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PHONOPHOTOGRAPHY IN FOLK MUSIC

AMERICAN NEGRO SONGS IN NEW NOTATION

BY

MILTON METFESSEL, Ph.D.

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WITH AN INTRODUCTION BY

CARL E. SEASHORE, Ph.D., LL.D.

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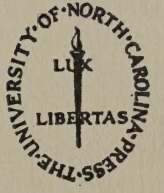

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MILTON METFESSEL

IOWA CITY, IOWA

CONTENTS

PART I

PART II

PART III

PHONOPHOTOGRAPHY IN FOLK MUSIC

PART I

INTRODUCTION

The history of the development of the technique employed in the present monograph may be indicated briefly by some extracts from three papers read before the National Academy of Sciences. These papers also serve the purpose of showing something of the complexity of the problem involved in the recording of primitive music, the magnitude and the richness of the field of investigation, and something of the art and theory of music as revealed by phonophotography. Those who have these interests at heart should find stimulus to action in the bare suggestion of scientific treatment of these phenomena with indication of the means and the character of the approach. These rather bold "announcements" in a pioneer field may now be checked by such treatments as the present volume and various other technical studies which have been published.

1. MEASUREMENTS OF THE EXPRESSION OF EMOTION IN MUSIC[1]

All musical expression of emotion is conveyed in terms of pitch, intensity, duration, and extensity, which are the four elemental attributes of all sound. In their compound forms these attributes furnish us *timbre,* which on the basis of harmonic analysis is a complex of pitches and accounts for all the so-called qualities of sound, from the pure tone to the purling of the brook; *rhythm,* which is a combination of intensity and duration effects in sound patterns, with all related time variants, such as tempo, staccato, and glide; *consonance,* which is the foundation for all phenomena of harmony and melody; and *volume,* which is the principal spatial and intensive aspect of sound.

[1] Extracts from a paper by C. E. Seashore read before the National Academy of Sciences, November 15, 1922. From the *Proceedings of the National Academy of Sciences,* IX (No. 9), 323-325.

This classification is probably complete, and we now have instruments and technique in the laboratory for the measurement of all these factors in terms of the sound wave; because the frequency of waves determines pitch, amplitude determines intensity, duration of the single wave determines extensity, and the form of the wave determines timbre. Thus, by combining measurements of frequency, amplitude, duration, and form of sound waves, we are enabled to take adequate account of every factor that enters into sound.

Now, when we stop to realize the situation, we find that everything in the way of musical expression that the singer conveys to the listener is conveyed in terms of the sound wave: when we eliminate sight and other senses which are merely accessory, there is only one avenue that can convey the musical message and that is the sound wave. The sound waves may be intercepted, recorded, measured, and analyzed by instruments of precision so that we secure a detailed and faithful objective record of what the musician conveyed through this medium. Thus we can isolate, describe, and classify all types of variants, from the cold, non-emotional, and mechanical production of tones to the most highly artistic expression of aesthetic emotion. This claim may sound crass and extravagant in the face of all our traditional regard for artistic expression of emotion as something elusive, indefinable, and intangible, and the general inability of experimental psychology to cope with the problem up to the present time. But let us take some examples showing how it works out.

One of the most characteristic evidences of the tender emotion effectively expressed in singing is the vibrato. There is no end of confusion among musicians as to what the vibrato is, its desirability, how it may be acquired or eliminated, what it really means, and the factors that control it. It is, however, universally admitted that the vibrato represents an attempt to express emotion musically.

The study of the vibrato was first taken up by Dr. Schoen in our Iowa laboratory and is now continued by Mr. Kwalwasser. Recording and analyzing the sound waves to determine what constitutes the vibrato, we find that it is a synchronous pitch and intensity pulsation averaging about six oscillations per second. A particular vibrato can therefore be expressed adequately in terms of the three variables, pitch, intensity, and time; i.e., the range of pitch fluctuation, the range of intensity fluctuation, and the rate, regularity, and form of these two synchronous fluctuations. Within these three factors we shall then find all the possible variants of the emotional expression of the vibrato. Thus, for different singers, or for a given singer at different times, it may be primarily pitch pulsation, or primarily intensity pulsation; and regarding these as constant, the rate, the regularity, and the degree of approximation toward a sine curve in the pulsation are variables descriptive of emotional quality.

With all these factors under control, we may now take great singers and study the personal characteristic of each singer and the laws for the expression of different kinds of emotion through the vibrato. For this purpose phonograph records are of inestimable value because they produce the vibrato faithfully and thus furnish fair examples of the singing in vibrato when it was not known to the singer that this was a factor under observation. With the objective facts in hand, we may correlate the vibrato with principles of neural discharge, showing the relation of artistic expression in music to nervous instability in terms of neurological concepts, for a tender emotion is a condition of nervous instability. We may here investigate the relation of a feigned emotion or a genuine emotion, according as the music was or was not actually expressed emotionally.

Another attribute of emotional expression is timbre. This is measured in terms of the form of the sound wave, which may be analyzed into its harmonic components by mechanical

instruments, and the harmonic elements may be combined into the complex wave form. Our question here resolves itself into the determination of types of the beautiful in timbre. These range, for various purposes, from the pure tone, as represented in the sine curve, to the richest tone reproducible, with significant peaks and valleys of affective tone. Types of beauty and ugliness may be traced and expressed in terms of the number and relative prominence of overtones.

Again, much of the emotional effect is expressed in terms of time, not only in rhythm and tempo and the various forms of acceleration or retardation, accentuation or holding of notes, but even more effectively in the form of attack and the release of tones.

These illustrations must suffice to show that everything in the nature of musical emotion that the musician conveys to the listener can be recorded, measured, repeated, and controlled for experimental purposes; and that thus we have at hand an approach which is extraordinarily promising for the scientific study of the expression of musical emotion.

It is, perhaps, superfluous to point out that in such study we are not concerned with the cause or character of the emotion of the musician except in so far as it is necessary for the understanding of what emotion is expressed. In the same manner, we are not concerned with the experience of emotion on the part of the listener except in so far as it is necessary for the understanding of what is actually transmitted in the tonal message.

The objective study of emotion has been approached profitably but remotely from the physiological point of view, as in the work on the glands of internal secretion and the autonomic system in general, as well as certain reactions through the skeletal muscles; but the bulk of our common knowledge of emotional expression rests upon crude observations of gross behavior in emotional situations, as in the study of animal behavior. The method of which I am speaking gives a

new approach to a rigid and analytical behavioristic study of emotion in musical expression which will not only aid in the scientific analysis of musical emotion, but should throw valuable light on the fundamental laws of all emotional expression. There is nothing radically new in the technique; but, as in many another advance in science, the new step consists in realizing a new application of means already at hand.

Incidentally, it may be noted that this method may be used in retracing the emotional elements of primitive music as recorded by the phonograph, as many of the emotional features of musical expression are faithfully reproduced in such records. Heretofore we have had no objective method of evaluating this important element; a permanent graphic enlargement of the sound waves may be made from the fresh record, thus preventing deterioration and making the optical record available for examination and measurement.

2. A PHOTOGRAPHIC METHOD OF RECORDING PRIMITIVE MUSIC[2]

The phonograph has been practically the only means used for recording primitive music. In its present highly perfected form this instrument is satisfactory for many purposes, but the records so produced have not been utilized to the best advantage in that they have been read and interpreted only by hearing and transcribed in ordinary musical notation. The number of times the record can be played is limited, the record deteriorates with each playing, the ear misses many significant features of the record, and current musical notation is entirely inadequate to represent the facts.

In the Iowa laboratory for the psychology of music and speech we have adopted the photographic method of transcribing such records and for the taking of original records. The apparatus consists essentially of an optical lever, a timing

[2] Extracts from a paper by C. E. Seashore read before the National Academy of Sciences, April 30, 1924.

device, and a modified moving picture camera. It can be adapted for direct recording of voice or instrument, and may be built in compact and portable form suitable for field work. Different models are required for the photographing of phonograph records, either of the disc or cylinder type. The superspeed moving picture film is used and the picture may be taken at any desired speed up to 3 meters per second, and the amplitude of the wave can be made such that the maximum covers the entire width of the film. [Description of apparatus and sample of records are here omitted.]

Among the advantages of this method of recording are, first, that it produces a magnified and permanent record showing minute details in terms of which we may render a full account of the song, even to the minute characteristics of emotional expression, because everything that the singer conveys to the listener in music is conveyed on the sound waves, and this record furnishes us a reasonably adequate picture of the successive sound waves. In the second place, this furnishes us the basis for a scientific terminology descriptive of musical performance, which is now greatly needed to clear away the rubbish of current musical, literary, and even anthropological description of music in terms of undefined concepts. In the third place, with these full data available, it is possible to introduce a new notation combining the scientific, graphic method with a modified musical staff in a way that will show details in a form that has musical significance. In the fourth place, for future recording expeditions we can eliminate the phonograph and take the direct photograph from the living voice in singing or instrument in playing.

The most economic rate at which to take these records is, perhaps, about 100 feet of film for each minute of music. A four-minute record will, therefore, require 400 feet of film for which, when developed, the material will cost about $25. The time needed for reading and graphing an ordinary interpretation of 400 feet of such film may be valued in round numbers

at from fifty to a hundred dollars, depending upon the degree of detail sought. It would be safe to estimate that museum collections of four-minute records now available and untouched could be reduced to film and score for publication for $50 or $75 apiece. This is, however, not prohibitive when one considers how vastly superior the product is to that which has ever been used before in anthropological records. The amount of time that may be spent in special study and interpretation of a record is, of course, practically unlimited.

Bearing in mind that everything the singer conveys to the listener is in the record, we may classify the data available in terms of features of the wave, expressed for convenience in musical terminology.

TABLE I

FACTORS IN A MUSICAL PHOTOGRAM

A. *Pitch* (Frequency)

I. Variability (Single tone)
- 1. Perfect intonation
- 2. Erratic intonation
- 3. Gliding intonation
- 4. Tremolo
- 5. Vibrato
- 6. Sharp and flat
  - (1) Even change
  - (2) Progressive change

II. Attack and Release
- 1. Direction
  Direct, up, down
- 2. Rate
- 3. Extent
- 4. Form
- 5. Tie
- 6. Glissando, etc.

III. Register
- 1. Absolute pitch
- 2. Relative pitch

IV. Timbre (Form of wave)
- 1. Pure tones
- 2. Overtones
  - (1) Number

B. *Intensity* (Amplitude)

I. Variable (Single tone)
- 1. Perfect uniformity
- 2. Erratic variation
- 3. Periodic variation
  - (1) Tremolo
  - (2) Vibrato
- 4. Progressive variation
  - (1) Crescendo
  - (2) Diminuendo
  - (3) Swell
  - (4) Circumflex
- 5. Attack and release
- 6. Absolute loudness
- 7. Relative loudness
- 8. Timbre
- 9. Volume
  - (1) Pitch and extensity
  - (2) Timbre
  - (3) Reduplication

II. Rhythm (Successive tones)
- 1. Accent
- 2. Time

C. *Duration*

I. Variability

(2) Prominence
(3) Distribution

V. Harmony (Interference)
1. Consonance
2. Dissonance

1. Precision
2. Erratic variation
3. Artistic variation
(1) Tempo
(2) Accelerando
(3) Retardando
(4) Hold
(5) Staccato
(6) Legato

II. Rhythm
1. Time
2. Accent

The record, therefore, shows the facts outlined in Table I on the basis of which we construct our musical terminology and the consequent analysis of the music. In order to illustrate how each of these factors may be considered in detail, we may take as an example the study of one of these items; e.g., the vibrato which is a mode of expressing the tender emotion.

TABLE II

VIBRATO

I. Factors
1. Pitch (Freq.)
(1) Absolute pitch
(2) Extent oscillation
(3) Rate oscillation
(4) Form oscillation
(5) Regularity
(6) Duration of tone
2. Intensity
(1) Absolute intensity
(2) Extent oscillation
(3) Rate oscillation
(4) Form oscillation
(5) Regularity
(6) Duration of tone

II. Laws of vibrato, e.g.:
1. Quality of emotion
2. Musical feeling (talent)
3. Æsthetic effect
4. Spontaneity
5. Age
6. Training
7. Emotion real or feigned
8. Criteria of worth
9. Emotional stability
10. Voice of instrument
11. Personal traits
12. Primitive music

Table II shows what factors we should have to deal with and the practical situations with reference to which we should desire to work out its laws, bearing in mind that the vibrato is a periodic pitch-intensity fluctuation of the voice or instrument.

The method here suggested, then, should improve our procedure in collecting by substituting the photographic for the phonographic method, and should improve our method of reading to such an extent that we may lay foundations for precise and defined terminology and notation for the description of musical phenomena.

3. DEVIATION FROM THE REGULAR AS AN ART PRINCIPLE[3]

The background for this paper lies in a series of studies of regularity, rigidity, and precision in sound waves. During the year 1924-25, in our laboratory Dr. Simon measured variability in the wave-lengths of consecutive sound waves in music and speech. Mr. Kwalwasser has continued studies begun by Schoen on laws of the vibrato. Mr. Robert Seashore has studied temporal precision in motor rhythms. Dr. Travis has studied the nature of the rigidity in the voice of stutterers under emotional stress. Mr. Metfessel has aimed to isolate certain constant tendencies in the expression of emotion in folk songs.

The principle involved is a well recognized theory of art. The new feature is the objectifying of it in terms of quantitative measurements. In music and speech, pure tone, true pitch, exact intonation, perfect harmony, rigid rhythm, even touch, and precise time play a relatively small rôle. They are mainly points of orientation for art and nature. The unlimited resources for vocal and instrumental art lie in artistic deviation from the pure, the true, the exact, the perfect, the rigid, the even, and the precise. This deviation from the exact is, on the whole, the medium for the creation of the beautiful—for the conveying of emotion. That is the secret of the plasticity of art. The exact is cold, restricted, and unemotional, and, however beautiful in itself, soon palls upon us.

[3] Extracts from a paper by C. E. Seashore and Milton Metfessel read before the National Academy of Sciences, April 21, 1925. From the *Proceedings of the National Academy of Sciences,* vol. XI (No. 9), September, 1925.

The variation from the exact which is due to incapacity for rendering the exact is, on the whole, ugly. The artist who is to vary effectively from the exact must know the exact and must have mastered its attainment before his emotion can express itself adequately through a sort of flirtation with it.

The aim of our paper is to show in one example how, by the process of photographing sound waves, we obtain adequate data for an objective portrayal or description of the expression of emotion in music; and that this description as a rule becomes a statement of the character and the extent of deviations from the exact in each and every attribute of sound. Such expression of emotion is the language of emotion in music.

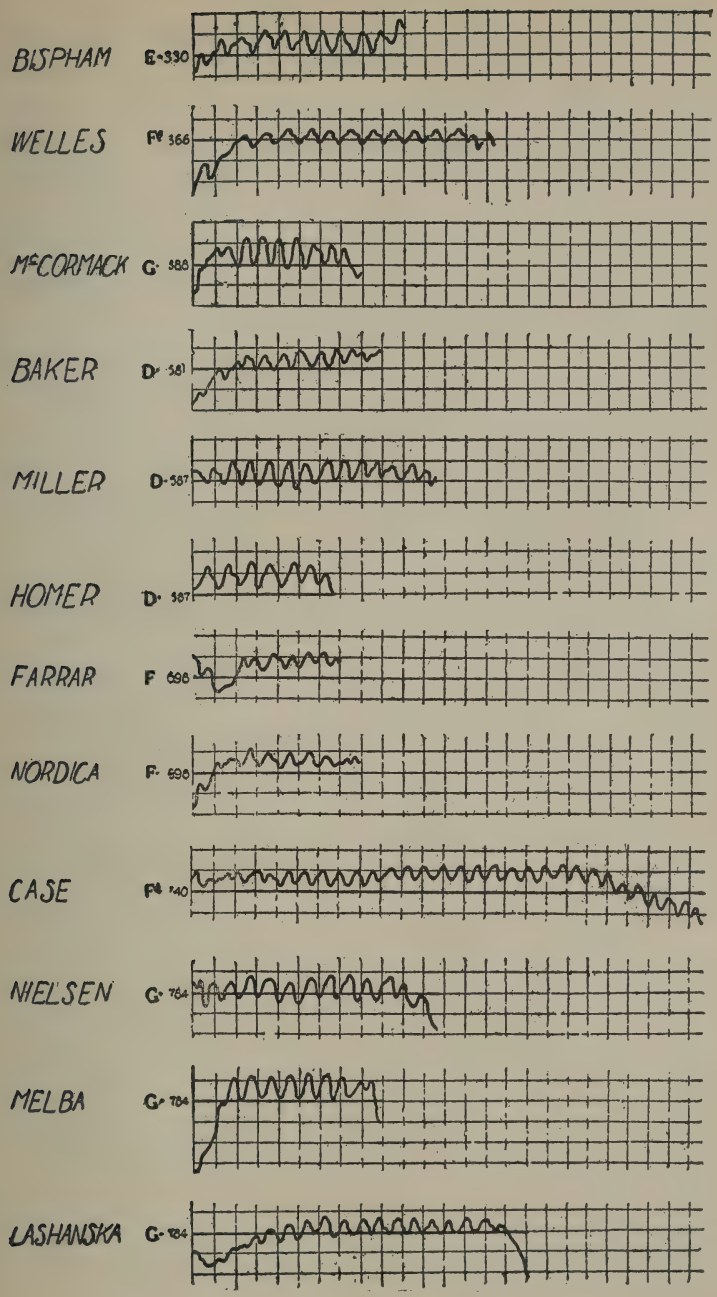
There are four elemental attributes of sounds: pitch, duration, intensity, and extensity. Extensity may be combined with pitch, with which it varies inversely. This leaves us, then, only three elemental factors to deal with—pitch, time, and intensity.

Of the complex traits of sounds, volume may be expressed in intensity, extensity, and the reduplication of these. Rhythm is made up of time and intensity. Consonance is a combination of pitches. Timbre is a complex of pitches.

Therefore, to interpret sound waves for practical purposes we deal with four factors:

1. Frequency, which gives us all the phenomena of pitch.
2. Duration, which gives us all the temporal phenomena.
3. Amplitude, which gives us all the phenomena of intensity or loudness.
4. Form, which gives all the phenomena of timbre or tone quality.

In the present example (one note from Annie Laurie), two of these phases are represented by the musical score; the phenomenon of pitch and the phenomenon of time. The other two factors, namely, intensity and timbre, may be measured and shown in a similar manner but are not included in the present score partly because too many data in a single score



"And" in the twelfth measure of Annie Laurie
as sung by twelve artists.

would clutter it, and partly also because at the present stage our interests have not centered about these, and our technique for them is not fully adequate, though quite within reach.

Let us now turn to the score and consider first pitch or intonation. None of the singers holds any true pitch. The flutter in pitch is the *vibrato*. On the basis of measurements like these we define a good vibrato as a periodic oscillation of pitch, taking the form of a sine curve representing an amplitude approximately a half-tone interval in pitch, synchronizing with an equally perceptible amplitude for intensity at the rate of about six or seven oscillations per second.

Such vibrato is one aspect of the expression of tender emotion. It is a highly refined trembling expressing emotionality. It is not to be confused with the tremolo, which is usually exaggerated, labored, and ugly.

Unemotional singing lacks this grace, and is either exact or erratic in intonation.

Notice also observable personal traits; e.g., the tendency for Case to linger on her high flute notes; or Melba's characteristic form of attack for a note of this kind.

By present photographic methods it is possible to organize the foundation for a science of countless emotional factors, and thus pave the way for the theory and practice of the art. Many of these laws have already been established, but the most significant fact today is the proof that emotional expression of this kind can be measured adequately.

Note other matters of intonation; e.g., the attack, the release, the glide, the tie—each a means for the expression of emotion.

Among the most interesting deviations of pitch are the corrections for illusions of hearing. To make a tone sound right it must often be sung wrong.

