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The Registers of the Voice

Emil Behnke

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NOVEMBER 1, 1886.

MR. SOUTHGATE

IN THE CHAIR.

THE REGISTERS OF THE VOICE.

AN EXTEMPORE LECTURE BY EMIL BEHNKE.

I HAVE to say a few words to you this afternoon on the Registers of the Human Voice. My definition of the registers is this:—A register consists of a series of tones produced by the same mechanism. If we were to hear two men outside playing a scale, one commencing on a double bass, and the other continuing, say, on a violoncello, without the scale being interrupted, we should know exactly where the one left off and where the other one came in. In a similar way several series of tones are produced by different mechanisms in the human voice, and each of such series I term a register; the mechanism of some of the registers may be seen just the same as the tones of these registers may be heard.

There are two ways of seeing the mechanism by which the registers of the human voice are produced. In the first place, you may see it in the usual way by laryngoscopic observation, and, in the second place, you may see it by "through-illumination." So far as laryngoscopic observation is concerned, we have heard a great deal about that of late, rather more than some people care, and I think it is pretty well known by this time how these observations are carried on. You have a little mirror, which is warmed, so that it may not be dimmed by the moisture of the breath. You hold that in a person's throat, throw a strong light upon it, which is reflected down into the larynx, and then, by means of this mirror, you see what is going on in the larynx—to a certain extent. You see what is taking place on the surface of the vocal ligaments; but cannot see below them. You see right into the wind-pipe under certain favourable circumstances; but you cannot see what is going on below the vocal ligaments, and you cannot see what is going on in their bulk.

Talking first about the results which are to be obtained by means of the laryngoscope, suppose we look down a person's throat, and let that person sing. Then we see three different

appearances in the larynx. I am not now speaking of minor appearances, but simply of broad facts. We see, first of all, while a man is singing his lower tones, the two vocal ligaments more or less firmly held together, and we see them agitated by full, loose, vibrations, through their entire thickness. That is one mechanism, and while a man sings with this kind of mechanism we speak of him as singing in the "thick" register. Now he goes beyond this mechanism—that is to say, he sings up the scale until he comes to a point where he can go no further without making tremendous efforts, and if he wishes to sing higher still he has to change the mechanism; he has to put on one side this instrument upon which he has been playing hitherto, and he has to take up another. When he performs upon this new instrument we see a different picture. The vocal ligaments do not any longer vibrate through their whole thickness; the vibrations disappear altogether. The vocal ligaments seem to stand almost still, and what little vibrations there are, are confined to the thin inner edges of the vocal ligaments, and there is an elliptical slit between them. When a person sings with this mechanism, then we say he is singing in the "thin" register.

Now, if we allow a lady or a child to take the place of our imaginary male singer who has been singing so far, and let this female singer or the child commence where the male singer left off, and sing up the scale again, then we shall find that these new singers also, after a certain time, will come to a point where they will be stopped, beyond which they could only go by making a very great effort; and here if you wish them to sing higher still they also will have to put away this second instrument, as it were, and take instead of it a third. Whenever that takes place we shall see a new picture; we shall no longer see the slit between the vocal ligaments extending from one end of them to the other, but we shall see it confined to the anterior part of the vocal ligaments—that is to say, we shall see the posterior part of the vocal ligaments held very firmly together, and we shall see a little oval orifice in the front part of the vocal ligaments, the inner edges of which are vibrating, and which, as the pitch of the voice continues to be raised, will get smaller and smaller. I shall never forget the impression which this third register, commonly called the head register, but which we prefer to call the "small" register, made upon me when I saw it for the first time. It is a good many years ago now, and I was then only beginning these investigations, so that I had really to discover a great many facts for myself, or to re-discover for myself a great many facts which had been really ascertained by other people before; but this makes the whole thing, in my estimation, none the less

