged to maintain its characteristic texture. If the singer had *failed* to decrease the intensity with the descent of the scale, this would have been impossible. Regardless of any effort made to avoid a textural change, the higher intensity level would automatically engage some element of chest register participation. Only by singing more softly was it possible to maintain the head register balance. In physical terms, the effect of this disengagement was to fragment the mechanism. Consequently, the

contour of a pure head register, obscured in a combined registration, was revealed.

From the standpoint of practical application, the predictable response of the vocal organs to the musical idea contained within the pitch, intensity, and vowel pattern presents many opportunities for assisting a more efficient functional response. We have just seen how the head register can be disengaged from its unitary function with the chest register, indicating that the teacher can arbitrarily balance the mechanism in a variety of ways. There is a second alternative. Should a stimulus pattern be introduced that would serve to isolate the chest register from contact with the head voice as, for example, singing forte on a single tone in the lowest possible tonal range, the division of the registers, whenever such division is necessary, can be speeded. In this manner, two normally integral parts of the mechanism can be made to work independently.

The conclusion to be reached from these observations points up the real significance of voice-building. For if it is true that the mechanism is susceptible to disengagement of its parts, it then follows that the entire coordinative process is equally susceptible to reconditioning. That is to say, when necessary, it can be taken apart, tidied up, and put back together again in what should be a healthier functional order.

Ideally, there is but one mechanism, and, unless all of the parts operate as a harmonious functional unit, there will be a serious loss of power, range, flexibility, and evenness of scale. However, a complete integration of the parts is not usually an immediate aim of functional instruction. Deficient areas of development must be corrected and brought up to strength before unification is feasible. Premature unification "builds in" limitations. The important point is that the means are now at hand for reconstructing a poor vocal technique.

Returning again to the subject of nature's laws, it should be clear that we have observed some of these laws in operation. None of the physiological, anatomical, or acoustic phenomena may as yet be understood. Nevertheless, from a pragmatic standpoint, the evidence clearly indicates that these laws have been operative. Contact with functional law is essential to a durable technique, and the means here described open the way for the establishment of that contact.

PROBLEM VOICES

So far our examination of functional happenings has been addressed to the type of response habitual to well-formed voices. What, then, of the problem voices—those voices in which healthy mechanical responses

are so obscured as to make detection of functional activities difficult, if not impossible?

The techniques for eliciting a favorable vocal response, even with poorly used voices, must consistently employ the pitch-intensity patterns already discovered to be helpful. However, it is not always possible to achieve a spontaneous reaction through the simple means described, by reason of the fact that habitual misuse tends to "mix" the registration. In a mixed registration, the two registers, instead of working as a harmonious, cooperative entity, conflict with each other.

A fairly accurate picture of a mixed registration is provided by imagining two people of unmatched stride lengths walking side by side. Rather than moving rhythmically, the couple constantly collide because their steps are out of phase. Thus, natural movement is impeded and walking together not only becomes difficult, but unpleasant. In principle, this is exactly what happens in a mixed registration. The chest register, which when healthy is robust and powerful and should at the extreme go no higher than E, above middle C, becomes thinned out by being driven too high and intrudes into a tonal area fully an octave higher than it ought to go. The head voice also presents a problem, because its pattern of response will have been forced out of character by the more aggressive quality of the chest register. Muscular activities which should work together harmoniously become mutual irritants.

So it may be seen that a mixed registration is also a muscular reflex to an outer stimulus of pitch and intensity, but a badly coordinated arrangement. The chest register operates far too high into the pitch range at an intensity far too low, while the head register is disrupted by this intrusion and becomes incapable of responding in a way natural to its own functional interest. A mixed registration will always seriously impair the natural beauty of the voice, with a consequent loss of range, power, and resonance.

THE "BREAK"

Almost all voices of any stature present a problem during training because of the break occurring in the vicinity of E, above middle C. Unless this problem is resolved successfully, smoothness and evenness of scale and, consequently, a good legato are impossible achievements. The break is caused by discrepancy in the balance and development of the registers. It occurs at virtually the same pitch in all voices. With women's voices, it will be found in the lower tonal range, and with men, in the upper tonal range. The reason for the seeming discrepancy is that women sing an octave higher than men.

While the break must be dealt with effectively during training, it must not be looked upon as a vocal malaise. On the contrary, it is only the better-formed voices that have to face this problem, as those which are perfectly smooth in scale are limited very often to lyric singing of a sweet and pretty kind. Such voices can never sing freely until the gap in the voice has been opened and a new program of development and re-integration begun.

There are several ways the break can be eliminated, but, regardless of the approach selected, certain conditions must be met: 1) the mechanism must be joined at maturity, *i.e.,* after each register has been brought to its fullest strength and development, 2) an equitable balance between them must be established so that they cooperate in their activity rather than conflict, and 3) inhibitory tensions in the form of throat constriction or perhaps faulty resonance adjustments must be eliminated. Failure to achieve these ends will result in a mixed registration.