Turn for just a moment to the temporal phenomena—time, tempo, rhythm—all expressed in the numerical notation and the

spacing at the bottom of the score. Here we find again the "flirtation" with the exact—one moment hitting time with precision, then a dash of defiance, a wistful approach, an assertion of freedom which is but the affirmation of law—that grace, that boldness, that richness of charm which stirs in us the emotion that the artist feels.

4. THIS COLLECTION OF NEGRO SONGS

This group of songs constitutes the first sustained effort to preserve selections from a particular type of folk music by the method of phonophotography. The camera has been substituted for the conventional phonograph, and scientific notation has been substituted for the conventional musical notation. The project was undertaken deliberately as a sampling procedure within this field of musical anthropology and is in no sense intended to cover systematically any group of people or types of music. The collection consists of a few random samples.

The representation of these songs from the sound waves is of necessity a compromise between endless minutiae resulting from measurement and the desire to avoid overloading of the notation staff with too much detail. Not only does the phonophotogram contain much detail which the transcriber does not consider relevant to his purpose, but it is a permanent document to which the investigator may appeal in case of controversy or in case of discovery of new interests or types of facts which the future investigator may wish to trace. We have already had interesting experiences in the laboratory in which a new feature has come out of an objective record as a surprise, and we have been able to go back over preserved records running several years back and find that this feature was present in those records, but had been overlooked because it had not occurred to anyone to look for such a fact.

The record of these songs is also a compromise in that the notation is limited largely to two of the four fundamental aspects of the song, namely, the tonal and the temporal. There

are instruments available for recording stress or volume and timbre or tone quality, but they are not yet of such construction as to be available for field work.

The writer is particularly gratified with the patient and painstaking attitude that Dr. Metfessel has taken in this work in order to embody in this contribution the precision, conservatism, and far-sighted planning characteristic of scientific work, and the sensitive and responsive æsthetic attitude needed for entering into the folk life of his singers. In this pioneer work there has been continuous opportunity for the exercise of ingenuity in the meeting of new situations. He has furnished reliable data on which the musician may not only see with surprising clarity the exposition of these Negro songs, but will find for himself source material on which he may make numerous studies in terms of the objective facts recorded. Dr. Metfessel has intended merely to point the way for musical interpretation of the graphs. Let the interested musician make his own examination and interpretation of the facts.

It has also been gratifying for us to co-operate with Professor Odum and his associates in the University of North Carolina in the field work and the publication of the results. The collecting of these data was originally suggested to the writer by the valuable work done by the University of North Carolina in the collection of Negro folk songs.

5. A FORECAST AND A PLEA

In this age of extraordinary spread of civilization into the remotest parts of the earth, primitive folk traits are being obliterated and lost at an amazing pace. Shall we preserve the native songs of our Indians, our Negroes, our Hawaiians, our Filipinos? Shall the scientific collection of the songs of the most primitive peoples be taken seriously, together with other anthropological collecting? Let us hope that the present trial of instruments and methods of collecting songs in the field may arouse investigators to a recognition of the great value of this

type of collections and the necessity of doing it at an early date, unless we shall forever lose the opportunity of recording permanently some of the most interesting expressions of folk life which are now being wiped out by the march of civilization.

Our experience in the present project has demonstrated the necessity of not only recording objectively the actual song, but going back to create and encourage the natural atmosphere of the singer on his own soil and to make objective record of essential features. The future collector of the primitive music must carry not only the phonophotograph camera, but also a moving picture camera to record the social setting in which the singing is done.

Those who have studied primitive music know how exceedingly difficult it is to get into the true spirit of the singing of simple folk. It would be fortunate if a staff could be financed for a period of years so that it might carry the experience in collecting with one group over into another group and guarantee the accuracy of record and the adequacy of the motivation of the singer.

It must occur to everyone that there is an unlimited field for the objective study of the artistic singing in many directions among cultured people; but opportunity for that will always be with us. It is for the preservation of the purest of primitive types of songs that we now are calling.

CARL E. SEASHORE

PART II

METHODS OF STUDY

The purpose of this research is to demonstrate how phonophotography may be applied to anthropological studies of folk music. It has been expedient to use American Negro singing as typical of the problems involved. Whatever description of Negro singing is here ventured is more to explain and evaluate the technique of phonophotography in folk music than to give an exhaustive account of Negro singing as a whole.

This study describes music as it has never been described before. Many of the traditional terms of music have been scrapped, and new ones introduced. This is a serious disadvantage from the standpoint of the non-technical reader, but there has been no other way out. If there is a new concept, there must be a new name, and there have been many new concepts. The best that could be done is to define each term the first time it is presented in this part.

Historical Summary. Graphic methods have been used in the study of folk music by the various "Phonogram—Archiven" of Europe, notably those of Professor Panconcelli-Calzia,[1] Professor Eric von Hornbostel,[2] and Professor Karl Luick and Dr. D. L. Hajek.[3] Instead of photography, smoked drums were used, with writing levers for transcribing from phonograph records, and tambours for records directly from the voice.

The first instance on record of the use of photographic processes in folk music is that of D. C. Miller and Miss Frances Densmore.[4] Miller made photographs with his phonodeik[5] from phonograph cylinders with Indian music which Miss Densmore had collected. The purpose of their experiment was to check

[1] Direktor, Phonetisches Laboratorium der Universität Hamburg.
[2] Psychologisches Institut, Universität Berlin.
[3] Phonogramm-Archiv der Akademie der Wissenschaften, Vienna.
[4] "Northern Ute Music," Smithsonian Institution, Bureau of American Ethnology, *Bulletin 75,* pp. 206-210.
[5] *Science of Musical Sounds,* p. 78.

certain elements in ear notation of the songs. Since the pitch of the notes and the temporal rhythmical patterns agreed with the ear notation, the method was not further investigated.

Other than this, much of the historical account of phonophotography is stated in detail in the Introduction to this volume by Dean C. E. Seashore. The series of papers which he includes represent the progress made from year to year on the program developed under his direction in the Iowa psychological laboratory.

In the actual manipulation of the program, it was found that there was no simple ready-made phonophotographic camera, nor had there ever been any studies which required the detailed reading of the sound wave photographs for certain factors. Kwalwasser,[6] Herzberg,[7] Simon,[8] Gray,[9] and the writer[10] undertook to reorganize the available physical instruments and methods in order to apply them to the particular needs of the program. Rigid tests were given for the accuracy of the entire procedure, from the mechanical action of the photographic camera to the processes of measuring the sound waves from the film.

With the completion of the laboratory technique, arrangements were made with Dr. H. W. Odum[11] to try out the new camera and methods in an actual field situation. Odum and Johnson had a wealth of Negro songs[12] which they knew conventional notation failed to describe musically.

[6] *An Experimental Study of Pitch, Time and Intensity Factors in the Dynamics of Vocalization* and "The Vibrato," *Iowa Studies in Psychology, Psychological Monographs,* XXXVI (1926), 84-108.

[7] *Photography and Interpretation of a Vocal Rendition of Annie Laurie.*

[8] "The Variability of Consecutive Wave Lengths in Vocal and Instrumental Sounds," *Iowa Studies in Psychology, Psychological Monographs,* XXXVI (1926), 41-83.

[9] "An Experimental Study of the Vibrato in Speech," *Quarterly Journal of Speech Education,* XII (1926), 296-333.

[10] "Technique for Objective Studies of the Vocal Art," *Iowa Studies in Psychology, Psychological Monographs,* XXXVI (1926), 1-40.

[11] Kenan Professor of Sociology, and Director of the School of Public Welfare, University of North Carolina.

[12] *The Negro and His Songs* and *Negro Workaday Songs.*

Difficulties of the Conventional Notation. Students of folk singing are quite frank in agreeing with Odum and Johnson that notating songs by ear is insufficient to indicate many elusive facts of folk music. Much of the charm and distinctiveness of the singing of Negroes lies in queer pranks of their voices, but these twists and turns occur too quickly. One seeking to analyze them or find out anything about them is only bewildered. As a consequence, valuable detail and necessary accuracy have been lacking in studies of folk music.

Work thought that some of the subtle effects of Negro singing are indescribable:

> Another peculiarity is a certain subtle effect which only the true "Jubilee Voice" can produce. This is indescribable, for it consists in certain turns, twists, and intonations not represented by any musical term. To be appreciated, it must be heard.[13]

Curtis-Burlin saw the difficulty clearly when she found no means of indicating certain grace-notes, turns, and quavers:

> The mellow softness of pronunciation added to vocal peculiarities—the subtle embellishment of grace-notes, turns and quavers, and the delightful little upward break in the voice—these can be but crudely indicated or described in the hope of awakening true memory in those who know Negro song, or of appealing with some vividness to the imagination of others who must rely for their picture solely upon the printed page. A recorder realizes, perhaps better than can another, how approximate only is any notation of music that was never conceived by the singers as a written thing. When one rereads the fixed transcription it seems to bear the same relation to the fluent original that the peep of a caged canary does to the free caroling of a bird on open wing.[14]

Scarborough was thinking of the ordinary musical scale and staff when she wrote:

> No instrument could reproduce, and no notation record, the trills and quavers of that song.[15]

[13] *Folk Songs of the American Negro,* pp. 39-40.
[14] *Negro Folk Songs,* pp. 9-10.
[15] *On the Trail of Negro Folk Songs,* p. 29.

A need for a different notation to record the peculiarities of Negro singing was explained by James Weldon Johnson:

In addition, there are the curious turns and twists and quavers and the intentional striking of certain notes just a shade off the key, with which the Negro loves to embellish his songs. These tendencies constitute a handicap that has baffled many of the recorders of this music. I doubt that it is possible with our present system of notation to make a fixed transcription of these peculiarities that would be absolutely true; for in their very nature they are not susceptible to fixation.[16]

Allen in his Introduction, states:

The best that we can do, however, with paper and type, or even with voices, will convey but a faint shadow of the original . . . the intonations and delicate variations of even one singer cannot be reproduced on paper.[17]

The same author says in discussing a particular song:

This is perhaps as good a rendering of this strange song as can be given. The difficulty is in the time, which is rapid, hurried, and irregular to a degree which is hard to imitate and impossible to represent in notes.[18]

The high degree of subjectivity required in notating folk music is revealed by Burton:

Everybody who has undertaken to reduce Indian songs to notes, whether from phonographic records or from the lips of singers, confesses frankly to the bewildering difficulty of the task. There is much vagueness in the Indian's frequent slurring from one tone to another, the intervals are often, to say the least, unexpected, their scale relationship hard to determine until long familiarity with both style of songs and performance enables one to listen in much the same spirit with which the song is sung.[19]

It will shortly be demonstrated that, by using the phonophotographic technique, the word "unnotatable" no longer need be used with reference to music or speech. It has been possible

[16] *The Book of American Negro Spirituals,* p. 30.
[17] *Slave Songs of the United States,* p. iv.
[18] *Ibid.,* p. 8.
[19] *American Primitive Music,* p. 22.

to notate all the twists, quavers, trills, breaks in the voice, quick slurs, erratic tempi, and other similar features so often a part of folk singing. These are, of course, only a small part of what phonophotography will reveal, but their description will probably illustrate the possibilities of the new method to best advantage.

The Portable Sound Photography Camera. Those who are interested in a technical discussion of the machines and methods employed will find such a treatise available.[20] The apparatus consists of photographic instruments mounted within a suitcase. In the interior (see Fig. 1) there is a large wheel to which a crank is attached from the outside. Motion picture film is wound around the wheel, coming from a film magazine. In its passage from the magazine to the wheel, beams of light are concentrated upon it. These lights are reflected from tiny mirrors, which are attached to diaphragms. The device with diaphragm and mirror is called a "Dorsey phonelescope."

The Voice in Pictures. The sound wave photograph is made on the moving picture film by three light points. The diaphragms pick up the vibrations of sound, and the mirrors translate the vibrations into an up and down flashing of the light. The light flashes at the same rate at which the vocal cords are sounding. Fig. 2, A, is a typical finished photograph.

There are three lines in Fig. 2, A. The one is a straight line through the center of the others. The second is a recurrent sine wave which was photographed from the tone of a 100 dv. (double vibrations per second) tuning fork.[21] The points where two successive downward strokes of the sine wave meet the straight line through its center mark off the distance the film travels in .01 second. This is termed the "time-line."[22] The

[20] Metfessel, *op. cit.*

[21] In the design of the new portable camera, the Dorsey phonelescope will not be used for recording the tuning fork. Instead, a mirror is mounted at the end of one of the prongs, and the moving light reflected from it is photographed.

[22] Simon, *op. cit.*

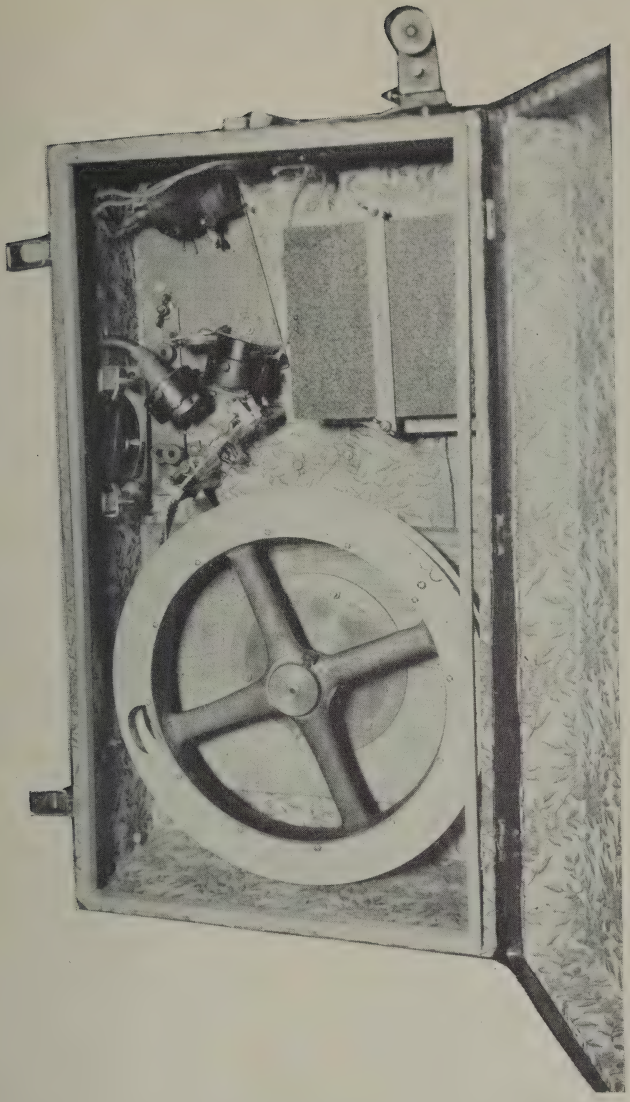


Fig. 1. Interior of portable sound photography camera.

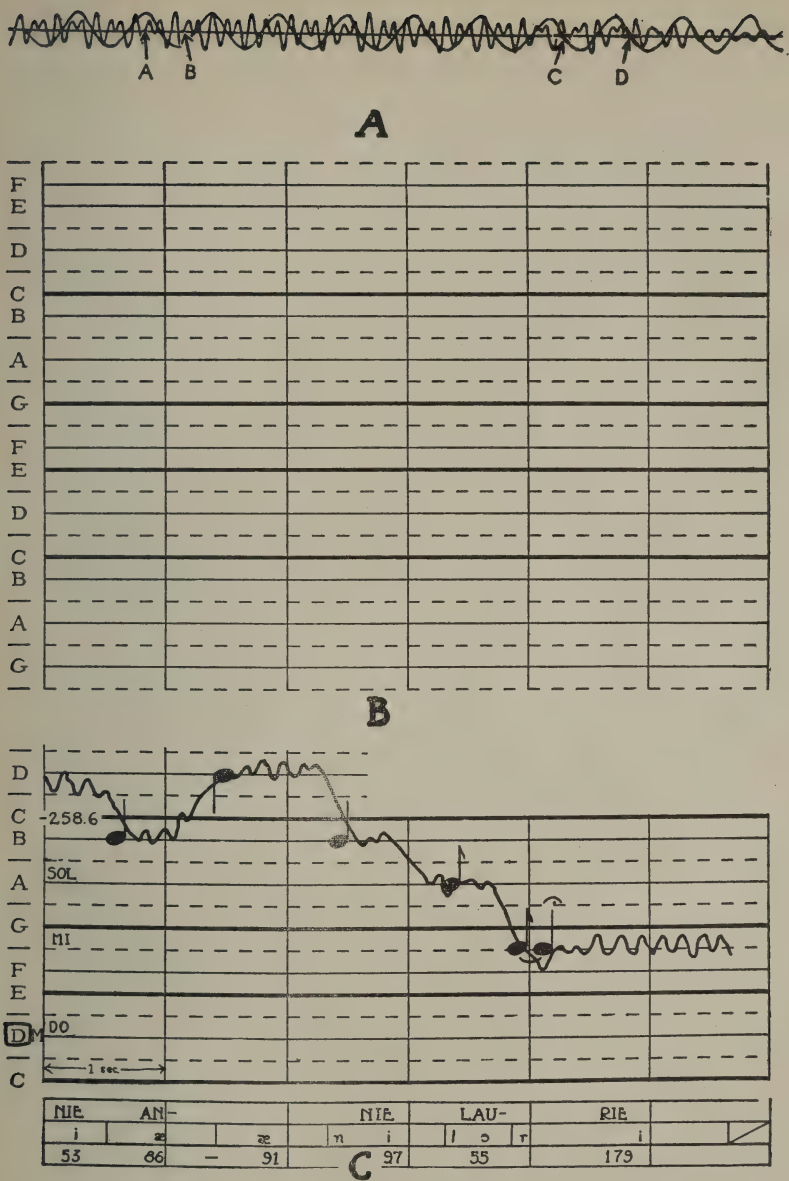


Fig. 2. A. Sound wave photograph. From A to B is one sound wave. C to D represents .01 sec. B. Half-step musical staff. C. Pattern notation.

third line is the representation of the sound waves from the voice. When the distance of one wave is measured, it is possible by reference to the time-line to state the amount of time consumed during a single vibration.

Pattern Notation. The time of a single wave may be converted into frequency of vibration, or the number of sound waves per second, which is to the sound wave what pitch is to auditory experience. The value, in terms of frequency of vibration, is then graphed in its place on the half-step musical staff (Fig. 2, B).

On the staff proper there are thirteen lines. Each of these represents a half-step of the even-tempered scale,[23] with A, 435 dv. C, E, G, C are heavily drawn. D, F, A, and B are solid lines, but less prominent. The five remaining lines of the staff proper are divided into equal dashes and spaces. A broken line is either the sharp of the letter below it, or the flat of the letter above it, depending on the key.

Approximately 80% of all the tones in the present group of songs lie between the two C's, for both the men's and the women's ranges. The staff proper for this study uses the two C's as extremes. Leger lines are used wherever necessary, to take care of the remaining 20% of the tones. The alphabetical letter belonging to each leger line is placed at the left of the leger line itself.

Time values are designated by divisions of the new staff from left to right into six equal parts of one second each, and by the dashes and spaces which divide the seconds into ten parts. One graph represents six seconds.

The new notation in its entirety is found in Fig. 2, C, which is a section of "Annie Laurie," sung by Lowell Welles, a professional vocal artist. The notation suggested by Seashore,[24] combining a graph with the musical scale, has been adopted with certain developments.

[23] It is quite as feasible to graph in true intonation.
[24] Cf. Introduction.

To this system the name "pattern notation" has been applied, since representation is accomplished by definite patterns, which are of value in describing musical expression, and which permit analysis and mathematical treatment.[25]

In the legend beneath the staff (Fig. 2, C), the first line contains the words of the song. Phonetic transcription is placed on the next lower line, in which each separate sound is centered in the space it occupied in the song. The line with the phonetic transcription is blocked off by small bars which mark the beginning and ending of a tone. The third line, with the numbers, presents the absolute time value of each tone in terms of .01 second.