valuable. I remember meeting, some eighteen or twenty years ago, a little Cathedral boy from Berlin, in one of our German forests, where I happened to be spending my holiday. At that time I always used to carry a laryngoscope in my pocket, and I was in the habit of laying hold of any one who was patient enough to submit to me, and to place my mirror at the back of his mouth, to try what I could see; of course there is nothing like sunshine for operating, and of that sunshine we had at that time fortunately a great deal. This little boy happened to be a very favourable subject. There was no difficulty to overcome with him. The throats of some people are so sensitive that the moment you touch them with a mirror you find it is useless to experiment with them. That was not so with him; from the beginning he bore it well, so that after a very short time he was able to sing up and down the scale as though he had no mirror in his throat at all. Now my idea up to that time had been that the voice was fundamentally the result of the vibrations of the vocal ligaments. That is, of course, perfectly true, but when I came to look down this boy's throat the moment he sang high tones, I was startled by discovering that there seemed to be a slice, as it were, cut out of one of the vocal ligaments. A crescent-shaped piece appeared to be cut out, and that, to my mind, seemed altogether to upset the fundamental notion of the production of the voice, and I could not understand it at all. I continued to operate upon him, and presently saw, by shifting my mirror a little, that the same thing took place on the other side. Then I further noticed that this did not take place at all pitches. It did not take place in the middle part of the voice, but the moment the boy sang above *F* or *F* $\sharp$ on the fifth line of the treble clef, this appearance took place. It then dawned upon me that that must be a new mechanism. Since then I have made these observations on many hundreds of people, and wherever I have had an opportunity of seeing the mechanism of these high tones, I have invariably found it to be the same. So that I assert with all confidence, and without any fear of contradiction, that regarding the appearances in the throat, so far as they may be observed by means of the laryngoscope, we can speak of three mechanisms in the human voice; the "thick" register, in which the tones are produced by vibrations through the whole thickness of the vocal ligaments; the "thin" register, in which the tones are produced by vibrations confined to the thin inner edges; and the "small" register, in which the tones are produced by the vibrations of a small part of the vocal ligaments only.

So far, so good. That has shown us a great deal we did not know before, and when we compare the data at which we arrived by means of these investigations with all that we

learn through the ear, then we shall be able to base a very satisfactory theory upon that, which will at least enable us to teach without any fear of doing mischief. We may not all be able to produce Farinellis or Jenny Linds, but we shall certainly be able to avoid ruining voices wholesale.

This is one way of looking at things, when we try to ascertain the mechanism of the human voice. But there is another way, and that is by trying to get a view of the vocal apparatus by means of "through-illumination." That is not so well known. These experiments were first made some twenty-five or thirty years ago by Dr. Czermack, of Pesth. He did not carry them on to any great extent, but I think very little has escaped him with regard to the human voice; and those experiments have also been repeated by Dr. Störck who now, I think, lives in Vienna, but who then lived in Stuttgart. With the exception of those two, I do not know of anyone who has carried on these experiments. I was anxious to do everything which was possible to get at the real truth of the matter, and to satisfy myself as to how things were really done. I, therefore, with the assistance of my friend, Dr. Lennox Browne, constructed an instrument containing an electric light of ten thousand candle power, which was enclosed in a box lined with iron, so that, although there was this terrific light, yet the moment the gas in the room was turned down it was pitch dark. I dare say you have all noticed before now the light of the sun shining through a person's ears making them semi-transparent; also how the edges of the fingers become transparent if we try to shield our eyes from the light of the sun. In a similar way we can "through-illuminate" the throat, and it is unnecessary to say that the thinner and the leaner the subject, the better we shall succeed.

Now let me explain to you how the experiment was carried on, and I hope this may be interesting to you, because we certainly have learnt a great deal from it. I had, as I said before, an electric light of 10,000 candle power, which was enclosed in a case, so that you could see nothing of it in the room. Supposing I had that case here on my right hand; in the front part of that case there is a lens through which the light is shining; it does not shine into the room, but into a cylinder, and the cylinder, just where it comes opposite to me, is bent at right angles, and the second tube touches my throat with something like the mouthpiece of a speaking-trumpet. At the angle where the two tubes meet there is a mirror, so that this enormous light, which is concentrated and shining through this lens, was thrown on the slanting mirror, and then, by means of that mirror, on to my throat. The mouthpiece was put against the throat just below the larynx, and a piece of