What appears to be an insuperable problem in the break area is the seemingly incompatible nature of the two qualities and intensities to be joined. As the chest register moves upward in the tonal range, it becomes increasingly aggressive, whereas the head register in the same area is weak and passive. To reconcile this imbalance within the overlap area, the chest register must be encouraged to *lower* its intensity so that the head register can participate more actively. Great care must be taken in doing this, however, as it is important not to devitalize the chest register to the point where the throat will constrict. In effect, what must be accomplished is to encourage the muscles activated while singing in the chest register to hold position and tension at a lower level of intensity, while at the same time the head voice is urged into greater prominence. In this way, tension is shared rather than being engaged on an either/or basis.

It is interesting to note again that the stimulus patterns projected throughout all stages of functional vocal training *evoke a predictable response.* This is important, of course. But even more important during training is the growing awareness of response as movement. For it is through movement alone that the muscular coordination resulting in "voice" can be changed in a rather dramatic way. This is exciting, because it provides the vocal teacher with a direct means of access to an involuntary process without recourse to methods of direct control.

RATIOS OF REGISTRATION

Unless the chest and falsetto registers operate in some degree as a functional unit, it is impossible to sing. Whether the balance is correct

or incorrect, some degree of coordination must be operative. From the first lesson to the last, the object of training is to synthesize the registration so that the two mechanisms balance perfectly and combine with an equally perfect resonance adjustment. A ratio of registration describes the constantly shifting proportion of tension shared by the laryngeal and pharyngeal muscles whose contraction holds the vocal cords in tension to define the pitch, the intensity, and the vowel.

Legitimate singing, then, finds both registers synthesized into a functional unit. Only the proportion of tension shared by the two mechanisms will alter as the pitch changes and the tone is swelled and diminished. At pianissimo, the percentage of head register participation will be high, while that of the chest register is negligible. In swelling the tone to forte or fortissimo there will be a gradual increase in head register response until its optimum degree of tension has been reached. At this point, additional tension will be assumed by the chest register and all subsequent increase in volume can be attributed to this mechanism. When a perfect equilibrium within the phonative process has been attained, the singer will have complete mastery over the *messa di voce.*

The *Messa Di Voce*

The supreme art of the singer is a properly executed *messa di voce.* This is a musical effect in which a single tone is gradually increased in intensity from pianissimo to fortissimo and then diminished. Not many vocalists today have a technique capable of this. Some appear to be able to sing loudly without being able to decrescendo; others appear to be able to sing softly without having the ability to swell the tone out to a full forte; while a greater number seem unable to sing either extreme very effectively and are forced to remain within rather narrow limits of intensity.

To swell and diminish properly, two functional arrangements must be operative: 1) a register balance must exist in which both mechanisms are engaged at a ratio of tension equivalent to the pitch and intensity being sung, and 2) a resonance adjustment must be maintained which does not alter its position regardless of the changing ratio of registration. When these two phases of technique operate in complete harmony, the ability to execute a beautiful *messa di voce* will become an integral part of the singer's technique.

THE VOWEL

Correction of vocal faults is not the exclusive province of the vocal registers. Other agents must be found to assist in reconditioning a badly

conditioned reflex. One such agent is the use of primary vowels. Ideally, the articulative needs of the registration and the vowel should be jointly served, and a wisely selected musical exercise will be one which enhances both the purity of the registration and the purity of the vowel at the same time.

Vowels are of particular interest throughout training. Tonal impurities are easily detectable there, as well as misconcepts in the area of pronunciation and quality. However, as vowel distortion lies within the functional process as a whole and not within the vowel proper, purification of the vowel without regard for the condition of the registration or the resonance adjustment will be ineffective. *A vowel will only be as pure as the coordinative process will allow.* Consequently, work on the vowel must move toward two major functional objectives: 1) it must improve the resonance adjustment, *i.e.,* eliminate constrictor tensions, and 2) it must assist in making changes in the registration, whether it be for purposes of separation or unification. The best way to study the behavior patterns of the vowels is to construct an exercise wherein all primary vowels are included so that *they represent the changing factor in an otherwise stable environment.* This can be done quite easily by using a single tone and maintaining a constant level of intensity, while linking the five primary vowels together as "ah," "ay," "ee," "oh," and "oo."

If a technically well-advanced baritone is asked to sing this exercise on D, below middle C, at a relaxed forte, it will be noticed that the "oo," and to a lesser degree the "ee" vowel, will always require slightly different adjustments. It is perfectly comfortable and easy to articulate the "ah" with the mouth quite open, and to both feel and hear the rumbling quality of the chest register for the simple reason that it is the dominant mechanism. However, with the "ee" and the "oo," neither the physical position nor the tonal texture remain the same. Moving into the "ee," the mouth automatically closes a bit, while at the same time the textural properties of the head voice emerge somewhat stronger. In phonating the "oo," the mouth has to close even more, the tonal texture further softens, and the overall feeling is that the tone has come "forward."

Now, suppose the same exercise is performed an octave higher, what then happens? Exactly the same thing—except that the reacting patterns will be even more pronounced, with the "ee" and "oo" presenting even greater problems. Perhaps not surprisingly, we now find the "oo" vowel particularly awkward, and it can no longer be well articulated with the mouth in a relatively closed position. The mouth *has* to open more and

great care must be taken not to let the vowel degenerate into an "oh."