When a dash occurs between any of the numbers it means that there were several notes sung on the same syllable, as a tie or slur. From top to bottom of the legend, the divisions into seconds of time are carried across from the staff proper. The heavier vertical bars divide the song into measures.

The bass and treble clefs are indicated by the location of "C-258.6"[26] (Middle C). Generally, for men's voices, Middle C is found on the upper C, and for women's, on the lower. Either "do-mi-sol" or "la-do-mi" is found at the left to indicate the key and mode. The key-note letter is enclosed in a square, and "M" at the right of the square represents major, or "m," minor. The time signature is placed at the left of the lower legend of the first graph.

The graph-curve. The measurements from the film are plotted by dots on the graph, each measurement being represented

[25] There may be a misunderstanding of the term "wave" as applied to the sound wave photograph, and to the wave-like patterns on the pattern notation. The latter are not sound waves, such as are found in Fig. 2, A, but are a representation of the vibrato. When the vibrato is heard by one accustomed to listen for it, its most obvious characteristic is a pulsating or throbbing. This throbbing has many degrees of prominence, and in an extreme or disagreeable form it is called a tremolo. Under the right conditions the acceptable vibrato adds beauty to the solo tone.

[26] The frequency of vibration values of the other steps in the even-tempered scale may be found in any physics textbook.

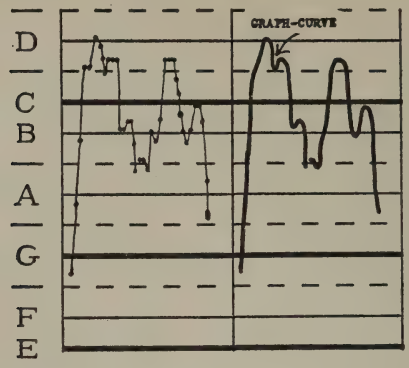


Fig. 3. Plotting (left) and smoothing (right) of measurements from sound photographs. Taken from Brunswick phonograph record No. 3150-B, "Climbin' Up the Mountain, Children." Sec. 10 (occurs during the tenth second after the record begins playing). The words are *Good Lawd.*

by one dot. Fig. 3, left, shows how the dots are placed. They are then connected by a smoothing process, illustrated by Fig. 3, right. The continuous line so produced is called the "graph-curve." There is a graph-curve only when the vocal cords are in vibration. Breaks in the graph-curve mean either that a breath was taken or that a "voiceless consonant" such as [s], [f], [t], or [p] was made.

As later pages present the songs on the pattern notation, it will be seen that the graphic method in its flexibility represents simply and relatedly much which conventional symbolization cannot represent.[27]

Hearing and Seeing Music. Work's statement, "To be appreciated, it must be heard,"[28] is true as far as it goes, but it is the experience of simultaneously hearing and seeing exactly

[27] One of the reasons why the old notation was inadequate for our purposes was the fact that the vertical distances were not spaced proportionately for whole and half-steps. For instance, the same vertical distance held for E to F, a half-step, as from G to A, a whole step. To give the same vertical distance in one case to a half-step as is given in another to a whole step would distort the measurements.

[28] *Loc. cit.*

how the Negro sings which will give a more complete analytic comprehension.

In making a complete analysis of singing, it would be necessary to deal with the singer, the sound wave, and the listener, the sound wave being regarded as the connecting link between the former and the latter. In the singer it is possible to study the action of nerve currents, which cause the movements of certain vocal muscles, which in turn cause the sound wave. The sound wave then strikes the ear of the listener, resulting in other nerve currents and auditory experience.

Because of the central position of the sound wave between the series of events occurring within the singer and those within the listener, it is the most strategic point of attack in a study of music. As was mentioned in a preceding section, the pattern notation in its present stage is a representation of frequency of vibration changes on the sound wave. In time, as the science of music progresses, certain laws of relationship will be set up between frequency of vibration and the action of the muscles and nerves producing it, or between frequency of vibration and the action of the ear, auditory nerves, and auditory experience.

Once these laws of relationship are established, the pattern notations of our folk songs will not only be a record of the sound waves, but of the neurology, physiology, and psychology in the production and reception of folk music. As experimentation increases, the pattern notation will grow in meaning, continually becoming a more complete record of singing. For this study we are restricted for the most part to the sound wave and the sound heard, each as a separate set of facts, both of which may be perceived at the same time, though through different sense departments.

Stated psychophysically, studying the sound wave gives an analysis of the stimulus which results in the auditory experience. The sound waves in singing can be analyzed only by

visual methods, because as soon as the ear picks them up certain fundamental changes take place, which are due to the sluggishness and varying sensitivity of the ear itself.

With this in mind, commercial phonograph records have been studied (Part IV) in the same fashion as the folk songs of this collection. The folk songs are not available for auditory purposes, but sufficient references to phonograph records will be made to enable anyone to recognize all the Negro voice patterns by ear. The folk songs on pattern notation may then be either "heard out" or sung.

A selection from a phonograph record, taken as a whole, is hardly an intact folk product. It is, however, only those embellishments of Negro singing which were found among the Southern Negro folk that have been chosen as fitting examples. Most of the voice patterns which are analyzed from the folk graphs have also been photographed, measured, and graphed from phonograph records. For a unique lecture demonstration for both seeing and hearing music, a device has been constructed which plays a phonograph record and at the same time projects a moving spot of light on the half-step musical staff (Fig. 2, B), graphing the frequency of vibration.

The device is simple, using a stereoptican and a phonograph. Without going into detail, the essential feature is to use the power of the phonograph in drawing a vertical slit across the face of a slide on which the graph curve is photographed. The slide is the negative photographic plate, so that light gets through only the graph curve. The vertical slit restricts the light reaching the screen to a point of the graph curve.

The same effect of a moving point used in this device is possible with Fig. 2, C, if a piece of cardboard is cut twice the length of the graph and an inch or so higher. Then if a vertical slit, of the same height as the graph, is made in the center of the cardboard, and slid across the page from left to right, the graph curve will appear as a moving point.

In the projection apparatus, the slit is cut in a tin slider, which is pulled through the slide holder of the stereoptican. A rack, fastened to the tin slider, engages a gear on the spindle in the center of the phonograph turntable, which is placed to the left of the stereoptican.

With the device used in our laboratory, it is possible to exhibit a song with five successive graphs of the pattern notation. The tin slider has five vertical slits, spaced at distances equal to the width of the slides. When one slit passes across a slide, another slide is shifted into place as in ordinary stereoptican projection. The singing, of course, continues all the time, and the operator must make a quick shift when the moving spot reaches the end of each slide.

Either the half step musical staff thrown on the screen from the second stereoptican, or a cardboard screen with the half-step musical staff drawn on it, will suffice as a background for the moving light spot.

On Ma Journey. To facilitate a general acquaintance with the pattern notation, a song by Paul Robeson was photographed from a phonograph record.[29] The words on Figs. 4, A, and 4, B, will be heard repeated five times during the course of the record. The fifth occurrence was photographed.

On graph 1,[30] the slide up on the first tone may not be heard as such. The same is true of the attack of *jour–,* in sec. 1. The slower gliding intonation at the beginning of *now,* sec. 2, will be perceived better. The second tone of *Mount,* secs. 3, 4, is released with a definite downward slide. *Ma,* sec. 5, is mostly a speech sound, as is the case of the third tone of *now,* sec. 6.

[29] Victor Record No. 20013-B.

[30] "On Ma Journey" is notated on four separate graphs, three on the first page and one on the second page. A "graph" consists of one staff of six seconds' duration, with the legend below it. The seconds are numbered from left to right, such as sec. 1, sec. 2, etc. The graphs will be referred to as 1, 2, 3, 4, etc. in the order in which they come in the song.

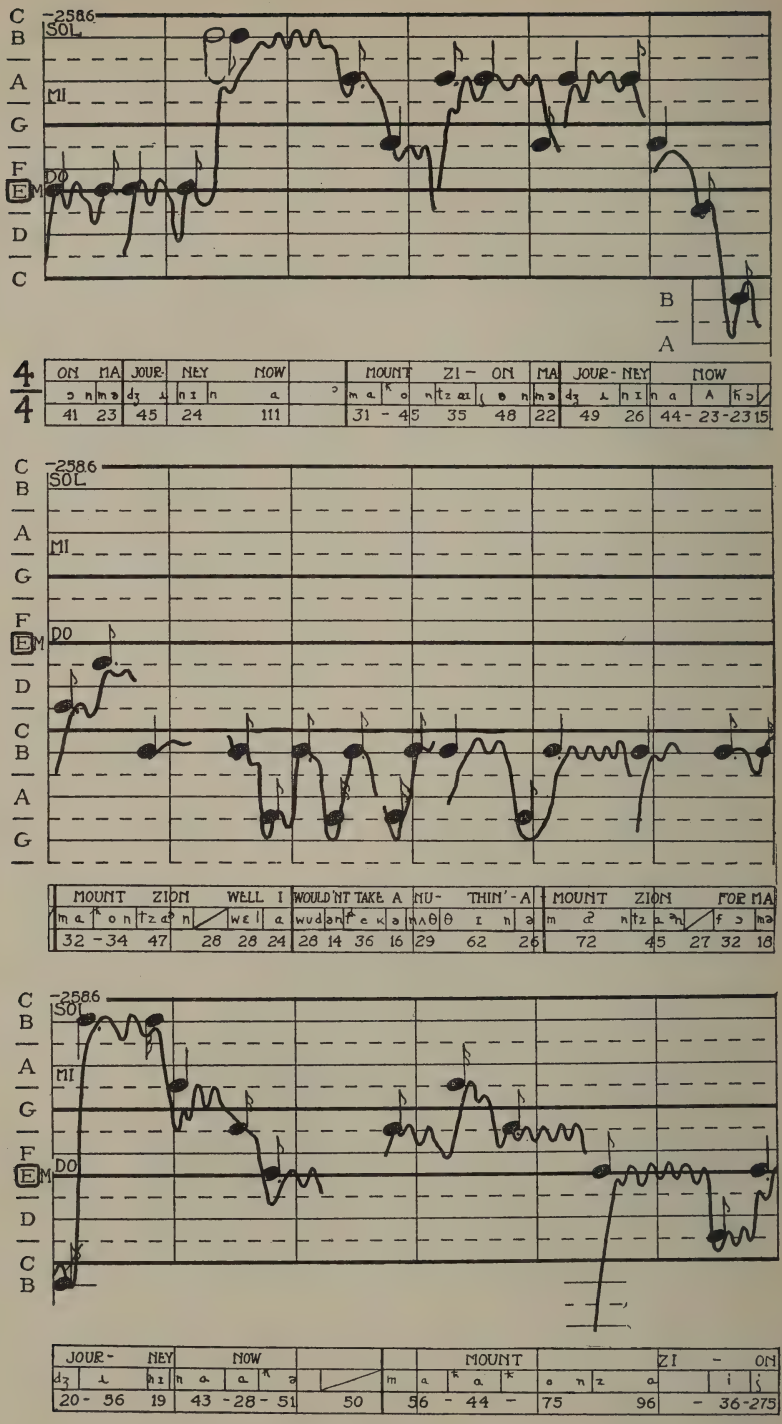
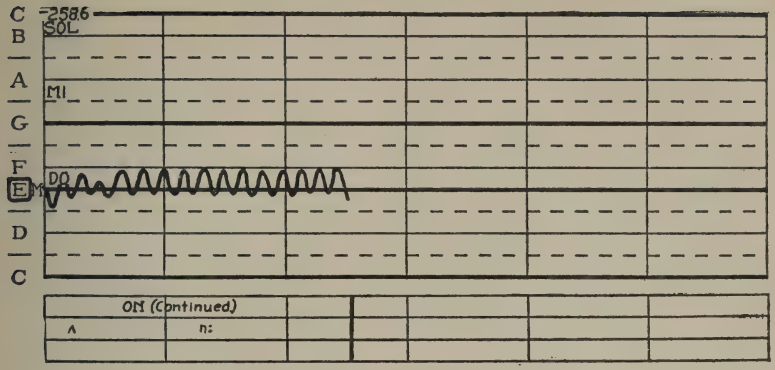


Fig. 4. A. Graphs 1, 2, 3. On Ma Journey.



B. Graph 4. On Ma Journey.

In making the attack of *Zion,* on graph 2, sec. 5, or graph 3, sec. 5, the singer begins the tone far below the level of the previous tone, without a marked pause between tones. The first tone of *now,* graph 3, sec. 2, has a slur upward, which can best be heard by slowing down the record.

The same wavy appearance of the graph-curve seen in Fig. 2, C, tends to appear in this song. It was stated that this rise and fall at a rate of about six times per second is the representation of the "vibrato." The striking thing about the vibrato of Figs. 4, A, and 4, B, is this regularity in rate, extent, and form.

Phonetic Transcription. The phonetic transcription of "On Ma Journey" is based on the key on page 32. All consonants in which the symbol immediately suggests the sound are omitted.

A ligature in the phonetic transcription of some vowel or consonant combination, other than diphthongs, signifies that one sound has a tinge of the other throughout its make-up. Generally the secondary sound is attached at the upper right of the primary.

When a vowel is written with a small character above the line of the other letters, and unattached to any other symbol, it means that there was a faint touch of that sound.

In Fig. 4, A, it is evident that the vowel timbre is altered when several tones occur on a single syllable. *Now,* graph 1, sec. 6, has the three vowels, [*ah*], [A], and [*aw*]. There are unstressed-a-'s as in [*a*bout] occurring in *Well, I wouldn't take -a-nuthin'-a-Mount Zion.* There is a touch of voiced [h] dividing some of the tones, when several are sung on the same syllable. The *Mount's* and *now's* having more than one tone have one or more [h]'s. Wherever *Jour-* occurs the [r] is syllabic. Some of the *Zi-*'s are given the [t]'s belonging to the *Mount's* preceding. This is probably a carry-over from the African languages of the Negro.

In making a phonetic transcription of this nature, the ear is sufficient to resolve the sung syllable into its component phonetic elements. While the ear cannot analyze the quick

PHONETIC KEY[31]

VOWELS		CONSONANTS	
Single Symbol	Example	Single Symbol	Example
i	m<u>ee</u>t	ŋ	sing
ɪ	b<u>i</u>t	ɵ	<u>th</u>en
e	f<u>a</u>te	ð	<u>th</u>at
ɛ	g<u>e</u>t	ʃ	<u>s</u>ure
æ	b<u>a</u>t	ʒ	a<u>z</u>ure
A	between bad and rah	ɹ	hear
ɑ	r<u>a</u>h	r	<u>r</u>ight
ɔ	f<u>ou</u>ght	j	<u>y</u>et
ʌ	b<u>u</u>t	ʍ	<u>wh</u>en
ə	<u>a</u>bout	w	<u>w</u>ay
o	fl<u>oa</u>t	ɦ	voiced-h
ʊ	f<u>oo</u>t	DIPHTHONGS	
u	b<u>oo</u>t	aɪ	b<u>i</u>te
		ɔɪ	b<u>oi</u>l
		aʊ	h<u>ou</u>se
		ju	m<u>u</u>le
		ou	g<u>o</u>
		eɪ	s<u>a</u>y

[31] Similar keys are used by Jones (15) and Krapp (18). In referring to phonetic sounds in the text of this volume, the examples used in the key will be bracketed. A written word, in which the letters of the sound are italicized, is sometimes used to represent the sound.

embellishments in folk singing, the vowels and consonants are generally prolonged enough to be recognized. All the phonetic elements could probably be determined directly from the film if laborious mathematical calculations were to be made.

Phonetic transcription dovetails neatly into the study of the sound wave photograph, and consequently into the pattern notation. Timbre, which includes the character of vowels and consonants as they are heard, is directly related to the form of the sound wave. It was quite possible to follow a series of waves on the phonophotograph in order to locate points where significant changes in form took place.

While the folk singers were practicing their selections and thoroughly accustoming themselves to the photographic situation, a rough phonetic transcription was made. Later, with a record of the successive sounds heard in a given song, each phonetic element was fitted to the train of waves in the photograph. This procedure falls down at some points due to the excessive sliding of the Negro voice. A check on the phonetic transcription was made possible by reading the lip movements on the slow motion pictures which were taken in addition to the voice pictures.

Conventional Symbols.[32] In this work there has been no attempt to make any musical applications, but it has been the aim to co-operate with musicians or others interested in such applications. In order to assist in interpretation of the pattern notation, musical "notes" or "note-symbols" have been used (see Figs. 4, A, and 4, B). Their use is only incidental, and no effort has been made to produce by refined measurement a better conventional notation of Negro music than has already been done by ear. As a matter of fact, ear notation has produced a symbolization of many Negro songs up to the limit of the possibilities of the notation system, and of the purposes of that

[32] Arrangements of the songs by conventional notation are filed in the Psychological Laboratory, State University of Iowa, and are available.

system.[33] It is important to understand that the conventional symbolization of this work has scientific and not musical purposes.

Distinction between "note," "intonation," and "tone." Before a conventional "note-symbol" could be placed on a line of the pattern notation, it was necessary to set up certain criteria of what it represents in terms of both the auditory experience and the pattern notation. This is fairly easy in Fig. 2, C, where in a single tone the vibrato[34] patterns hover about a general level[35] on the half-step musical staff.

Fig. 5 is a picture of the way Melba sang the tone *and* in the twelfth measure of "Annie Laurie."[36] This graph is an enlarged section of the pattern notation, to be used in cases where very detailed measurements are desirable.

In Fig. 5 no successive frequencies are equal, and the graph-curve fluctuates about a general level. In listening to the tone represented, a single pitch may be heard. A note, psychologically, is the perception of a definite, steady pitch. In terms of the pattern notation, awaiting further experimentation, whenever the graph-curve remained about a general level for at least .10-.15 seconds it was given consideration as a note.

When all the places at which the graph-curve remained about a general level for .10-.15 seconds or more are marked off, there are still many parts of the graphs neglected. All the slides and swirls will be called "intonations," following the

[33] It was interesting, after our conventional notations had been completed, to compare the spirituals photographed at Hampton Institute, Hampton, Va., with those in R. Nathaniel Dett's *Religious Folk Songs of the Negro,* Hampton Institute Press, Hampton, Va., 1927. They agreed on most points. Nearly all our deviations from Dett's edition resulted from our attempt to indicate as accurately as possible exactly how a song was sung.

[34] Cf. footnote 25.

[35] The concept of "general level" is necessary because of the presence of some type of variation in successive wave-lengths in singing a certain note, as pointed out by Simon, *loc. cit.*

[36] Victor Record No. 6217-A.

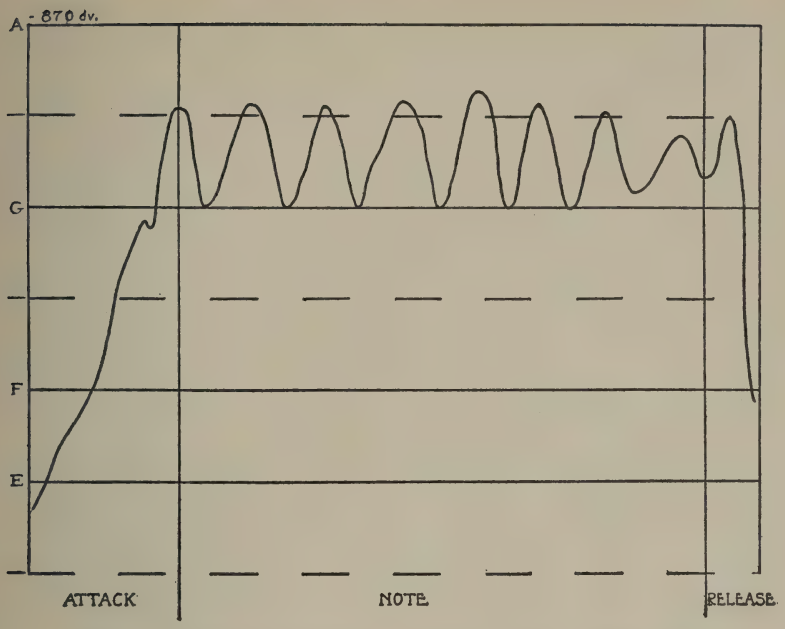


Fig. 5. A tone from Melba's "Annie Laurie." *And,* sec. 59.

terminology of the phoneticians.[37] An intonation, psychologically, is a continuously changing pitch, and it may be identified on the pattern notation by the extended rise or fall of the graph-curve, which does not cling about a general level for any great length of time.