black cloth attached which was tied round my neck, so that when I stood in that position I had a most intense light against my throat, but the room itself was pitch dark. I regret I am not honoured by the attendance of Dr. Dundas Grant, who, with Dr. Lennox Browne, happened to be present at this experiment, because he would have been able to confirm what I am going to tell you. I had this enormous light on my throat although no one could see anything of it, the room being quite dark. The moment I opened my mouth, any one looking into it would see in the act of breathing, for which the glottis is open, the light shining through and illuminating the upper part of the throat. I then took a laryngeal mirror and held it at the back of my throat in the orthodox way, just as is done in the ordinary laryngoscopic observation. It was warmed so as not to be dimmed by moisture of the breath; I had a second mirror facing me in which I could see any image that might be reflected in the laryngeal mirror, which, however, did not interfere with the view of anybody facing me, so that a person standing opposite me and I could simultaneously see any appearances in the mirror at the back of my throat. While I was singing in the thick register very little was seen. Of course, at the time I took an inspiration, the glottis opened, and there was a great stream of light which was reflected in the laryngeal mirror. Then we also saw the outline of the vocal ligaments; but the moment I closed my glottis again in the act of singing this light disappeared, and we saw very little, it was almost absolute darkness; only just the outer edges of the vocal ligaments being discernible. If you imagine the vocal ligaments cut through, the section would be triangular; they are broad at the outer edges and narrow at the inner edges, so that at these inner edges some light was shining through, but at the outer edges we saw very little in the act of singing. When I went beyond the "thick" register, commonly called the "chest" register, the moment I put away that mechanism and sang in the "thin" register, or, as it is commonly called, the "falsetto," we saw quite a different picture. We then immediately saw that the bulk of the ligaments had, to a very great extent, collapsed; whereas they had before been opaque, they now became quite transparent. We could see right through them, and the higher I sang, the thinner they appeared to become, and the more transparent they were. We saw the intensity of the light I had in my throat as distinctly as possible, and that shows very clearly in another way the mechanism of the "thick" register, and of the "thin" register; and it also shows at the same time the great appropriateness of these terms.

So far as terms are concerned, I think it is a very great

pity that there are so many, the majority being really meaningless ones. I find invariably that when I want to have a discussion with anyone on the subject of registers, it becomes necessary, first, to define terms, because one man means one thing by a given term, and another man means quite another thing by the same term, and I frequently find that while two people are using the same term they are really talking about two totally different things. Now these terms, "thick" register and "thin" register, are most admirable, because they are absolutely true. What can you find more to the point than the term "thick" register, when we now know for a certain fact that the vocal ligaments actually are very thick while producing that series of tones; and what can you find more appropriate and more to the point than the term "thin" register, when we now know for a certain fact that the vocal ligaments nearly collapse in that register and become quite thin? That is a point which the inventor of these terms, the late lamented Mr. John Curwen, did not know. He was a great educationalist, as you are aware, and was dissatisfied with the existing terms, which are very vague, being based on fancies and sensations, and he tried to substitute for them terms which should mean something, and have a scientific basis. By the light which he then had, he selected these terms, "thick," "thin," and "small," but, as I said just now, he did not know himself at the time how true these terms really were; we have only found that out since his death, by means of the investigations which we carried on with "through illumination" of the throat. I hope these investigations will help to introduce the term "thick," "thin," and "small" more generally, because then there will be no difficulty in one person understanding another.

When I had done with these demonstrations by means of "through-illumination" on myself, I got my daughter to take my place. Her throat is very favourably constructed for these experiments, and it is very easy to see the mechanisms in it; in fact, easier than it is in mine. At the same time, she has had the advantage of being trained to these things from early childhood, so that she never had any difficulty to overcome. When we put her in my place, and made the same investigations upon her, we saw something with which I had been previously familiar, and of which a great many other people have been cognisant, but which was nevertheless demonstrated once more in the most striking manner. We had an ocular demonstration of the fact that the great break in the human voice takes place exactly at the same point in pitch in women, children, and men. It is a very great mistake to speak of the soprano voice as simply a reproduction of the tenor voice an octave higher, and of the contralto

voice as a reproduction of the bass voice an octave higher. Consequently it is also a great mistake to speak of the great break in the human voice as taking place *relatively* at the same place in different people. It does nothing of the kind; it takes place at or about the same absolute pitch in men, women, and children—namely, at middle *F*. That is a very important point in the training of voices. It was found that while I sang in the "thick" register up to *F*, above the second ledger line of the bass clef, and then changed into the "thin," it was exactly the same with my daughter; she sang up to the same *F* in the "thick" register, and then she changed into the "thin" register, the only difference between her singing and mine was that she was able to sing very much higher in this "thin" register than I was, and therefore we could see very much more of the high tones than we could ever hope to see in a man. In her case the vocal ligaments became so thin that eventually there really seemed nothing but a film covering the light.

