CHAPTER II

Structure and function

As this monograph is written mainly for laryngologists and others with basic knowledge of the laryngeal mechanism as an organ of phonation, the reader shall be spared oft-repeated fundamentals. But emphasis must be applied to a few details. The author's aim is directed to the *treatment* of vocal disabilities, which has been somewhat neglected, whereas works on vocal anatomy, physiology, laboratory research, and technique abound.

However, it is debatable how much of such knowledge should be imparted to the singer, however intelligent. A detailed description of the limbs is, to draw a parallel, more likely to confuse and inhibit a dancer or tennis player. In addition, the whole subject is bedevilled by confusion and lack of agreement over terminology amongst teachers and singers.

We can regard the phonatory mechanism (setting aside the more primitive valvular function of protecting the lungs from foreign bodies) as consisting of bellows, vibrators, resonators and articulators—although in practise one cannot consider them in isolation:

1. The air-stream *via* the lungs is powered by muscles of the chest and abdominal walls. Many teachers and singers make much of so-called 'diaphragmatic breathing' when they are usually referring to the abdominal muscles. The diaphragm is passive on expiration and only contracts on inspiration, as has been well proved (Wyke, 1974).

It may be helpful to a young singer to explain that the air wave only travels a few inches in front of the mouth, the wave being transmitted from particle to particle of air. This may prevent the singer from trying to gain vocal volume by excessive expiratory force, which may damage the larynx.

2. It is no longer disputed that during phonation the larynx vibrates by a myo-elastic mechanism, active when the cords adduct and tense as subglottic air passes between them. Wyke has distinguished three phases: a *prephonatory tuning* of the laryngeal muscles (the subglottic mucosa contains mechanoreceptors); the *initiation of the tone*; and *acoustic monitoring* by which the singer may modify the tone if his acoustic mechanism so advises. The first and third of these functions are under voluntary control, but the second is a reflex action.

It should be noted that, setting art aside, singers are vocal athletes.

The importance of the strap-muscles, and especially the sterno-thyroid, is still a matter of doubt, but posture is important. The depressing extrinsic muscles, however, are active in stabilizing the larynx and preventing it from rising unduly, especially when singing the higher tones. If suitable rest periods (a few seconds every ten minutes in a three-quarter hour session) are adhered to there should be no more than a slight, brief ache.

The posterior cervical muscles would not seem to contribute positively, but undue tension in the back of the neck is certainly to be avoided (Brodnitz, in symposium edited by Wyke).

It is interesting (as shown by Bartholomew (1934), and later confirmed by others) that an exciting voice exhibits a *vibrato variation* of pitch, intensity and timbre at about seven times a second. (Five times or slower results in a 'wobble'.)

The action of certain muscles needs to be mentioned.

Probably too little attention has been given in the past to the crico-thyroid muscle. On contraction the arytenoid is rocked backwards on the cricoid. Although this lengthens the cords, the increase in tension actually *raises* the pitch.

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The thyro-arytenoid is not just a straight length of muscle, but groups of fibres create a spiral-like appearance.

The extrinsic muscles, including neck muscles and joints, should not be unduly tensed or the result will be tiring to the singer and elevate the larynx, probably resulting in a strained tone.

The pitch of the larynx note is dependent on many variables—so many in fact that they cannot all be measured at the same time; this has caused confusion. These factors include length, thickness, breadth and stiffness of the *vibrating* portion of the cords, and also breath pressure and adductive force.

There is also the question of *formants*. These vary in different voices and refer to a rise in energy level at certain pitches produced by good singers. Vowel quality is fundamental here.

The matter of *registers* and a so-called break in the voice ascending a scale have been much disputed. Discussion seems endless and will not be added to here, nor will the problem of assessing a singer's vocal range, except to say that in my experience sopranos and tenors have more trouble than lower pitched voices. Assessment of tessitura and range may be difficult.

The larynx note is relatively weak, but its intensity and quality are vastly augmented by the *resonators*. These are almost entirely the pharynx and mouth. Many singers judge by their sensations and these may be helpful, but the term 'sinus resonance', used because of the feeling of a sense of vibration in these regions, is a fallacy. Sinuses filled with fluid or polypi do not impair resonance (although post-nasal discharge or blockage—as with enlarged adenoids or infection will do so). Vennard (1964) gives a good account.

Articulation depends mainly on varying positions of tongue, lips and lower jaw.

It is no wonder that disagreement, dysfunction and damage are common in the Profession!

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