Sometimes an intonation occupies the entire tone. It is then called an "intonation-tone." Many tones, however, are analyzable into three parts for purposes of classification: "attack," "note," and "release" (Fig. 5). That part of a tone which takes place before the tone attains the characteristics which it bears when it remains on a general level or "note," is termed the "attack." When the characteristics of the note give way to a change toward the end of the tone, such a change is called the "release."

[37] Jones, *op. cit.,* chap. XXI.

The tone is the unit of the pattern notation. Since every tone has been given a conventional "note-symbol," these symbols will be called "tone-symbols," in deference to the necessary distinctions just made.[38]

The work of locating the tones on the pattern notation would be begun by marking off the syllables of the selection, after the successive phonetic elements of the song have been assigned to the successive changes of the contour of sound waves of relatively unchanging wave-lengths. If a number of tones are found on the same syllable, as is true in the case of many Negro voice patterns, the syllable would be subdivided into its component tones.

After the tones had been located in time, and the words of the songs applied to them, the problem was to assign a tone-symbol to a certain half-step on the scale. What is the single frequency of vibration which would represent the pitch heard in a note?

By the use of a siren which produced a tone somewhat like the vibrato patterns of Fig. 5, an experiment pointing toward an answer to this problem was possible.[39]

A cycle of frequency of vibration at a rate of six times per second, approaching a sine curve in form, and a half-step in extent is one type of frequency vibrato. The holes were cut in the siren so that the average frequency of the cycle was 240 vibrations per second. This vibrato pattern was then compared with frequencies 234, 236, 237, 238, 239, 240, 241, 242, 243, and 246. A calculation of the results showed that twenty-three naïve observers heard the pitch of the vibrato approxi-

[38] The terms above are not considered as being defined except for the terminology of this research. As far as possible, they have been given meanings which will fit into most related terminologies, but those meanings are limited purposely in order to avoid confusion. For example, a definition of a tone would have to exclude noises, and we are not here concerned with noise.

[39] As yet unpublished.

mately at 240 dv. That is to say, the pitch heard in an unanalyzed vibrato is between the two extremes.[40]

Awaiting further research, it has been assumed on the basis of this experiment that to regard pitch of a vibrato as equivalent to the mean frequency is adequate for the present explanations. The average of all the individual frequencies in a note was then computed, and the tone located on the nearest half-step line on the notation. This gave a temporary and rough representation of the pitch outline of the song with the words and a succession of tones of varying lengths.

The determination of the measures of the song followed. When a temporal rhythmical pattern was repeated, it gave a cue to the length of the measure and to those surrounding it. Often the moving pictures served as a check on the measure bar locations, because the singers would keep time with their feet or hands.

Pitches, words, and measures being ascertained, the time values of the tones were left to be measured. The duration of each tone of the song was determined by counting the number of .01 seconds the tone lasted on the motion picture film.

This number was divided into the length of the measure, the resulting quotient being an index to the time value of the tone-symbol. Suppose that a measure lasted 3.00 seconds. If one tone in that measure had a time value of .80 seconds, the quotient would be 3.00/.80 or 3.75. If this were referred to Table I, it would be found to be within the limits of a quarter tone-symbol.

[40] There are individual variations to this experiment, due to differences in the structure of the ear; so the above results are the average of a group. There is, of course, a band of frequencies which cannot be discriminated, but these bands center about the frequency heard by the group as a whole. For example, one observer could not discriminate between the pitch heard in the vibrato and the tones with constant frequencies 239, 240, and 241.

TABLE I

Determination of time values of tone-symbols.

Time value of tone-symbol (4/4 time)	Quotient
Thirty-second	26.67 — 32.00
Dotted 32	18.67 — 26.66
Sixteenth	13.34 — 18.66
Dotted 16	9.32 — 13.33
Eighth	6.67 — 9.33
Dotted 8	4.67 — 6.66
Quarter	3.34 — 4.66
Dotted 4	2.34 — 3.33
Half	1.67 — 2.33
Dotted 2	1.17 — 1.66
Whole	1.00 — 1.16

In many cases, these methods did not give a finished conventional notation. The roughest spots were smoothed over by the application of the current musical standards in notation. The so-called irregularities and mistakes were not covered up, although there were many points where close decisions had to be made.

Each phrase of the song was notated without reference to the rhythm or melody of other sections somewhat like it. If a Negro made any changes the second time he sang a melodic sequence, that difference will be found on the conventional notation. This procedure not only shows more nearly untampered notation, but brings out the variations, good and bad, which the Negroes put into their renditions.

The deviations in duration and pitch as they are placed on the conventional staff, without regard to the intent of the singer, are not so glaring when they are sung as when the selection is played on the piano. The glides of singing seem to ease one tone into the other. But, to be consistent, in most cases the half-step of the tempered scale nearest to the mean frequency of a general level has been considered the place for the tone-symbol.

No rest-symbols will be found on the pattern notation, but each space of any consequence was considered as a rest.

Interval Analysis. In the past, analyses of folk songs in the main have consisted of the determination of intervals and scales. Since the pattern notation has the necessary data for a quite accurate study of intervals, an accessory graph is presented concentrating upon this element.

The interval graph is shown in Fig. 6.[41] It is constructed on the same basis as the pattern notation. The vertical pillar in the center is divided upwards into equal spaces denoting half-steps. Instead of being called C, D, etc., the half-step lines are named P1, A1 — (m2), M2, etc., the musicians's terms of perfect unison, augmented unison (minor second), and major second. D stands for "diminished."

The pillar is divided at the P1 line into ascending intervals and descending intervals. The former are above the P1 line and the latter are below. The intervals graphed on the left of the pillar are computed from the key-note, and are called "key-note intervals." Those to the right are computed from the previous-note in a melody, and are called "previous-note intervals."

The number of cases of a given interval may be found by reference to the numbers at the bottom of the graph.

The stars represent the intervals determined from the tone-symbols. The horizontal lines leading out from both sides of the pillar stand for intervals which are measured from the mean frequency of vibration of the various notes on the pattern notation. The mean frequency of the first note is divided into the second. This ratio expresses the interval as it was actually sung. Table II is constructed on this basis, giving the ratio for each half-step. For graphing purposes, the pillar is divided into finer units of .1 step. All measured ratios coming between one of these units and the next were considered to be concentrated on the lower .1 step position.

[41] The data here presented are taken from a phonograph study of McCormack singing "Annie Laurie." Cf. Victor Record No. 740-A.

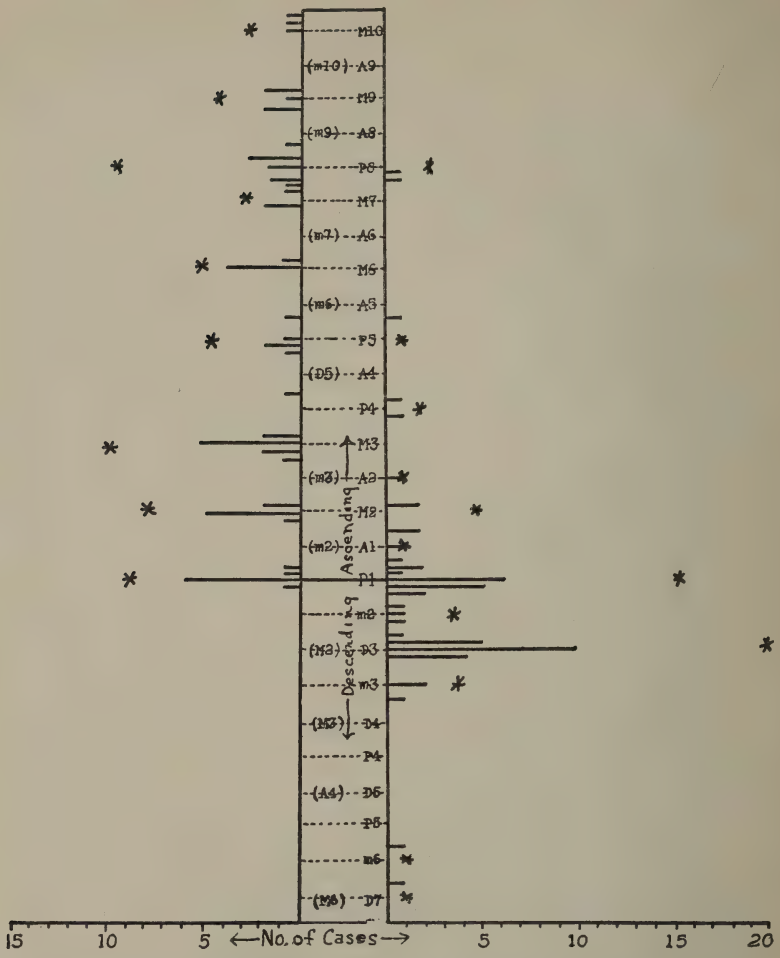


Fig. 6. Interval graph from McCormack's "Annie Laurie." Left of pillar, key-note intervals. Right, previous-note intervals.

TABLE II.

Ratios Indicating Intervals of the Even-Tempered Scale (A 435 dv.)

	Musician's interval terms		Half-steps from base	
Ascending	M10		16	2.519
	A9	(m10)	15	2.378
	M9		14	2.244
	A8	(m9)	13	2.118
	P8		12	2.000
	M7		11	1.888
	A6	(m7)	10	1.782
	M6		9	1.682
	A5	(m6)	8	1.587
	P5		7	1.498
	A4	(D5)	6	1.414
	P4		5	1.335
	M3		4	1.260
	A2	(m3)	3	1.189
	M2		2	1.122
	A1	(m2)	1	1.059
	P1		0	1.000
Descending	m2		1	.944
	m3	(M2)	2	.891
	D3		3	.841
	D4	(M3)	4	.794
	P4		5	.749
	D5	(A4)	6	.707
	P5		7	.667
	m6		8	.630
	D7	(M6)	9	.594
	m7		10	.561
	D8	(M7)	11	.529

When the first note has fewer vibrations per second than the second note, the interval is called ascending. When the opposite is true, the interval is called descending.

When the position of the star at a given interval is compared to the lines, a comparison is made between the representation of intervals by conventional notation and by pattern notation.

If the singer follows the even-tempered scale,[42] it would be expected by chance that the lines on the graph would distribute themselves about a half-step line as a center. This can be seen by reference to Fig. 5 on the P1 and the D3 descending lines. If the singer departs from the tempered scale, the lines would group themselves about some other point on the scale than the half-step line.

Tempo Analysis. When a singer slows down in tempo, the measures obviously become longer in time. The length of the measure may therefore be used as an index to the tempo. This is not so fine a unit as might be desired for certain types of study, but it was the most practicable in introducing the method.

Fig. 7 is another graph accessory to the pattern notation. It aims to show in a compact way what may be seen on the pattern notation itself in a less related form. The distance of the measure lengths is put on a new reduced scale, the lengths being graphed in a vertical rather than a horizontal scale.

Each small square in Fig. 7 vertically has a value of .25 second. The same distance horizontally is given over to one

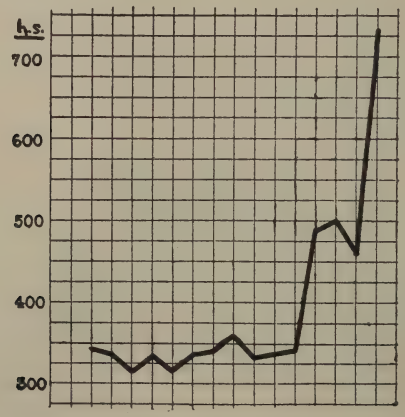


Fig. 7. Tempo graph from McCormack's "Annie Laurie."

[42] The use of the even-tempered scale is arbitrary. The lines representing any scale could be drawn inside the pillar and referred to the data at the right and left.

measure. As the line goes up, the tempo is slower. In Fig. 7 McCormack sings with a rather steady tempo at first, suddenly slackening to a new level and ending with a very long measure.

If desirable, the numbers representing hundredths of a second, at the left of the tempo graph, may be translated into metronome values.

Illustrations of Pattern Analysis. 1. *Artistic singing: McCormack's "Annie Laurie."* A section of this song as photographed[43] from a phonograph record is shown in Fig. 8. It is

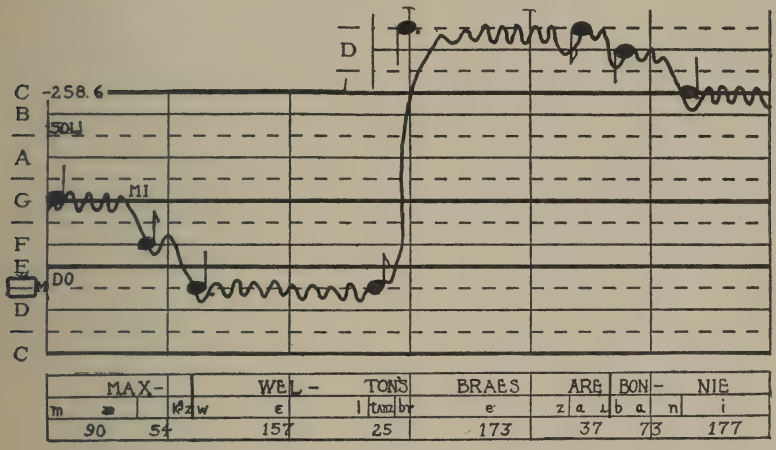


Fig. 8. Section of McCormack's "Annie Laurie."

plain that McCormack's tones have the vibrato present consistently and regularly. The vibrato is of frequent occurrence in the Negro songs about to be presented, and in its many variations of rate, extent, and form, it is an important voice pattern. In McCormack's tones, the vibrato represents a nicety of muscular adjustment.

Note that *braes* is not attacked cleanly, but that McCormack slides up to E^{b}. This feeling for a pitch is hardly apparent when

[43] Victor Record No. 740-A. Transferred from the early pattern notation of a previous study (Cf. footnote 10) in which the numbers are in terms of a quarter tone-symbol with a value of 1.00.

listening to the record, for the time taken is very brief. There is a downward dip of the graph-curve between *braes* and *are,* the extent of which is almost half a step below the mean of the vibrato of *braes.* Among the folk songs, there will be some comparisons made with the way McCormack attacks such tones as these, for the examples just mentioned are representative of what most artists do in calm singing.

The smoothness of the jumps from one level to another is quite marked. There is a definiteness about each tone, with its vibrato patterns, which will be noticeably lacking in some of the Negro songs. Once a tone reaches a general level, its patterns remain there until the tone is released. As was seen in the interval graph (Fig. 6), there is very little significant deviation from the steps of the even-tempered scale. The conventional tone-symbols and the graph-curve seem to fit each other, for McCormack sang from a conventional notation.

The only break in the graph-curve is covered by a tone-symbol. It occurs at the beginning of *ton's.* The [ks] of *Max-* has a touch of [gz]. Through the rest of the song, the graph-curve shows the tendency of the voice to keep in operation, for such phonetic elements as [k], [s], and [f] sometimes bring in noises out of harmony with the mood the singer is trying to express.

2. *Speech: Bryan's "Immortality."* The Negro is especially prone, in his general habit of going to extremes in vocal matters, to insert here and there a number of patterns closer to the type case of speech than that of song. The peculiar grace-notes, voice-breaks, and sudden slides, to say nothing about actual speech sounds, all will be better understood in terms of patterns arising out of an actual speech situation, such as is shown on the speech graph in Fig. 9.[44]

This graph looks choppy in comparison with the continuous and regular singing notation. In a sense, a partial difference

[44] Photographed from Victor Record No. 16168-B, Bryan's speech on "Immortality."

between speech and song when heard could be put into some such statement, although no sharp line of distinction can be drawn between speaking and singing. Generally considered, part of that which is called singing contains much that would pass for speech in a different setting. The converse is equally true.

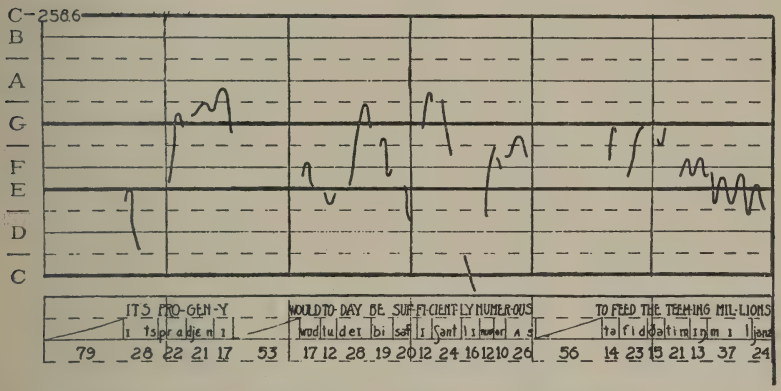


Fig. 9. Section of Bryan's "Immortality."

The syllables obviously are of much shorter duration in Fig. 9 than in Fig. 8. In the former, the graph-curve seems to glide all around the page, the jumps exhibiting few places with a sustained general level.

There are four primary intonations. First, the rising intonation, of which the syllable *pro-*(geny) in Fig. 9 is an example. The voice simply climbs a step and a half in a few hundredths of a second. Second, falling intonation, exemplified by *its*. Third, the circumflex, which occurs on each syllable of *teeming*. It is merely a flash upward and back again. Fourth, the syllable *to-*(day) is the inverted circumflex type, which is not of very frequent occurrence throughout Bryan's entire speech.

Limitations. Out of the many measurable aspects of singing, it so happened that at the outset of this work the pitch and duration factors were the most readily attacked. A good deal of experimentation was necessary, in making the measurements,

to strike a point where there was sufficient but not cumbersome detail in representing the stimuli for these factors as they exist on the sound wave. The problem lay in finding out just how much error can be involved without making the desired results impossible.

The measures of the physical stimuli for intensity and timbre will receive only incidental attention. There are instruments invented for the accurate recording of wave-energy and wave-form,[45] but at this stage the returns were not commensurate with the complications arising in utilizing these devices. It is quite apparent that pitch and duration present unique problems of their own. They are so allied as to form a significant unit, as it were, in themselves, and their treatment will pave the way for later work on intensity and timbre.

[45] Notably those of the Western Electric Co.

PART III

TYPES OF SONGS

The interpretation of the pattern notations of the Negro songs of this collection could be made an almost endless task. There are so many features which may be isolated, that it is left to students with individual problems to interpret the facts as they wish. The description of the pattern notation in the following pages is therefore not at all exhaustive. It is the intention merely to point out a few illustrative features, in order to take the initiative in the analysis.

WORKADAY RELIGIOUS SONGS

Odum and Johnson first used the term "Workaday Religious Songs" to distinguish between the "unsophisticated religious songs of the workaday Negro as they are sung today in the South" (p. 189) and the old formal spirituals.[1] The first three songs of this collection have a musical character quite distinct from the other spirituals.

No. 1. I Heard the Voice. Many of the elements in Figs. 10, A, and 10, B, are ordinarily identified with primitive music. A man of low intelligence but rather high emotional responsiveness, the singer (Figs. 11 and 12) entered into the experimentation with unusual abandon and interest. His combined bodily movements and voice are a good illustration of uncultured Negro singing.

The familiar words *I heard the voice of Jesus say, Come unto me and rest* would take the song out of a Negro classification, were poetry the chief consideration. However, it is a Negro rhythm which causes the peculiar combination of sounds into breath-groups[2] of *Ah ray, Ah voice, Ah Je-, zus say.* The

[1] *Negro Workaday Songs,* chap. XI.