Everything I have told you so far goes to prove that the frequently received idea of a soprano being nothing but a tenor an octave higher, and a contralto nothing but a bass an octave higher, is a mistaken one. It also proves that the voice is a diapason which, so to speak, has been distributed amongst children, women, and men in such a way that the upper part of it has been given to women and to children, and the lower part has been given to men, and the great break between the upper part and the lower part of the voice takes place exactly in the middle portion of the voice. I have here a diagram, by means of which I have endeavoured to make that clear. The column on the left represents the male voice and on the right the female. Up to *F*, the first space in the treble clef, is the "thick" register; above it is the "thin" register. In the female voice that goes up to the *F*, the octave above, and then the register above is the "small" register. There are also some sub-divisions, but the great break between the "thick" and "thin" takes place in all singers at about the same point in pitch.

The sub-divisions shown on this chart indicate minor breaks. That is a point which some people do not believe in at all. I believe in it very strongly, and I am fully convinced that there is not only the "thick" register, but a lower "thick" and an upper "thick," and not only a "thin" register, but a lower "thin" and an upper "thin." In point of fact, so far as I am able to judge, and so far as experience has aided me, we have really, taking the human voice as one instrument, five registers and five mechanisms, the "lower thick" and "upper thick," the "lower thin" and "upper thin," and the "small." Now these sub-divisions are very difficult to demonstrate by means of the laryngoscope, as well as by

means of "through-illumination" of the throat. The changes are so exceedingly minute that the subject is open to argument. The changes are so very small that one man may really fancy he sees one thing, and another man may fancy he sees another thing. It is very difficult really to lay down anything like a law here. Yet some changes do take place, and if we listen very carefully to a variety of voices we shall have no difficulty in recognising them. I may tell you that frequently you find these five registers in one single voice. I have repeatedly had an opportunity of demonstrating five registers in one single voice, and I had hoped to have that opportunity here this afternoon. Unfortunately the young lady who was to have come has been prevented, so that I cannot give you the demonstrations; but I remember some years ago giving a lecture in Edinburgh, at the invitation of a committee of musical men, some of whom I met afterwards at a ladies' college where they had older girls than you generally find in schools, some from sixteen to eighteen years of age, and amongst those girls there were two in whose case we found all the five registers. They had contralto voices; they still had their head register or "small" register, which, in after life, is generally lost as the voice settles, so that in the case of those two voices, we could hear the five registers just as plainly and distinctly as we could have seen five different colours, and the gentlemen who were there to meet me and to hear this demonstration were all perfectly satisfied about the matter.

Of course it is quite useless to talk about registers as demonstrated in the case of accomplished singers. Why, the singing master who is not capable, when he gets a fair chance, of blending the registers in any given voice, and of equalising them so that you cannot distinguish one from the other, is not worth his salt. That is one of the very things which he must be able to do. If he cannot do it then he does not understand his business. Therefore, I say, when you want to ascertain the registers, or to demonstrate the registers, it is of no use to refer to accomplished singers. In fact, I have no hesitation in saying that the more accomplished they are, the more equal their voices are naturally from the beginning, and the more afterwards they have learnt to blend the different registers, the less you can recognise them. You do not hear any difference as the singer goes up and down the scale, and if you come to look down the throat by means of the laryngoscope, of course you cannot see any difference. How can you expect to see a difference in the mechanism when there is no difference in the voice itself? It is quite unreasonable to expect that. If you take a young voice, in which the registers are as marked as possible, so that even the uneducated ear shall recognise them without

any difficulty, and then look down such a person's throat and—given a throat that will at all stand the touch with the laryngeal mirror—you will have no difficulty in at least discovering without a shadow of a doubt the three mechanisms—the “thick,” the “thin,” and the “small.”