The functional significance of such a study is plain. It should be noticed that when on the upper D the "oo" tended to open up into an "oh," there was a corresponding shift in the tonal texture. The head register quality of the "oo" when the vowel was kept pure had to modify and disintegrate when the texture changed, as this vowel is incapable of being articulated in the upper tonal region unless the registers are extremely well coordinated. If the textures of the lower "oo" and the upper "oo" are compared, it will be apparent that the vowel changed reflexly to the change in the ratio of registration. The texture which made the "oo" degenerate into an "oh" was that of the chest register.

If one were to insist on keeping the vowels pure at all costs so that a real "oo" is maintained on the upper D even at forte, the singer has no other recourse but to "cover" the tone. Covering, it is true, will take away the "too open" quality which makes "oo" sound like "oh," but it also destroys the effectiveness of the resonance adjustment—shutting it off and inducing constrictor tensions. With a covered tone, the effect is one of a "lid" having been placed on the tone and, consequently, this leads to the ultimate distortion of all the vowels. Covering is a practice to be avoided, except as a temporary expedient.

Returning to the problem of the "oo," how can it be made to maintain its purity at forte without recourse to covering? Here we come to the art of the *messa di voce,* the art of balancing the registration so that the ratio of registration for each pitch, intensity, and vowel is in exact proportion to the needs of the musical pattern. Before practicing the *messa di voce,* however, a groundwork must be laid so that it can be executed properly. This groundwork is prepared by employing the same exercise, with one exception. Rather than keep the intensity constant throughout all five vowels, a slight decrescendo will be made as the "oo" approaches. The effect of this will be to slack off some of the chest register tension, but not enough to cause the resonance adjustment to collapse. In this way more of the upper register texture will be pulled in. This will immediately eliminate the "too open" quality of the "oo" and provide a healthier functional climate. With both registers equitably engaged, pressure can slowly be increased. As long as the unitary function is maintained, there will be no real reason for modifying the vowel any longer.

A striking example illustrating the problem of the "oo" vowel as it pertains to registration will be found with women's voices. It is impossible for women to sing the "oo" softly in the chest register, and even when sung loudly it is extremely difficult and tends, as with men's

voices, to cause the vowel to modify to "oh." So we arrive at four conclusions: 1) that the so-called open vowels are more advantageous when singing in the chest register, 2) that the closed vowels are more adaptable for bringing out the strengths of the head register, 3) that the same reacting patterns occur in both men's and women's voices provided the patterns of pitch, intensity, and the vowel are identical, and 4) that even though the pitch-intensity pattern remains unchanged, the ratio of registration will change with the changing vowel.

The significance of these observations is clear. Registration and adjustments for resonance are not *purely* the result of a functional response to pitch and intensity, although this is primarily so. Equally essential is the assistance of discreetly selected vowels to facilitate the program of register realignment being undertaken.

Needless to say, the possibilities contained within the practice of vowel manipulation are endless. Some of these possibilities have already been explored. In general, a good rule of thumb to remember is this: "Ah" tends to expose the strengths and weaknesses within the registration and affords excellent insights into the type of imbalance present. It is also useful in bringing the chest register into greater prominence. The "ee" tends to coordinate the registration, but at the same time exposes the weaknesses within the resonance adjustment (constrictor tensions are very easily detectable with the "ee" vowel). The "oo" helps to separate the registers, and to coordinate the "oo" vowel properly is a difficulty not commonly surmounted even by fine artists.

Manipulation of the vowels in order to improve the resonance adjustment and create a better balance of registration is an important teaching tool. Much can be done in this way to bring about a better functional arrangement provided, of course, quality is regarded as vowel quality. The procedure is straightforward. Vowels are used to perfect the purity of the registration, as it is purity of registration (a unified and harmonious coordinative process) that purifies the vowels. Vowel purity and beauty of tone quality are always the result of a healthy functional condition, not causes. Quality is what happens. Function is what makes it happen. Functional freedom alone is responsible for vowel purity and naturalness of tone quality.

QUALITY

From what has been said about vowels and the textures of registration, it should be quite clear that training procedures developed to meet functional needs must ignore contemporary attitudes toward quality. At no time is the instruction primarily geared to making lovely sounds,

including resonance of whatever kind, the cultivation of "ping," or the use of concepts such as tonal projection. There are but two legitimate areas of concern, and these are registration and the vowel.

Whenever a good equilibrium has been restored to the mechanism, the question of aesthetic beauty will vanish. Inner beauty is always present and ready to surface the moment functional relationships have been made right. Natural tonal beauty is the end result of vocal freedom, and never has to be made. To make it is to destroy it. When the singer learns to respond without inhibition to the stimulus patterns projected by the teacher, and the mechanical function is free and well coordinated, the prerequisites for tonal beauty will have been met. Natural tone quality is achieved by this kind of identity and through no other.

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(To be continued in the next issue of this journal.)