[2] A "breath-group" as used in the phonetician's terminology means *those sounds made from one breath to the next.*

singer improvised the melody, making radical changes from one rendition to the next in practice.

The ornaments of the song are excessive, but fit into the general emotional intoxication of the singer. The ornaments help the rhythm to carry the song along over the melody handicap.

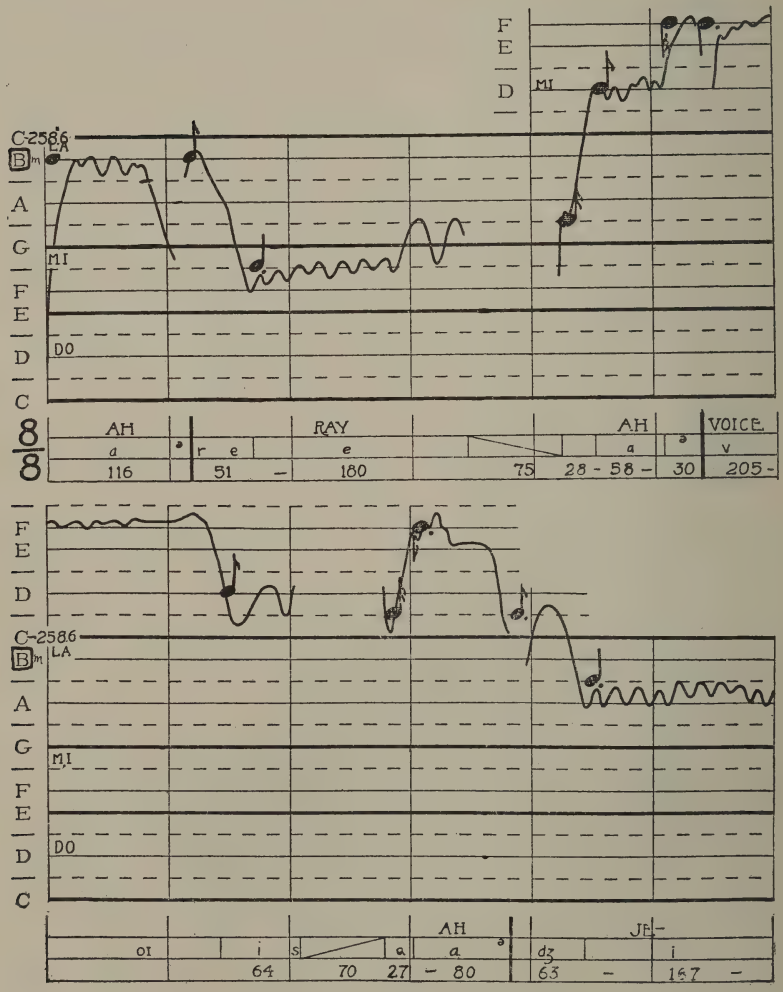
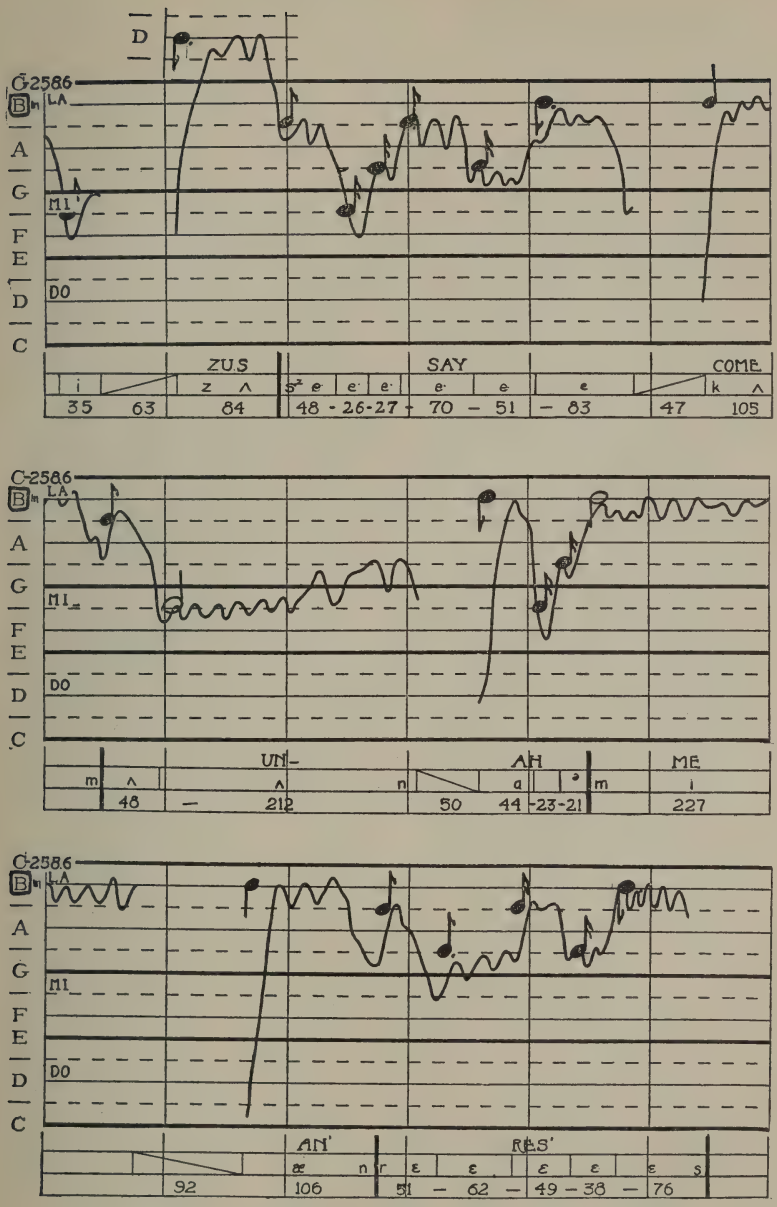


Fig. 10. A. Graphs 1, 2. I Heard the Voice.



B. Graphs 3, 4, 5. I Heard the Voice.

Long glides of some type or other start each breath-group. Transitions from tone to tone are for the most part slow portamento. Nearly every tone ends in an embellishment of some kind, an upward or a downward sweep of the voice or a slow quaver. The latter, at the rate of about three a second and nearly a whole step in extent, occur at the end of *ray, voice,* and *un-*. The glide at the end of *ah,* graph 1, sec. 1, is a very common release intonation in Negro folk singing. The same intonation is found in graph 2, sec. 4, and in graph 3, sec. 5.

While the vibrato on different tones is quite variable in extent and rate, there is in general a fair regularity of these two factors on a number of single notes. Instances are to be found on graph 2, secs. 5, 6, and graph 4, sec. 2. The vibrato on the whole is slow. On the high note, graph 2, sec. 1, it gives way to an erratic waver indicating its disappearance under strain. It changed on graph 4, sec. 6, for this tone was excessively loud.

The rhythm and embellishments of the song were outstanding. The notation does not explain that in each measure the singer kept time with four sets of accented and unaccented beats and that the syncopations in the voice rhythm were based on a strict timing of each beat.

The motion pictures show the singer keeping time with co-ordinated foot, knee, hand, elbow, and shoulder movements. Watching the shoulders alone, one notices a rise and fall on each beat, with the accented beat given a more extended dip.

The syllable which occurs at the beginning of each measure was given six beats, if the breathing period is included. The short tone completing the measure had two.

On the accent, the singer clapped his hands, his right foot—heel as fulcrum—snapped flat to the ground, and his knees were flexed. The unaccented beat was accompanied by a sequel action with less evident movements, in which the hands were kept together, the left foot repeated the action of the right, and the knees flexed about half as much as on the accented beat.

Fig. 11. *Ah Ray* (I heard) from No. 1. *Ah*, left and *ray*, right.

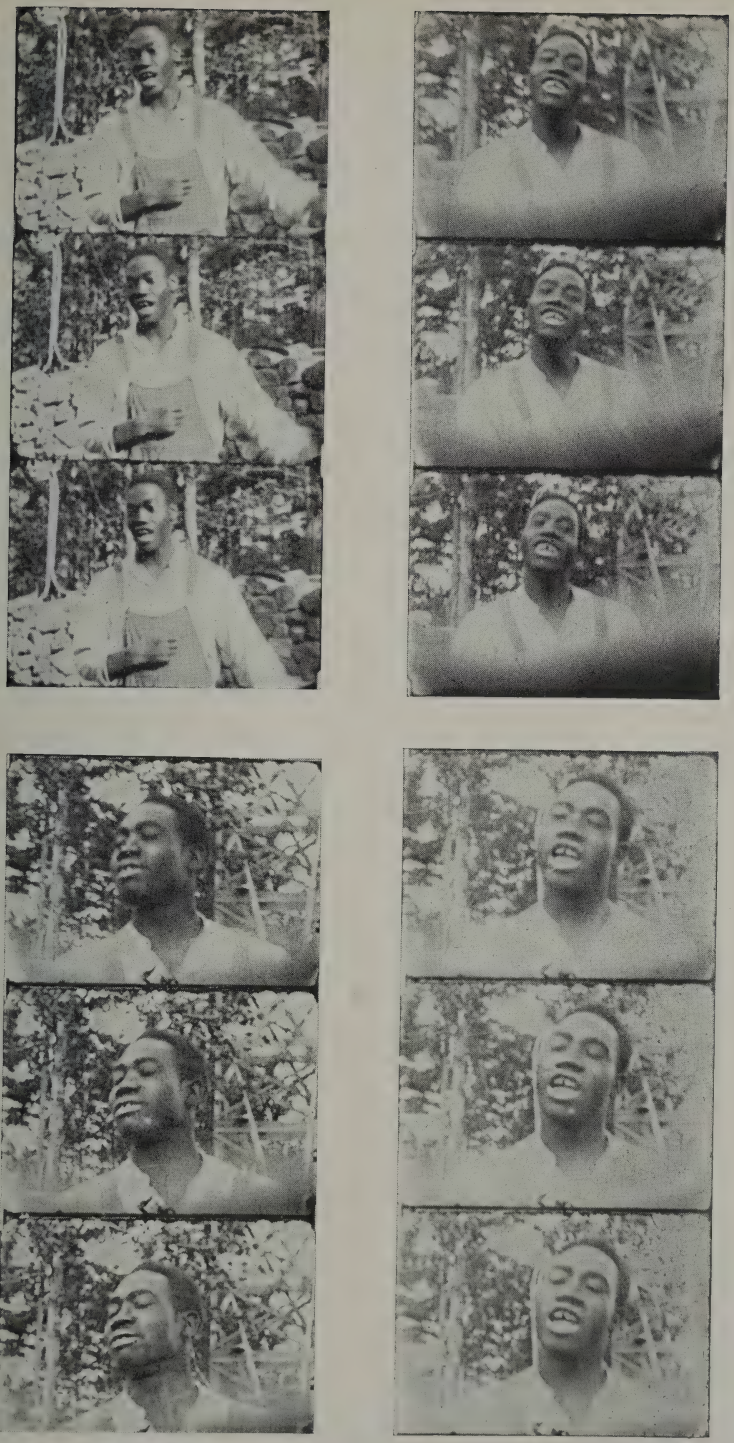


Fig. 12. "Getting the Speerit Up," with clapping hands, patting feet, swinging arms, and swaying body.

The breath-groups were always started with co-ordination of voice and body movement, but there was no such synchronism just before taking a breath. Probably the precise duration of a tone is not significant for rhythmic structure as long as the starting points remain unchanged in the pattern. Between breaths, the song is divided into fairly equal time values of two syllables each. The following table shows the strictness of the rhythm:

TABLE III[3]

Breath-group	Beat Length	Breath Length	Shorter Syllable
422	52.7	75	116
455	56.8	76	116
440	55.0	63	107
436	54.5	47	84
415	51.8	50	105
407	50.8	92	88
382			106

It will be noticed in the second column that throughout the song the average length of the beats within a given measure is not variable to any great degree. However, within the same measures, both the length of the breath and the shorter syllables deviate markedly from one measure to the next.

Referring to the column of shorter syllable lengths, *-zus* and *ah,* 84 and 88 respectively, take the least amount of time. It so happens that the motion picture record shows a wider lip movement on the syllables following these two than on any others in the song. Since a wide extent of lip movement roughly accompanies the production of an intense sound, the intensity of the tone immediately after *-zus* and *ah* may have been anticipated, and so the latter two were cut short. At least the effect is unique.

The *ah* sound seemed to be the singer's favorite. His wide open mouth quite fits into the general expression of the song.

No. 2. Do Lawd. "Ah Ray Ah Voice" and "Do Lawd" (Figs. 13, A, and 13, B) were sung by the same Negro. The

[3] Values are in .01 sec. units.

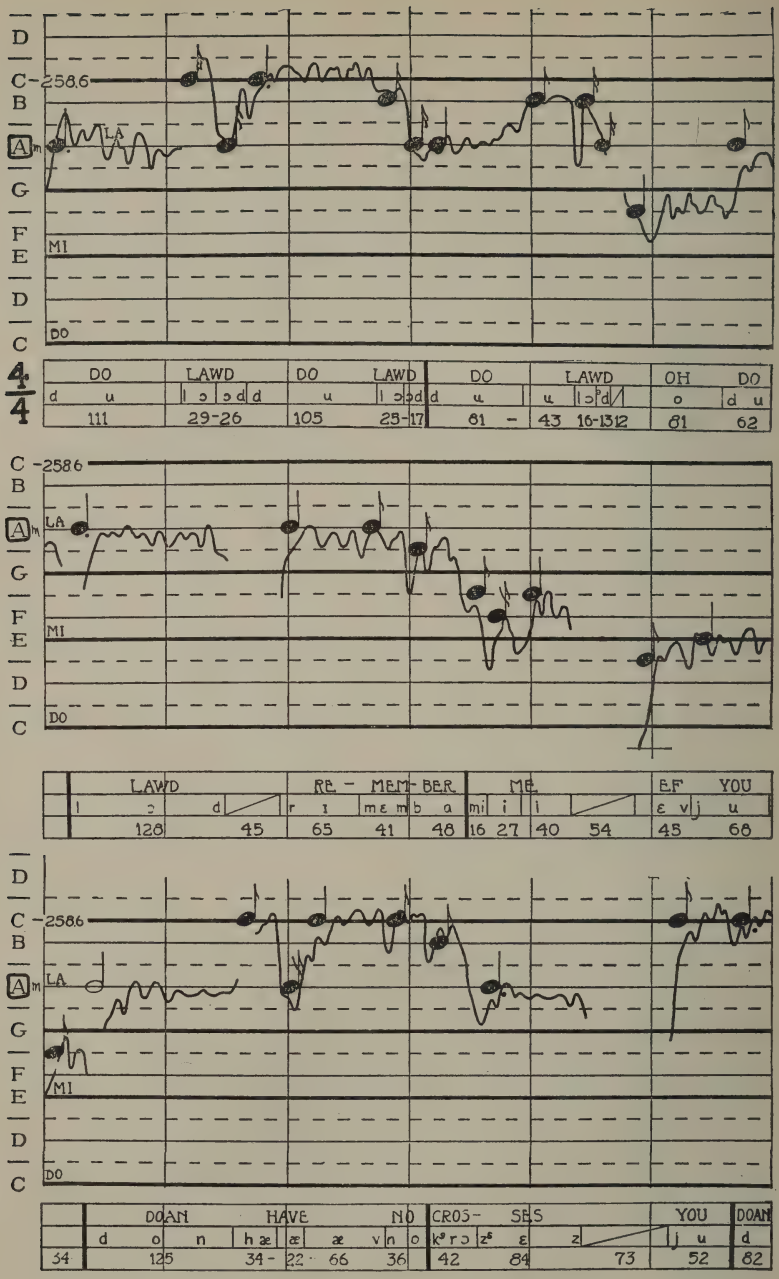
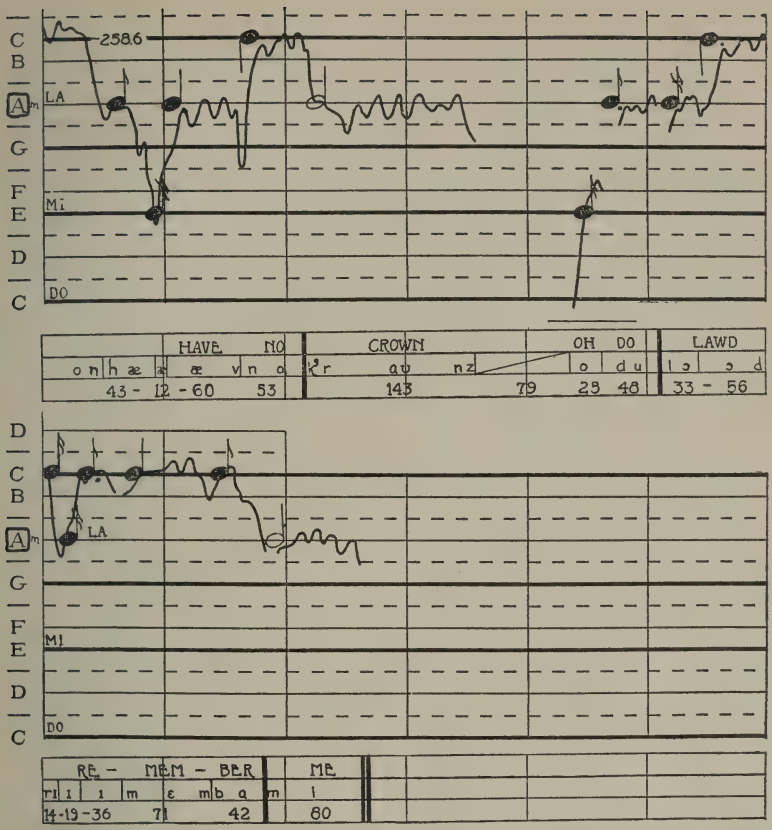


Fig. 13. A. Graphs 1, 2, 3. Do Lawd.



B. Graphs 4, 5. Do Lawd.

slow glide in graph 1, sec. 4, takes up the entire tone. The step and a half dip of the graph-curve on the attack of *Lawd,* graph 1, sec. 5, has the effect of sharply differentiating one tone from the next. Similar attacks are found in graph 2, secs. 3, 4; graph 3, secs. 3, 4; graph 4, sec. 2. *Oh,* graph 1, secs. 5, 6, is attacked by an inverted circumflex intonation.

Me, graph 2, secs. 4, 5, has a pattern of successive tones frequently occurring in Negro singing. The syllable is started on the same pitch on which it ends, but within its limits a short

note or intonation is interpolated. There have been no terms for these patterns, and those suggested are "interpolated-note" or "interpolated-intonation." In the case of *me,* the pattern is an interpolated-intonation, for a circumflex, a whole step in extent, occurs soon after the syllable is begun. On graph 3, secs. 2, 3, an interpolated-note is a minor third below the other notes of the syllable. *Have* on graph 4 has an interpolated-note on E. The three notes—one interpolated—of *re-,* graph 5, have different time relationships from the other similar successive tone patterns in the song. Instead of an eighth followed by a quarter, a sixteenth is followed by a dotted eighth.

Ef, graph 2, secs. 5, 6, has the first sweeping attack as in "Ah Ray." The only other extended glide preceding a note is in graph 3, sec. 6, since *oh* in graph 4, sec. 5, is a rising intonation throughout. The release of *crown,* graph 5, is exceeded in extent only by that of *-ber,* graph 5. Most of the other tonal releases do not stand out. The last tone flats somewhat.

No. 3. Burden Down. Almost without exception, the place in Figs. 14, A, and 14, B, where breath was taken may be identified by the long pitch swoops which follow the inspirations. The attack of *I've,* graph 2, sec. 3, extends an octave and a quarter. Throughout, the graph-curve is radically moving about with few hesitations for a prolonged tone. Many of the tones leave the general level when they end, generally with a downward flip. When there are notes of half a second or longer, the vibrato makes its appearance at a slow rate, but not to an excessive extent.