I do not know whether there is any need for me to refer to these diagrams further. In the case of the male voice, I may say the point where the change takes place from the “lower thick” into the “upper thick” is variable, but in the case of the female voice these changes are very much less noticeable, and the great break between the “thin” and the “small” takes place almost invariably at the same place, at all events, it is quite safe to say it takes place at or about the same place. Now, by way of illustration, I will just tell you one thing. This is the newest illustration that has come under my notice, and it is only a few days old. I may tell you that, in my own teaching, speaking of women's voices, I commence in the middle of the voice. I confine them to the compass of a fifth from *E* to *B*, no more, and in that compass they are taught to do everything with their voices that it is possible to do. When they have learnt that, then, in the case of sopranos, I go up from *E* to *E*, taking the octave in that way, and in the case of contraltos I go down from *B* to the lower *B*. First of all I develop the “lower thin” register, and then take in the “upper thick” register, and in that way I have the octave. The other day I had taken a lady, for the first time, into this “upper thick” register, so that she had, for the first time, been singing from *B* to the lower *B*. When she came to me the next time, she said, “Oh, Mr. Behnke, I want to ask you a question—this is a very curious thing; I can sing that low *B* in two totally different ways.” Of course that immediately made me smile, because I knew what was coming. I said, “What was the alteration, just sing it.” Then she sang that *B* in two different ways, and, of course, she sang the one in the “lower thick” and the other in the “upper thick.” That was the explanation of the whole thing, and the *B* is just about the place where the voice changes from the “lower thick” into the “upper thick.” When she had gone down to that *B* she found she could either sing it in one register or in the other, and was immensely startled, though to me it was perfectly plain. When I explained it to her she also understood it. That is just one of those little illustrations which one comes across frequently, which are so powerful as a stimulus in convincing one of the correctness of one's theories which have been built up in the course of years. The same thing takes place in the “thin” register, you find the same change from the “lower thin” into the “upper thin” very frequently.

I do not know that I have anything further to say; in fact, I am afraid, as it is, I have exceeded the time usually allotted to these lectures. Just let me sum up, in a very few words, what I wanted really to bring before the Association this evening. I wanted to emphasize these two facts—first of all that the human voice is a diapason which has been distributed amongst mankind in such a way that the upper part has been given to children and women and the lower part to men, and that the great break between the “thick” register and the “thin” register occurs in all voices, whether they be the voices of children, of women, or of men, at or about the same place—namely, middle *F*. That is one of my great points. In the second place, I wanted to emphasize the fact that the soprano is not, as is frequently supposed, a tenor an octave higher, and the contralto a bass an octave higher, and that there are not only two registers in the human voice, or, as some people would say, three, but that there are, in point of fact, really five, although out of those five, by means of laryngoscopic observation, whether with reflected light or with “through-illumination,” we can only demonstrate three.

DISCUSSION.

The CHAIRMAN.—Ladies and Gentlemen, it will be our first duty, which I am sure will be heartily admitted, to return a vote of thanks to Mr. Behnke for his very interesting paper. It may be asked what good are these investigations, but it continually happens that research of all kinds adds something to the stock of human knowledge; in this case I think we shall agree that the information he has given us will tend to preserve and help nature in her most perfect musical instrument, the human voice. I will put the vote of thanks, and then invite discussion on this interesting lecture.

(The resolution was carried unanimously.)

Mr. J. S. CURWEN.—I limit myself now entirely to the practical view of the matter. I do not take up the physiological or scientific points, but I have very ample experience in going about the country and observing the results of this system of voice training. In its essential features it is the same as that which is employed by the Tonic Sol-faists generally, and you know that the teachers of that system have under their control a very vast number of young people and adults. I can testify by experience that the consequence of adopting this plan of voice training is that the voices are conserved, that they last well, that they develop in

strength and in sweetness, and it seems to me that that is really the proper test of any system of voice training. "The proof of the pudding is in the eating," and there is nothing like bringing a system of voice training to a practical test. I find this system meets most fully the demands of the choral trainer, and I believe also of the teachers of solo singing.