Just at the point where the singer would be expected to take a breath, at the end of a legitimate phrase, in graph 3, sec. 1, he plunges into *Glory, glory, hallelujah.* Then in a pleasantly disconcerting way, he pauses for a few moments after *since I lay my* before finishing the sentence.

Different kinds of circumflex intonations are present. Those in graph 1, secs. 1, 2, and graph 2, sec. 1, are entirely different

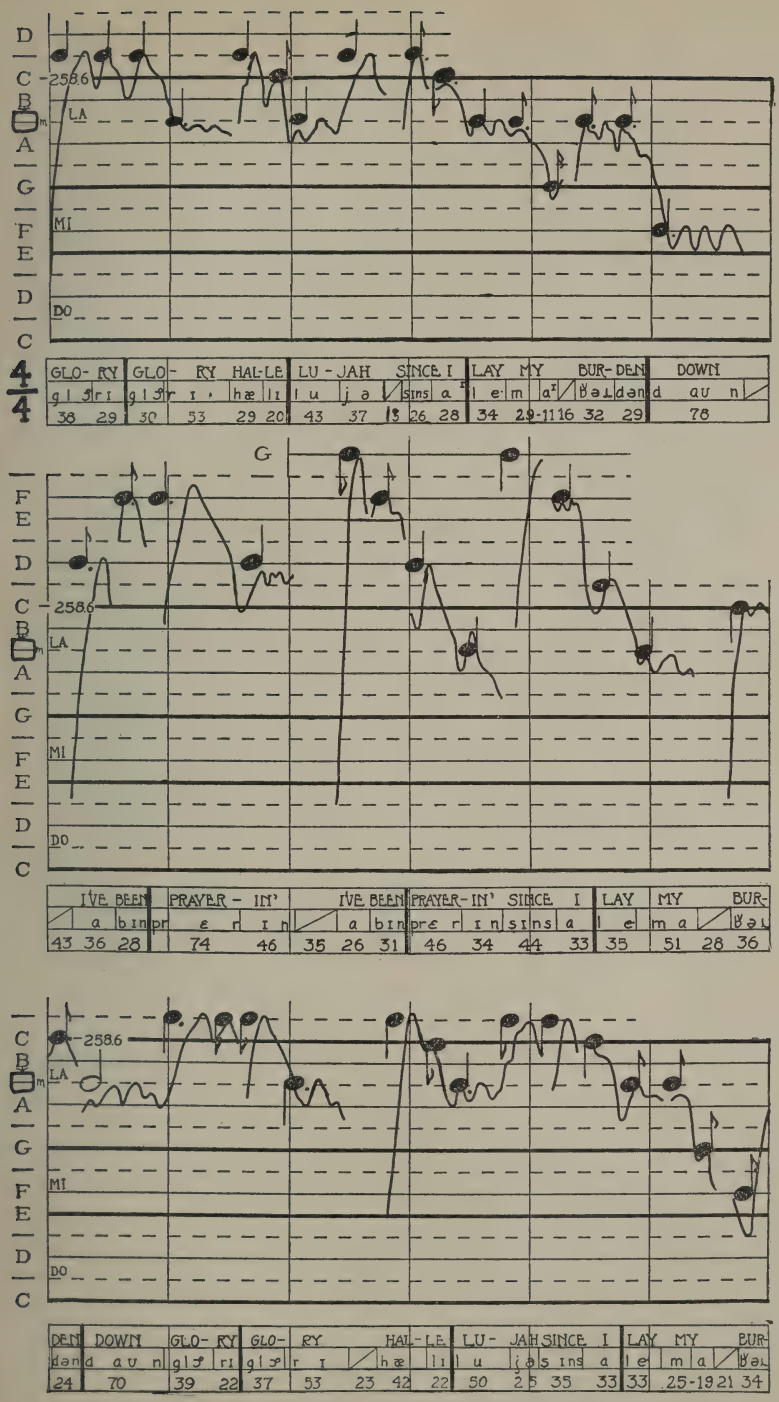
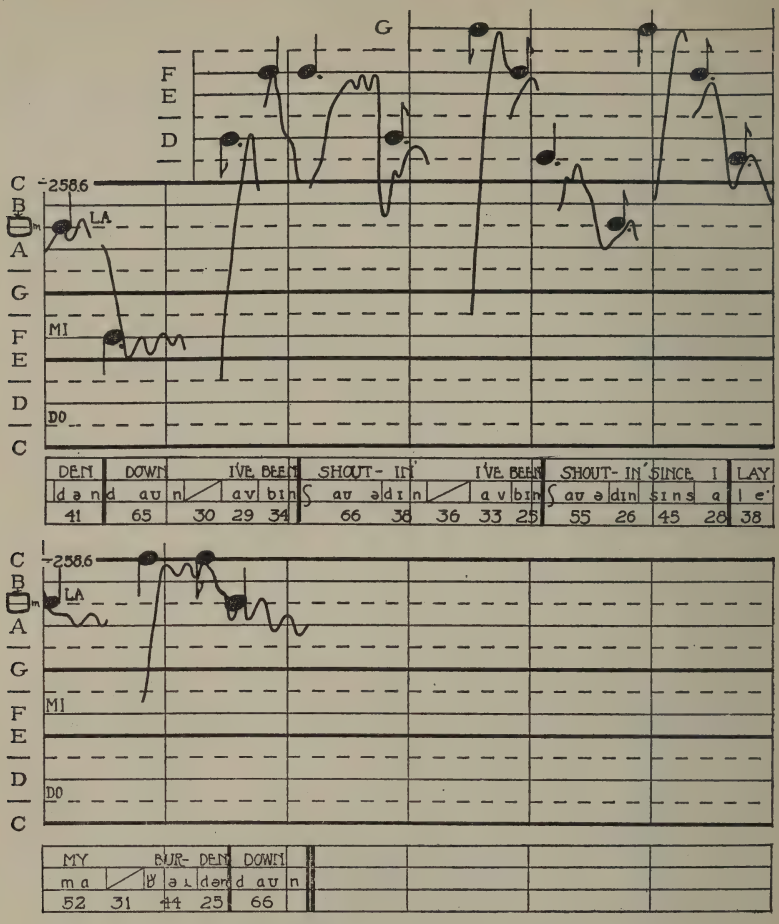


Fig. 14. A. Graphs 1, 2, 3. Burden Down.



B. Graphs 4, 5. Burden Down.

physiologically from the great circumflex found on *prayer-* in graph 2, sec. 2. Tones which are almost entirely rising intonations are *since,* graph 2, and *since,* graph 4. The two tones of *my,* graph 3, are falling intonations. Most of the other tones are composed fully as much of intonations as notes.

Fig. 15, left, exemplifies a habit of the Negro of emphasizing consonants, either by duration or force. In this case, the

Fig. 15. Burden Down. Left, first sound in *shoutin'*. Right, first sounds in *burden*.

latter was evident from the moving pictures. This habit serves to cut one tone definitely from the one following it.

The taking of breath occurred only at irregular intervals where the singer needed it, and then for but a short time.

SPIRITUALS

Conventional notation comes more nearly to representing accurately the singing of the standard spirituals than any other group of Negro songs. This fact is probably indicative of European influences, leading to a crystallizing of Negro songs on conventional notation. The cultured Negroes of today learn their spirituals from published music; so it would naturally follow that a selection sung from conventional notation could easily be turned back into that notation. The spirituals are not a "pure" American Negro folk song for this reason, since many of the African elements are lost because of a lack of symbolization.

No. 4. Roll, Jerdon, Roll. The notes of this singer from Hampton[4] are clean-cut (Figs. 16, A, 16, B, and 16, C) with the vibrato outstanding. The song is slow moving, and the tones are of long duration. As in the other spirituals, there are fewer primitive rhythms and embellishments and more tonal beauty and melody.

Extremes in the rate of the vibrato extend from four per second in graph 1, sec. 5, to seven in graph 2, sec. 6, and still faster in the short tones in graph 3, sec. 3. The character of the vibrato in rate, extent, and form varies from the smooth oscillations of *hear,* graph 8, to the ragged form on graph 1, secs. 3, 4, and the jerky rate on *there,* graph 5, breaking down on *ought-,* graph 5, or *-don,* graph 4.

Long tonal attacks occur three times, the first on graph 1, sec. 6, the second on graph 2, sec. 1, and the third on the same graph, sec. 5. On the second the inverted circumflex attack is

[4] Hampton Normal and Agricultural Institute, Hampton, Virginia.

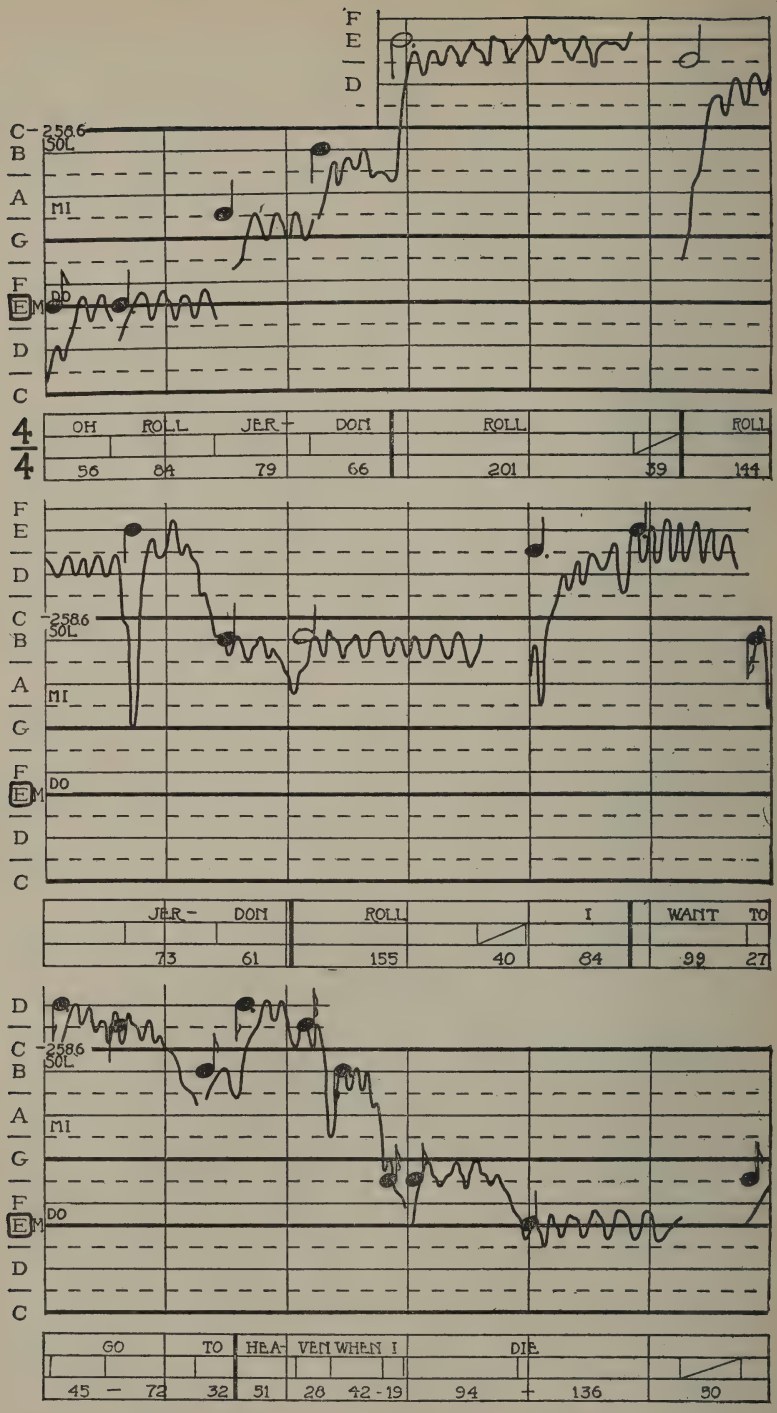
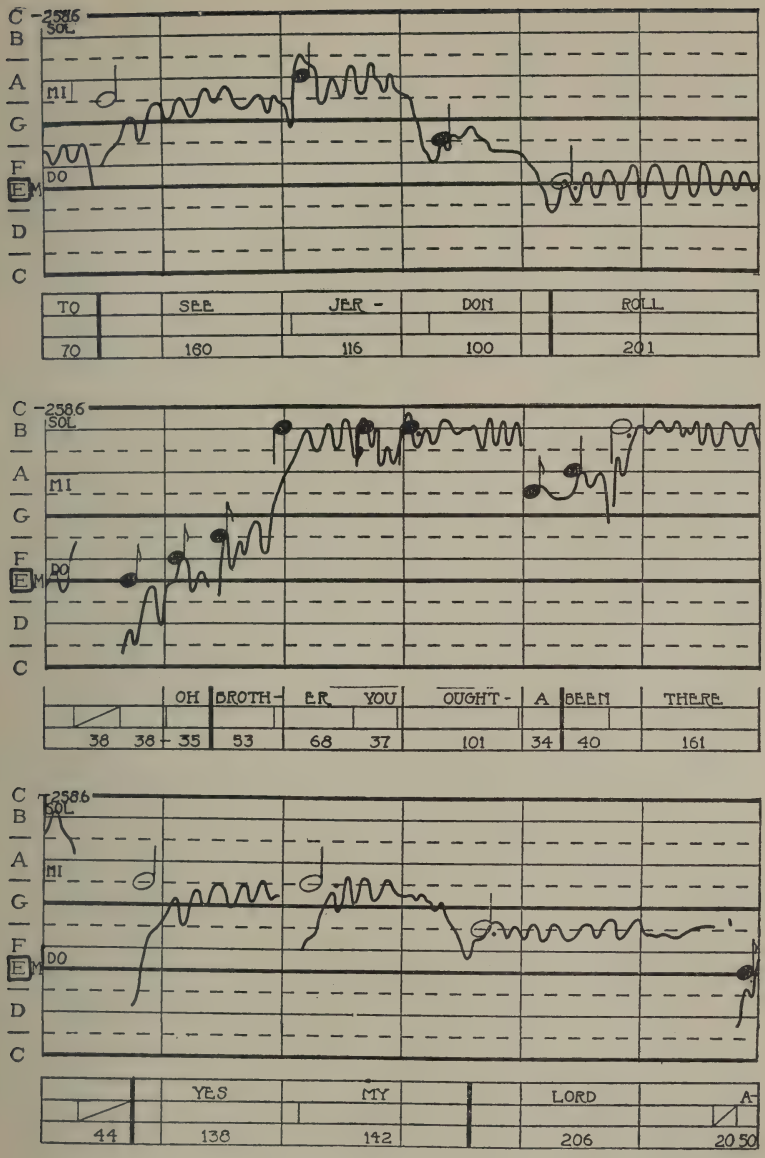
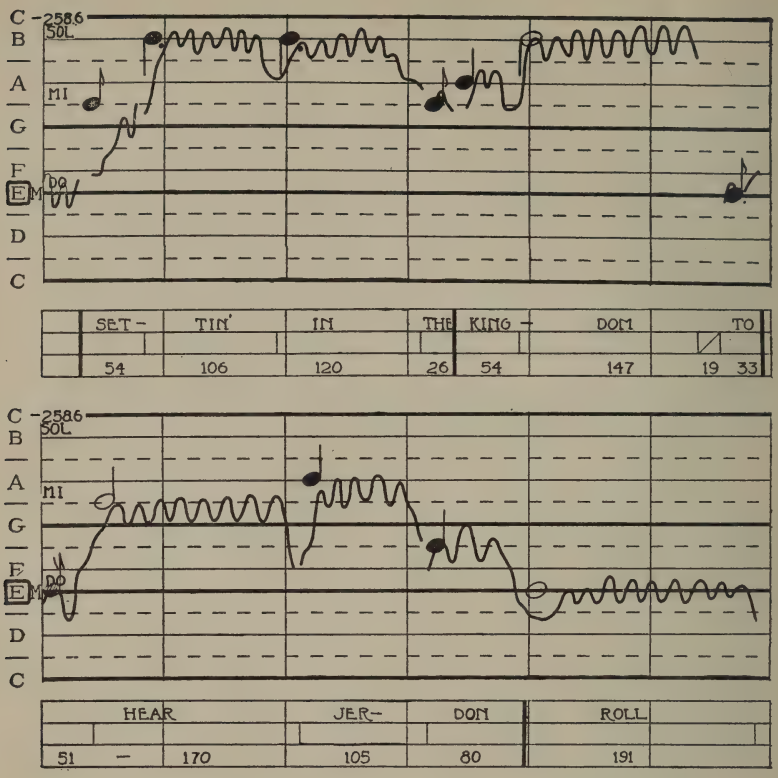


Fig. 16. A. Graphs 1, 2, 3. Roll, Jerdon, Roll.



B. Graphs 4, 5, 6. Roll, Jerdon, Roll.



C. Graphs 7, 8. Roll, Jerdon, Roll.

brief and extends a P5, although the tone attacked is but a half-step above.

Jer-, graph 4, is attacked by a circumflex intonation. The curve doubles back on itself a half-step above the tone that follows. Such an attack may be called a "circumflex-attack." Another circumflex occupies the entire tone of *to,* graph 3.

Roll, graph 2, *in,* graph 7, and *-dom,* graph 7, are preceded by an unbroken dip, and *my,* graph 6, and *Jer-,* graph 8, have somewhat the same effect but with voiceless consonants between them.

The graph-curve leans upward throughout *I* of graph 2, with the rate of change lessening as the tone progresses. Other tones which gradually sharp for the most part are *see,* graph 4, *yes* and *my,* graph 6. The latter slowly flats toward the end. Such a slow portamento effect is evident on *Jer-,* graph 2, *go,* graph 3, *Jer-* and-*don,* graph 4, and-*don,* graph 8.

No. 5. All My Days.[5] The deep bass singer of the Hampton quartet contributed this song. The patterns of Figs. 17, A, and 17, B, are expansive, with the delicate turns of the graph-curve which were seen in most of the previous songs replaced by broad sweeps. Phonetic transcription was not made of this song, but the interesting pronunciation of the words of Fig. 17, B, *Aw mah dee, aw mah dee, ah want ah live umbah aw mah dee,* is vividly recalled.

The sustained tones with pronounced vibrato stand out. The latter is slow in rate and wide in extent, but its emphasis is in harmony with its setting in deep emotional tones. On *all,* graph 2, it nearly reaches a whole step in extent, but on graph 4, secs. 2, 3, 4, it disappears. This is an example of the uncertainty of the vibrato in Negro singing.

The transition from tone to tone of *I have my trials here below* exemplifies the characteristic Negro attack and release in successive tones. When one note follows another and the second note is above the first, there is generally a quick dropping of pitch on the release of the first, followed by a long, fast rise to the general level of the second. If the second note is below, the release intonation of the first drops below the level of the following note seemingly to make it possible to slide up on the attack.

Before the breath, there is often an apparent falling intonation. Examples: *-ble,* graph 2, *days,* graph 3, *days,* graph 4, sec.

[5] For technical reasons, the first two-thirds of this song have been omitted, but the portion left out did not contain material of a radically different nature from what is included.