MR. DUNSTAN.—My experience has been chiefly confined to voices from the age of about seventeen to twenty-four, and for about ten years past I have been directly and indirectly concerned in training such voices. They come to me as teachers; they have been pupil teachers, and come to the training college for a course of training in order to prepare for the work of teaching in elementary schools, and so on. My experience with regard to both sexes has shown me that what Mr. Behnke has told you to-night is entirely correct in every point. I have now no less than four contraltos, in whose voices I could pick out distinctly the four registers, and in one the fifth register also. The small register is missing in four out of the five—that, no doubt, through age, as Mr. Behnke said, has disappeared; but in the majority of cases, we do distinguish a very great break indeed between the thick and thin registers. From a practical point of view it is sometimes very difficult indeed—especially with female voices—to notice any change; but as far as the great distinction between the thick and the thin is concerned, I believe in all the hundreds of voices I have ever examined, there it was. Of course the amount of training they have had before—they are not entirely untrained, and some have given some little attention to the subject before—tends to obliterate the distinction somewhat. As to the tenor voices, there is a distinction between thin and lower thin, which may be noticed perhaps more than in the female voices. I tried the experiment with a class of sixty men from eighteen to twenty only a week ago. I asked all these men to sing me first of all middle C. Then I said, sing C, E, G very softly. By that means they all sang G, some of them very indifferently indeed. I mean they all sang it who could, some could not get it at all, but all who could sing that G sang it in the thin register. I made them sing it *pianissimo*, so that the notes were not forced from the thick register. They all took it on the register marked by the lighter shaded portion of the diagram. The contrast between the voice was very marked, and instead of the *fortissimo* notes of the lower register the quality was very thin and small indeed, in fact, one trained tenor would be able to give a better G than the whole sixty of them. Those men have only been under my care a few months. Those I have had another year I tried the same experiment with, and I found that a good many of them could sing that G fairly well, and even A and B with-

out much trouble. I was suspicious that some were using the upper thin, that they were really singing in what is called the falsetto voice, instead of the lower thin register; therefore, I asked them all to define the register by the sensation. It is well known that if the lower thin is employed the tone seems to come from the throat itself, but if the upper thin is employed, it seems to come from some part of the roof of the mouth, though, of course, we all know it is not generated there. About half of them told me the sensation they experienced was different from the other half. Half seemed to have the tone come from the roof of the mouth, and the other half from the throat. With those who used the upper thin register the volume of tone was very much better than those who used the thin falsetto, and carried it down below its proper place. All along in my teaching I have been groping at these facts, but never had them stated clearly until I read Mr. Behnke's book. Since then I have been able, with much less trouble to myself and less fatigue to my class, to secure this singing in the thin register.

Mr. McNAUGHT.—So far as the physiological aspect of this question is concerned I should like to speak with whispering humbleness and bated breath. My experience of it is as a practical teacher. This theory, which has been enunciated by Mr. Behnke to-day, is so familiar to me that I should as soon deny that the world goes round the sun as deny its truth. I have got used to it, and it fits in with all my experiences for many years past. It is especially useful, I may say, for training the tenor voice of choirs, and the tenors as a rule are amongst the troubles of the choir conductor. They will shout and rave, and this theory of using the thin register and the danger of forcing up the thick register, and the fact that the thin register can be used at the upper part of men's voices, has been exceedingly useful to us in training our choirs; in fact, I might say, in a word, that this theory has reduced voice training to a science.

Dr. PEARCE.—I do not pretend to have the experience of either my friend Mr. Dunstan or Mr. McNaught, or, indeed, Mr. Curwen, but I should like to say a few words from the composer's point of view. No doubt this confusion of the register is in some degree due to the way in which composers look at the human voice in writing for it. We are all told in learning how to write a fugue that we must consider the soprano part as being to a certain extent an octave above the tenor; for instance, if the subject is announced in the soprano, you will have the very same notes sung by the tenor an octave lower, and the same thing will occur with respect to the contralto and bass voices. I cannot help thinking that this fact in some degree may help to explain the confusion into which this matter has fallen.

Dr. LENNOX BROWNE.—I feel, Sir, that it is almost an impertinence for me to say anything here this evening; but as everybody may well imagine, I, from my point of view as a doctor, am able to confirm everything Mr. Behnke has said. In fact, it has been by working with him and seeing his splendid auto-laryngoscopic demonstrations, as well as by examining the larynx of others, that I have some idea of what the registers of the human voice are. It has been said that Mr. Behnke has somewhat indecently exhibited his larynx, and it has been asked what good has come of it. I beg leave to ask—How were the investigations of the inventor of the laryngoscope made, by the man whom you all ought to be very proud of, whom we as doctors delight to honour—Manuel Garcia? They were by examination of his own larynx; and in his paper at the Royal Society—which has never been disputed—he taught the use of the laryngoscope. I say that an immense amount of modern teaching in singing is due to the investigations of Garcia, and that was done by auto-laryngoscopic examination. When the great Professor Czermack sought to apply this discovery of the musical professor to the healing of diseased throats, how did he carry out his work? Why he travelled through the whole of Europe and demonstrated his own larynx. What Manuel Garcia did with his paper at the Royal Society, what Czermack did for the advancement of the laryngoscope and its application to the healing of diseased throats, Behnke is now doing by his enthusiasm, by the control he has obtained over his own larynx, for all those who are teachers of music and trainers of choirs.

Mr. KLEIN.—In view of what Dr. Browne has said, I would like very much to say this, that as a pupil of Manuel Garcia for four years, I had the privilege of hearing from him demonstrations, oral rather than practical, of the use and value of the laryngoscope. I would, however, like to add that those demonstrations were practically useless to me until I saw Mr. Behnke and Dr. Lennox Browne's book.

The CHAIRMAN.—Before calling on Mr. Behnke to reply, I should like to say that I was very glad to hear the name of Manuel Garcia mentioned with the respect and honour that it should be by all English musicians who have trained voices. There is just one other point I may say a few words upon. I take it that this question must have a practical outcome, and the query which musicians will ask is:—Can Mr. Behnke distinctly say what is the note, or the various notes at which the breaks of the voice occur; because, if so, then we can assimilate the two registers together, and a very great deal will have been accomplished.

Mr. BEHNKE.—The Chairman has asked one or two questions which are very important ones. When he first

got up he said it would naturally be asked—What was the good of these investigations? It is a question which is continually asked, and I myself, enthusiastic as I am in the matter of these investigations, am always most ready to admit that if there were no practical outcome of all this, then, however interesting it may be, it would be of very little good. But, as a matter of fact, it is really of the very highest practical importance in the case of those who have at all grasped the facts which are brought out in these investigations. When I commenced teaching I found it was all guess work, I was continually in mid-air, I had nothing to stand upon; that was a most unsatisfactory state of affairs to me; and then I turned to science and commenced reading scientific books. I have no hesitation in saying that the more I read books—which, of course, were never intended for my perusal, they were intended for medical men—the more hopelessly I got into a fog. At that time the auto-laryngoscope was not to be bought. I had to make my own instruments. Now-a-days it is all plain sailing. It is very easy for any man who wishes to carry on investigations, because he can buy an instrument, and the whole process is described. It was not so in those days, and I had to find out everything for myself. I had the limelight laid on, just the same as you have gas in your houses, and whenever I had time I turned the limelight on and commenced operating on myself, or on any other unfortunate individual that I could lay hold of. I can assure you that I would not in my work as a teacher be without the basis which I have obtained by means of my investigations on any consideration whatsoever, because I find that I have no difficulty at all, where I had the greatest difficulty in times gone by. My mode of proceeding is simply this: I sit down before my laryngoscope, and show my pupil what a good tone depends upon, and what is the position of the soft palate in the throat in the formation of a good tone. Then I produce a nasal tone and show the action of the soft palate in the nasal tone. I now ask the pupil to take my place, and to sing before the laryngoscope, as I had been singing previously. Then the pupil would see immediately where the difficulty lies, and all I have to do is to give this pupil control over his soft palate and the difficulty disappears in a very short time. So much in reply to the question of what is the good of it. One more remark in reply to an observation which fell from Mr. Dunstan. He said that the registers were not always equally clear, particularly the sub-divisions. Of course not, and undoubtedly in many voices they are not at all clear. In fact, you cannot hear them. Then I say: It is not the teacher's object to exaggerate the registers. I always say in reply to people who ask me