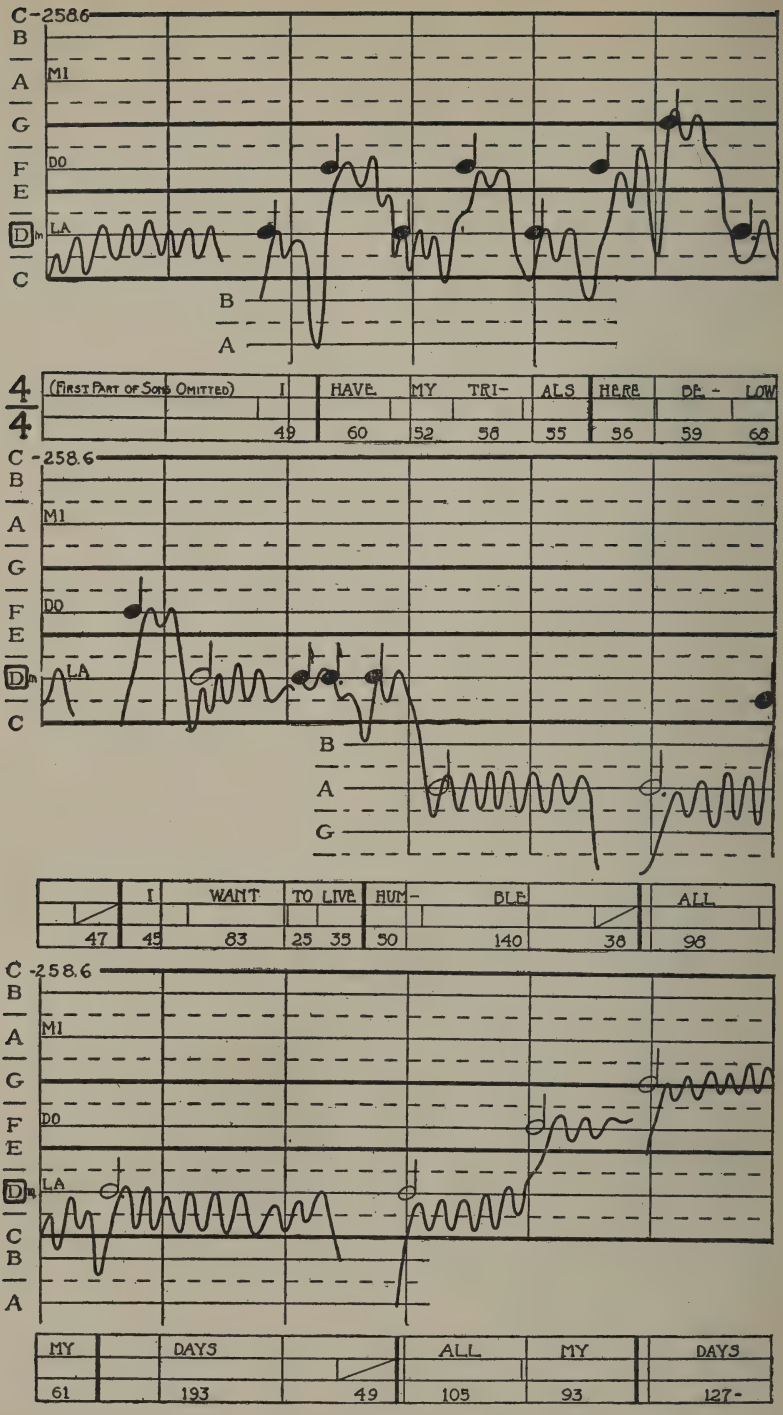


Fig. 17. A. Graphs 1, 2, 3. All My Days.

B. Graphs 4, 5, 6. All My Days.

1, and *days,* graph 6. The circumflexes on graph 5, secs. 2, 3, are both long and extended.

No. 6. Let the Heaven Light Shine. "All My Days" and this selection (Figs. 18, A, and 18, B) were given by the same singer and the two have quite similar characteristics. The vibrato is on an average faster and of a lesser extent than in the preceding song, but again it drops out on graph 1, sec. 3, and graph 4, sec. 3.

The attacks and releases are, for the most part, the same as No. 5, with the falling release intonation being replaced by a rising on *light,* graph 2. *Hea-,* graph 2, is a peaked circumflex. *To,* graph 4, is a falling intonation. Upward glides occur at the close of *shine,* graph 1, and *for,* graph 3. *On,* graph 6, neatly bridges the gap between *shine* and *me,* by slurring from the one level to the next.

No. 7. Go Down, Moses. The singer was "lead-off man" for a college quartet.[6] The lack of the vibrato is noticeable in Figs. 19, A, and 19, B, but the beginning has a fluctuation that is vibrato-like, and another such pattern may be seen at the end of graph 3. For the most part, the graph-curve varies without uniformity, and the technical term applied to such a pattern is "erratic-waver."

The "lead-off man" had other qualifications beside good tone quality which made him valuable as a member of the quartet. Here is the only instance among the cultured group in which the vibrato was not an important singing pattern.

The circumflex-attack of *down, Mo-,* and *way,* graph 1, *down,* graph 2, *tell,* graph 3, and *my,* graph 5, in each case goes above the general level of the note which follows. The circumflexes are small on the average. There are none of the long gliding attacks, but *Mo-* and *way,* graph 1, and *tell,* graph 3, begin much lower than the rest of the tones.

[6] North Carolina State College for Negroes, Durham, N. C.

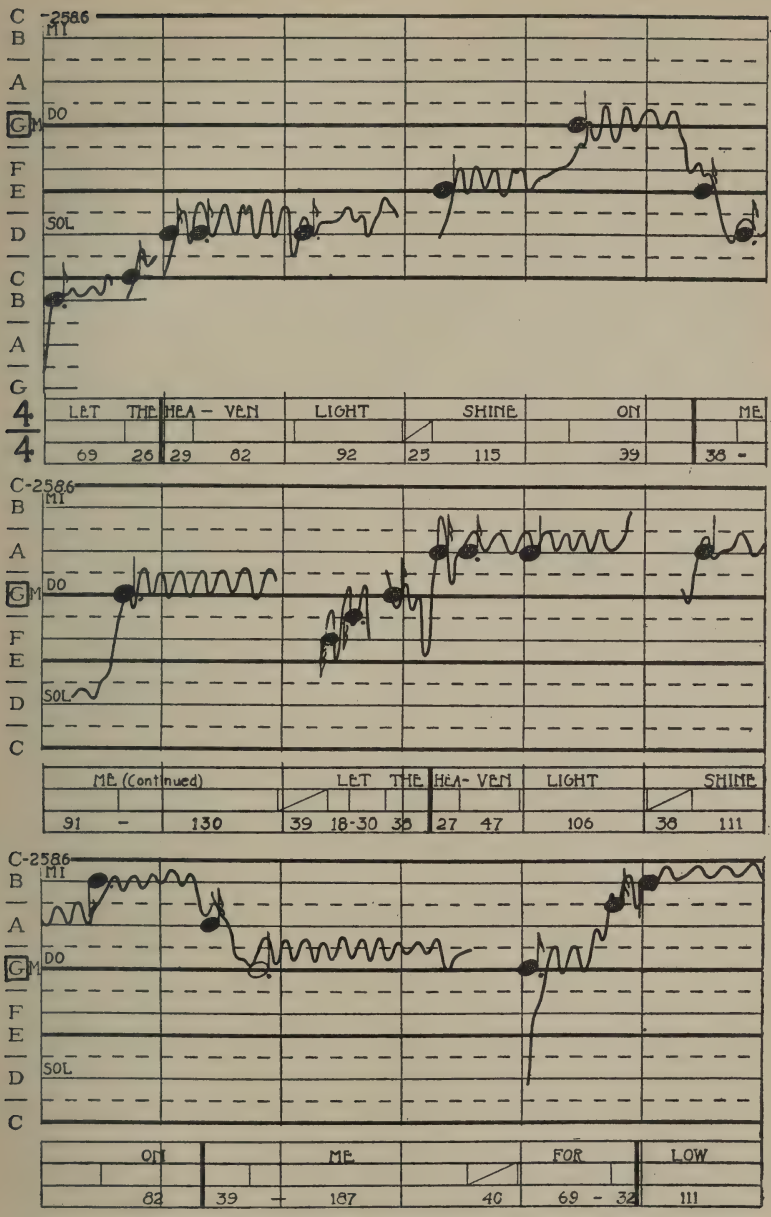
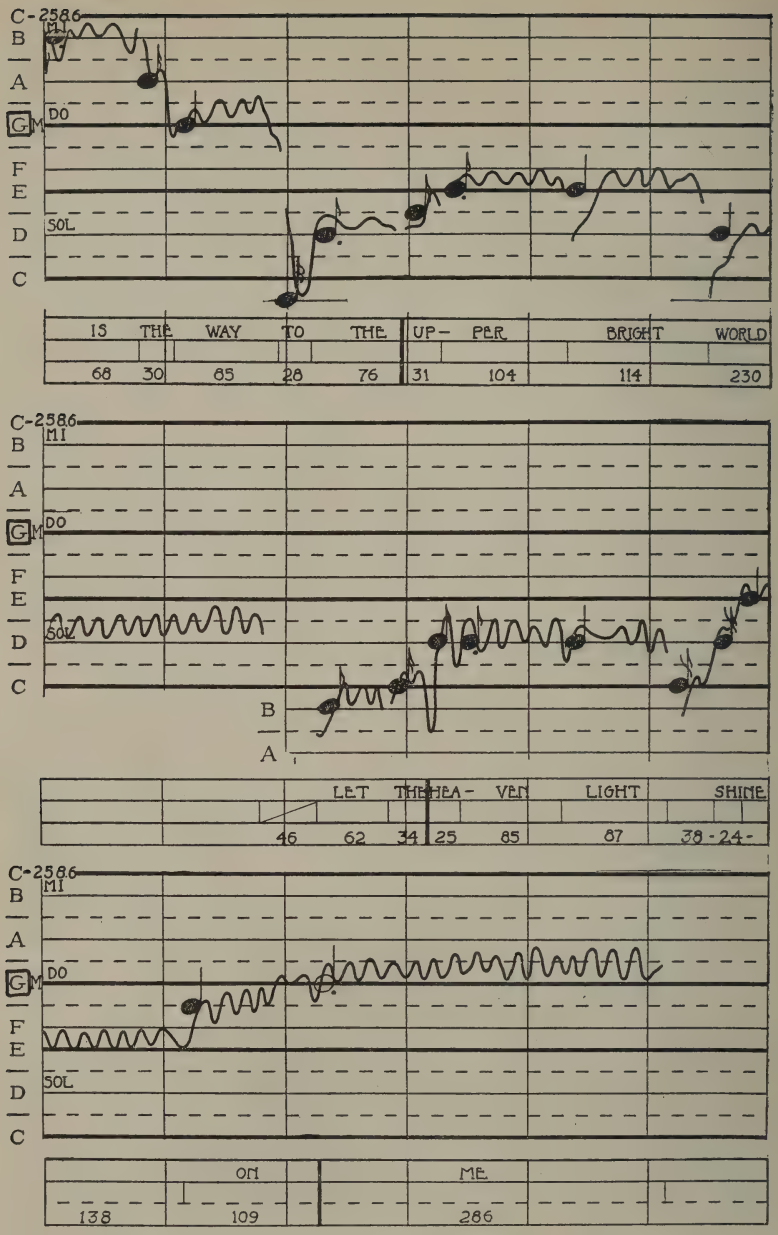


Fig. 18. A. Graphs 1, 2, 3. Let the Heaven Light Shine.



B. Graphs 4, 5, 6. Let the Heaven Light Shine.

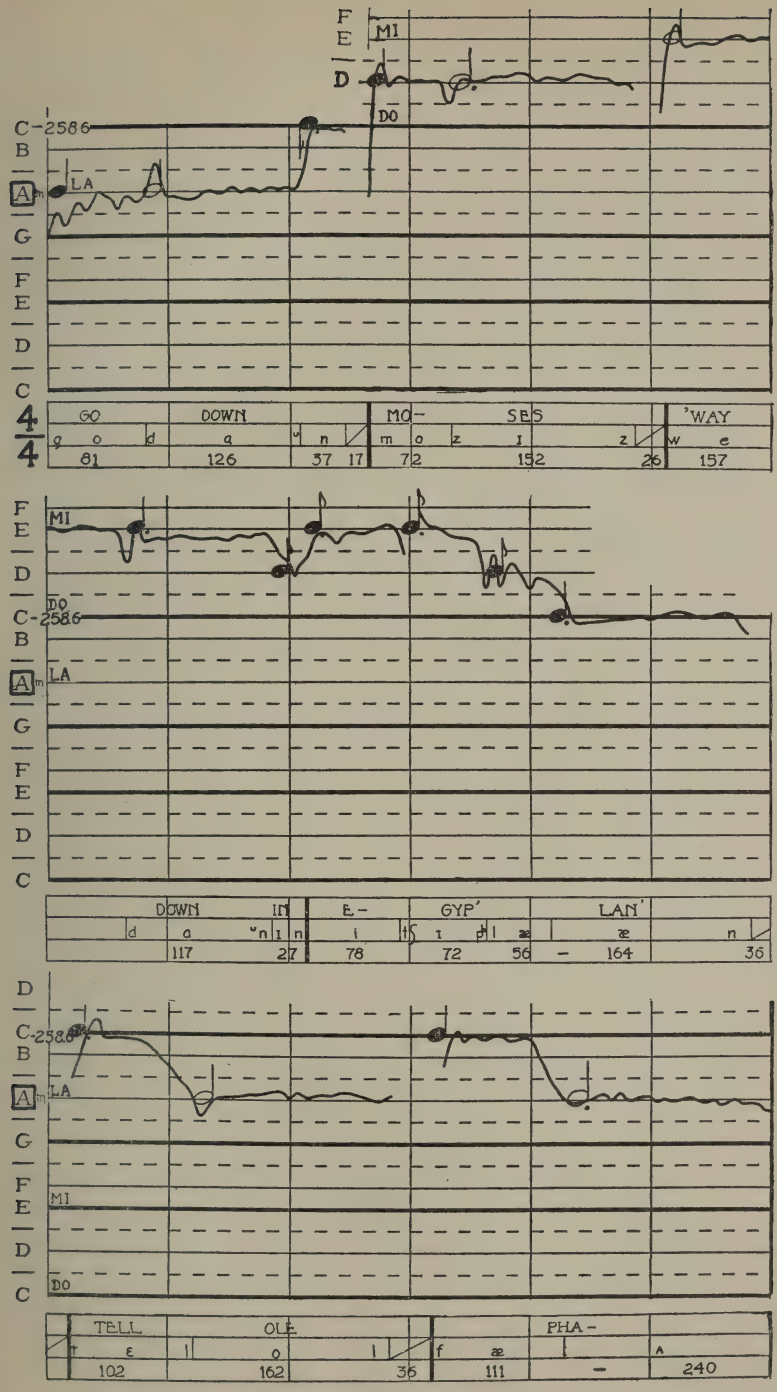
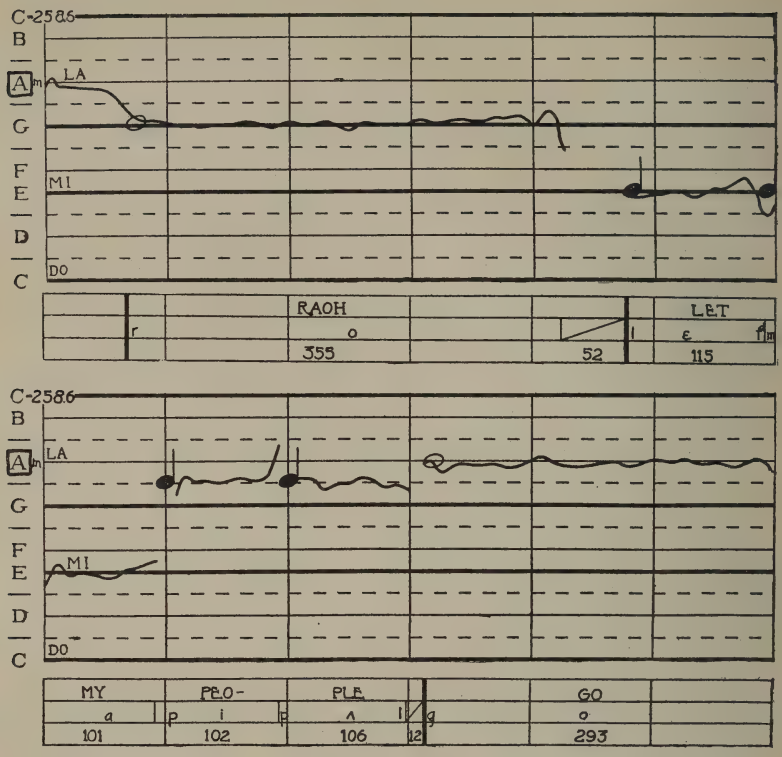


Fig. 19. Graphs 1, 2, 3. Go Down, Moses.



B. Graphs 4, 5. Go Down, Moses.

The releases are for the most part straight, with a slight downward movement at the end of *E-* and *Lan'*, graph 2, *-raoh,* graph 4, and a rising intonation preceding the voiceless consonant [p] in *-ple,* graph 5. There is a downward dip in graph 1, sec. 4, graph 2, sec. 1, and graph 4, sec. 6, to an extent of approximately the average dip in these songs.

No. 8. By and By. Figs. 20, A, and 20, B, are black with tone-symbols, but the vibrato is evident on the graph-curve of the longer tones. It is fairly regular on graph 2, secs. 4, 5, graph 3, sec. 3, and graph 4, secs. 3, 5. The last two tones, graph 5, vary in rate, and somewhat in extent. On some of the tones