tha particular question, if you do not find these breaks in the voice be thankful that they are not there, because then you will not have to equalise them; do not try all you can to pull a voice to pieces, but do, on the contrary, all you can to make the voice the one great instrument the Almighty intended it to be. With regard to the exact point where the change occurs, the fact of the matter is, it is quite impossible to lay down an exact law. You cannot fix the limits of the different registers within a semitone, nor yet within a tone, very often not within a third; but, broadly speaking, you may take it that, as I have put it on the diagram, the great break between the thick and thin, or chest and falsetto takes place at *F* in the first space of the treble clef; of course when sung by a tenor it is written an octave higher, but that is the *F* he really sings. There is the great break; below that you have the thick, and above that you have the thin, and another octave higher above the same *F* you have the small. I believe that the fact of the break from the thin into the small in a soprano voice occurring exactly where the break occurs between the thick and the thin in the tenor, only an octave higher, has had more to do with mixing up the two voices—with the idea that the soprano is a reproduction of the tenor—than anything else. Then you will find if you listen to the majority of male voices, that there is a change at about *A* or *B*, between the lower thick and the upper thick. The change varies, it is a little lower in low voices, and a little higher in high voices. I find, as a rule, that a low bass changes on the *G*, from the lower into the upper thick, a baritone on the *A*, and a tenor on the *B*. In contralto voices I find the change is very much the same. In the vast majority of cases the change takes place on *B*. Then there is another change at about *C*², from the lower thin to the upper thin, and finally a change on *F*³ from the thin into the small.

Mr. McNAUGHT.—I forgot to say just now that Mr. Behnke has said nothing whatever about the fact of the registers over-lapping; perhaps some of the audience who have not thought about the matter may think that there is an arbitrary break, but, in fact, there are some notes which exist side by side.

Mr. BEHNKE.—That is a very great point, and one which I have not mentioned, because it really does not come under the head of my lecture to-night. It would come under the head of how to develop or how to treat the registers. But since the matter has been mentioned, I may say that I set my face against screwing the registers up. Of course, that is, as we know, a very common thing. There are teachers who are absolutely proud of being able to extend a person's voice; it is nothing but a screwing process. It is a case of

either bend or break, and I am satisfied that is the reason why, of all the thousands of young people who go into vocal training, there are so very few, comparatively speaking, who survive the process. They simply cannot stand it. They break down before they have ever had time to come before the public. I always go on the principle of carrying each register downwards. To take one illustration, if you talk about a tenor, you may take the thick register, and screw it up to *A* or *B* flat, or whatever the case may be. He will sing those tones, and make the rafters ring, but he could no more sing those tones softly than he could fly. It is a case of forcing, and if you were to look down his throat at the time you would see that his larynx was in a state of most terrible tension. It would be all red and inflamed. If, on the other hand, you take the thin register and cultivate it, and carry it down a third, so as to give him two or three optional tones at the break, which he can sing either in the one register or in the other, you overcome the difficulty. That difficulty is even greater, I have no hesitation in saying, in the case of contraltos than in tenors. In the case of contralto voices, the break takes places at the same place, at the *F*. It is one of the commonest things in my experience that contraltos try to screw their upper thick register up to *A* or *B* flat. What is the result? The result is that, when they do change into the thin register, the contrast is so obvious that by no manner of means can you ever get over it. The consequence is that in such voices you always find a big hole. You can do what you like, but you will never fill it up. Now I, on the other hand, take the thin register and cultivate that. I commence with the thin register from *E* to *B*, and keep the pupil for months and months singing nothing but in that register. I do all I can to make that strong and bring it out. Having carried it down to begin with to *E*, I then commence to join it on to the thick, and the difficulty has disappeared. That thin register has then become very much stronger, and I have not allowed the thick register to be forced up, and the difficulty of equalising the registers does not exist.

(Mr. OTTO GOLDSCHMIDT proposed a vote of thanks to the Chairman, which was carried unanimously.)