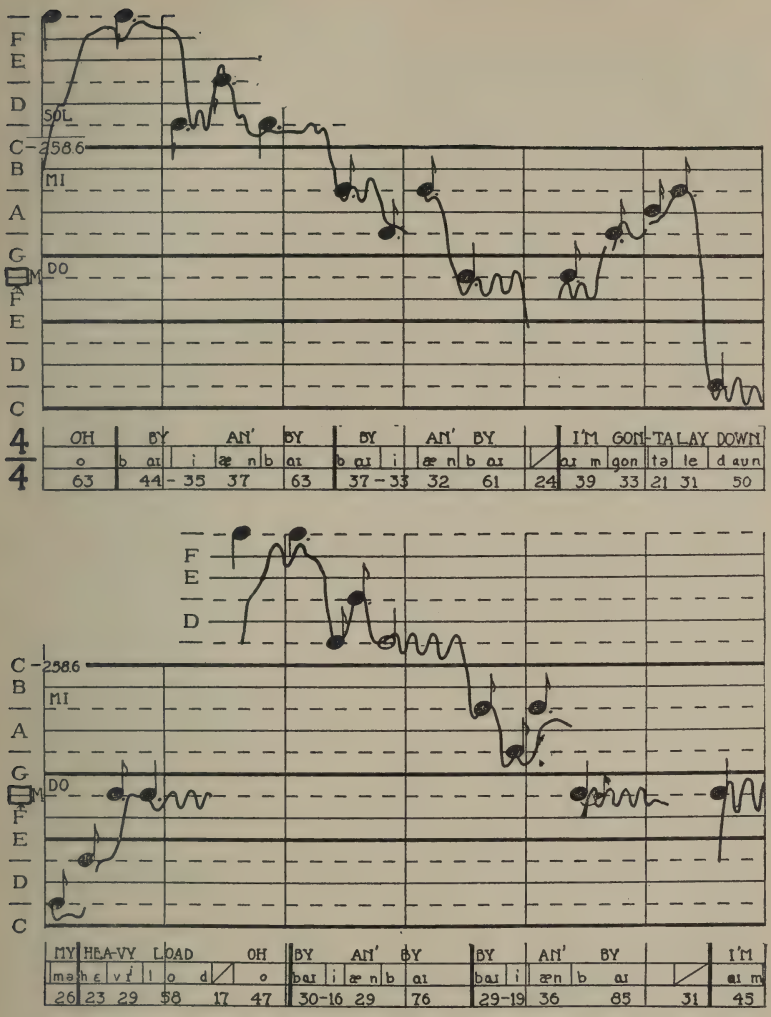
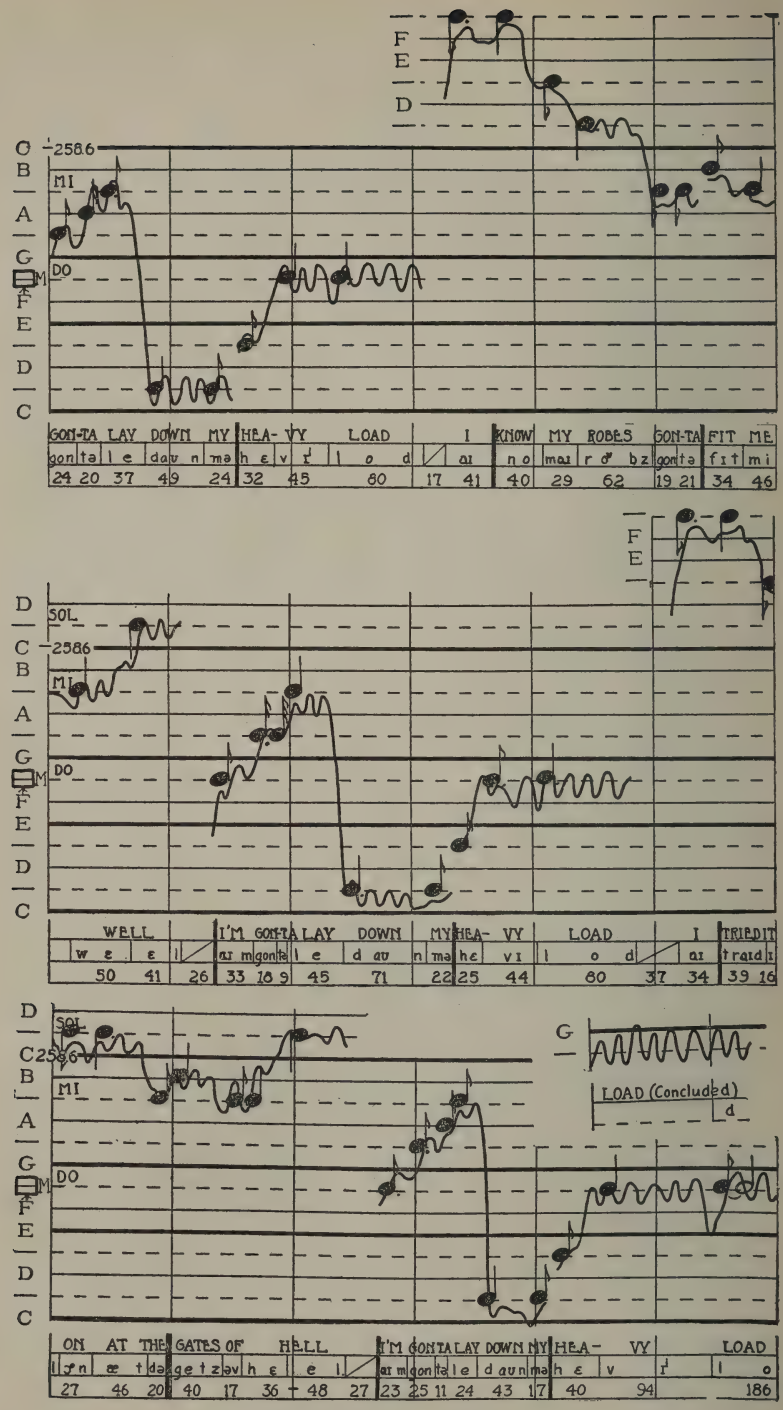


Fig. 20. A. Graphs 1, 2. By and By.



B. Graphs 3, 4, 5. By and By.

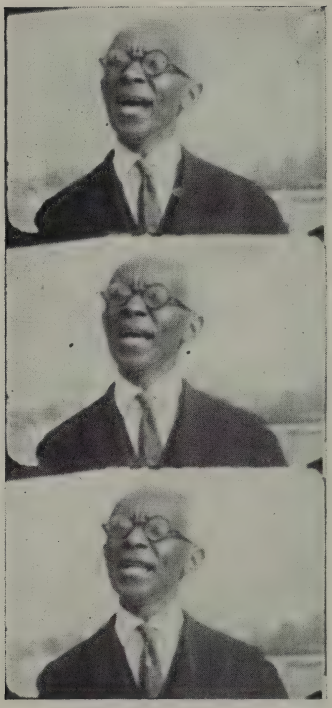


Fig. 21. By and By. A Hampton Institute singer.

of graph 2, sec. 5, and graph 4, sec. 3, it reaches the extreme of rapidity in rate. The widest extent, exceeding a half-step, occurs in the last tone, graph 5. On the highest tones it is always obliterated.

The longest attack opening a breath-group is found at the start. Most of the tones begin with a very short rising intonation. The dip between successive tones on the same general level is at a minimum, less than in "Go Down, Moses." On graph 5, sec. 6, it is more like that found in the workaday religious songs.

The only release, preceding a breath, that leaves the general level of the note is the falling intonation in graph 1, secs. 4, 5. The slurs dividing *hea-vy,* graph 3, or *well,* graph 4, and *hell,* graph 5, are a contrast to most of the tones, which hug a general level. The dotted eighth is frequent, one following another in graph 1, secs. 2, 3, and 5, graph 2, and secs. 3, 4, graph 5. A noticeable flatting occurs in graph 2, secs. 2 and 3.

No. 9. I'm So Glad Trouble Don't Last Always. Ornaments are evident in "I'm So Glad Trouble Don't Last Always" (Figs. 22, A, and 22, B) more than in any other of the spirituals. Glides or slurs are not at all rare, the slur breaking into a circumflex intonation at the end of *so,* graph 1, *so,* graph 2, and *so,* graph 4. Such patterns may be called "circumflex-releases."

There is a difference, however, in the circumflex *so,* graph 2, and the others. In the former, the contralto's voice twisted for the moment in and out of the falsetto, introducing another of the Negro voice-patterns. The "falsetto-twist" also occurs on the release of *I'm,* graph 2, and on the release of *Lawd,* graph 5. The latter concludes with a falling intonation in addition to the falsetto twist. The falling intonation releasing *glad,* graph 3, is three times as extended as that of *Lawd,* graph 6.

The longest attack, following an inspiration, occurs on *I'm,* graph 4. The rising intonation goes directly into a vibrato which maintains a steady level. Generally when a tone is

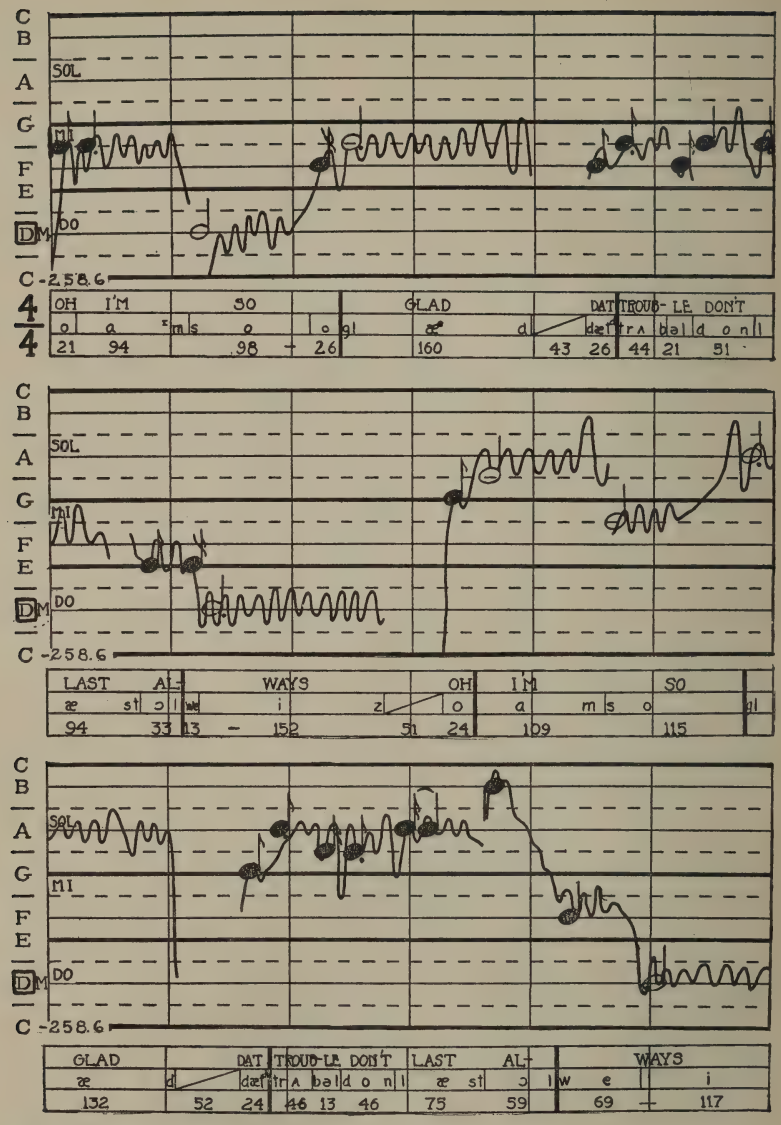
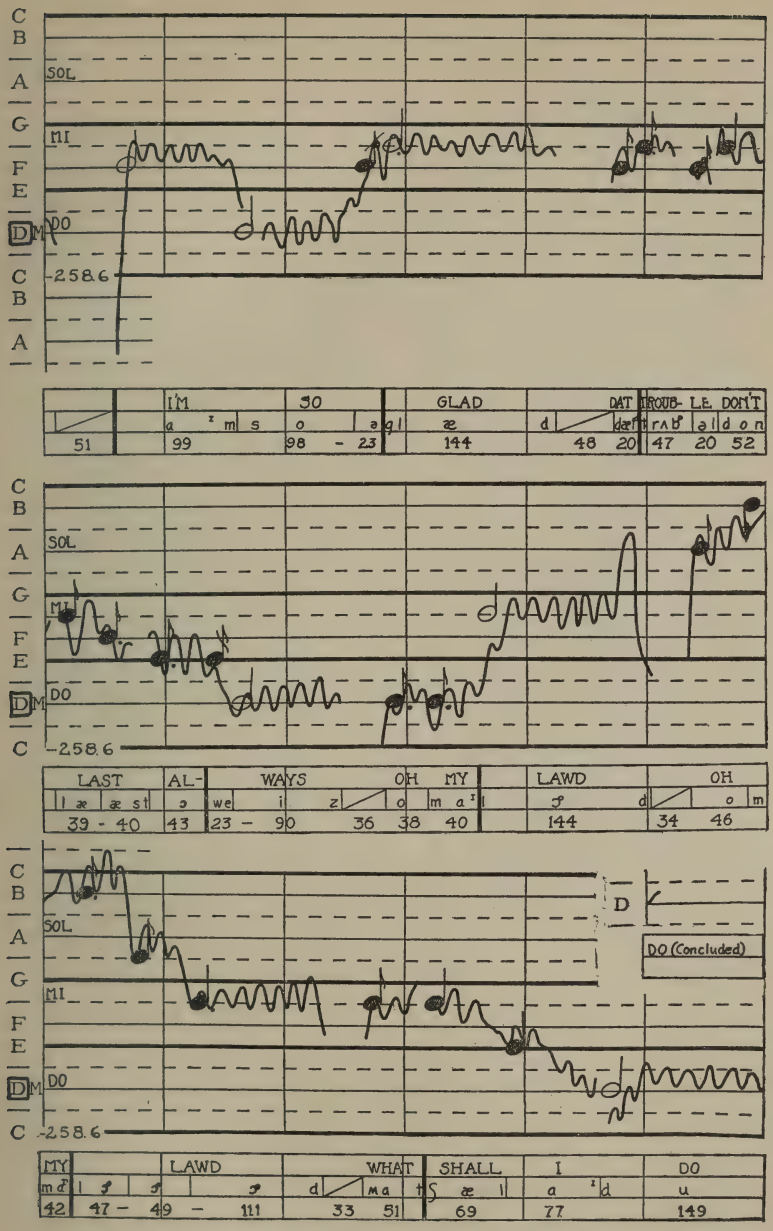


Fig. 22. A. Graphs 1, 2, 3. I'm So Glad Trouble Don't Last Always.



B. Graphs 4, 5, 6. I'm So Glad Trouble Don't Last Always.

attacked after a breath, the rate of change of successive waves becomes less and less.

Do, graph 6, is attacked about a step below its general level, although *I* was almost completely portamento. *Oh,* graph 1, *oh,* graph 2, and *oh,* graph 5, are greater in extent than *dat,* graph 1, *dat,* graph 3, *dat,* graph 4, and *what,* graph 6. In the former cases the new breath-group opens with a vowel. With consonants such as [d], which cannot be prolonged without attaching itself to a vowel, the rising intonation is cut to a minimum extent.

Dat trouble don't last on graph 3 and graphs 4 and 5 is rendered differently, but in each case the successive tones are distinctly sectioned off. On graph 3, the "dip" serves a similar purpose to that of the gaps between the tones on graph 4.

The vibrato is fairly regular at some places, although it exhibits a wide variability in different tones. The rate is fast and the extent average. It appears more consistently at all times than in any of the previous songs, clinging to such glides as *My Lawd,* graph 5, *shall* and *I,* graph 6, or such a "drift"[7] as *al-,* graph 3. On *glad,* graph 1, it has a crescendo effect, increasing in extent but slowing in rate. Toward the end of *I'm,* graph 1, and *glad,* graph 3, it suddenly accelerates.

No. 10. Nobody Knows the Trouble I've Seen. Nearly all tones of this contralto selection (Figs. 24, A, and 24, B) glide at a moderate rate from one to another. Exceptions are found in *nobody,* graphs 1, 2, and 3. Possibly, since *nobody* is syncopated, the shortness of the *no-* and the effort to stress the *bod-* results in the quick transition.

No-, and *troub-,* graph 1, *no-* and *knows,* graph 2, and *no-,* graph 3, are more rising intonation that note. The intonations, however, seem to point to the note location, but when it is reached the tone is soon released.

[7] Gray, "An Experimental Study of the Vibrato in Speech," *Quarterly Journal of Speech Education,* XII, 308.

Fig. 23. I'm So Glad Trouble Don't Last Always. Left, *shall* of *What Shall I Do?* and right, *I'm* at opening of the song.

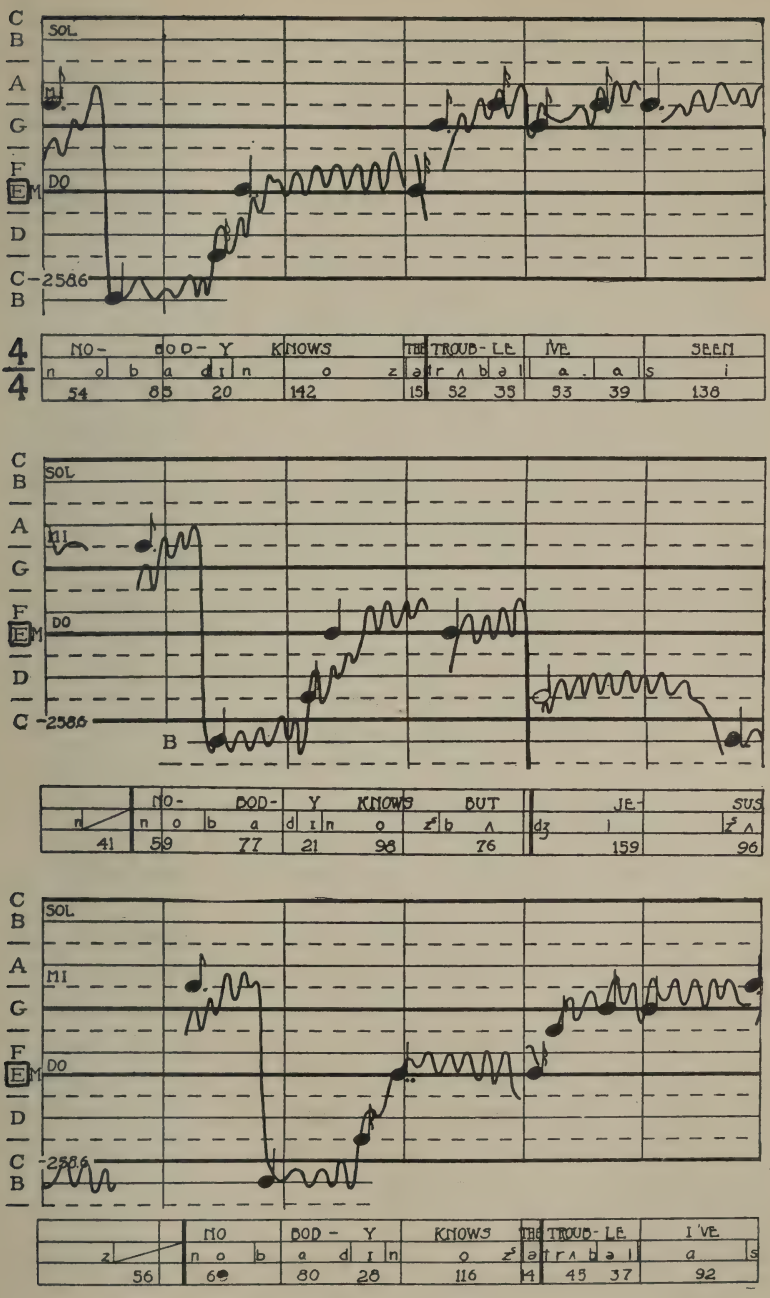
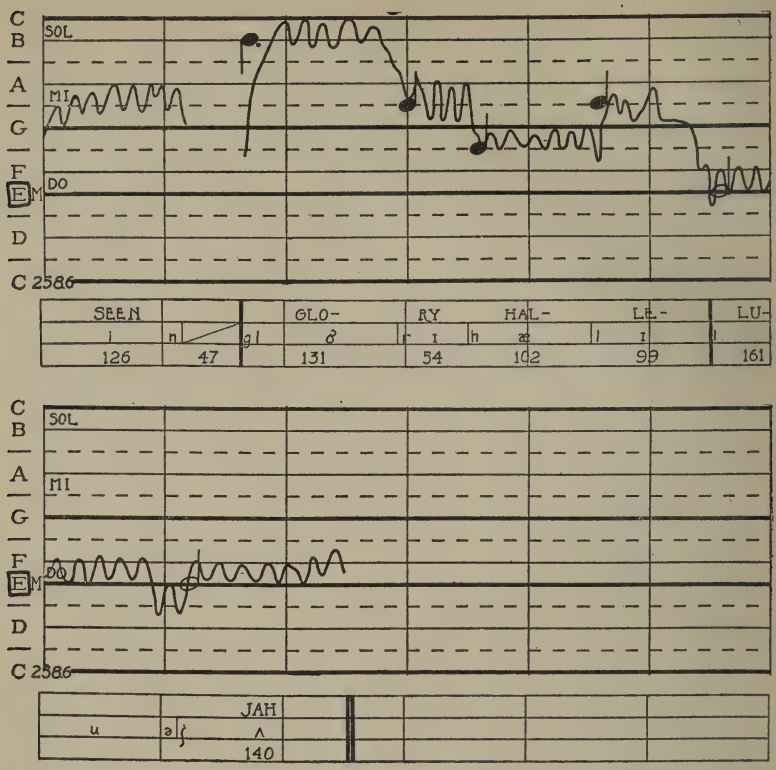


Fig. 24. A. Graphs 1, 2, 3. Nobody Knows the Trouble I've Seen.



B. Graphs 4, 5. Nobody Knows the Trouble I've Seen.

The dip between two tones on the same level is exaggerated on the last two tones, being sufficiently prolonged to carry one oscillation of the vibrato. *The,* graph 1, and *the,* graph 3, are both falling intonations, even though the melody goes upward.

The vibrato is about average in rate and extent, with the exception of *-ry,* graph 4. Then it is both fast and wide. In general it maintains a fairly steady cycle, being irregular on the shorter tones, but present in some form in all but *I've,* graph 1, and *-le-,* graph 4. As in the previous song, the glides carry it over and above their own course.

Fig. 25. *I've* of "Nobody Knows the Trouble I've Seen," at opening of No. 10.

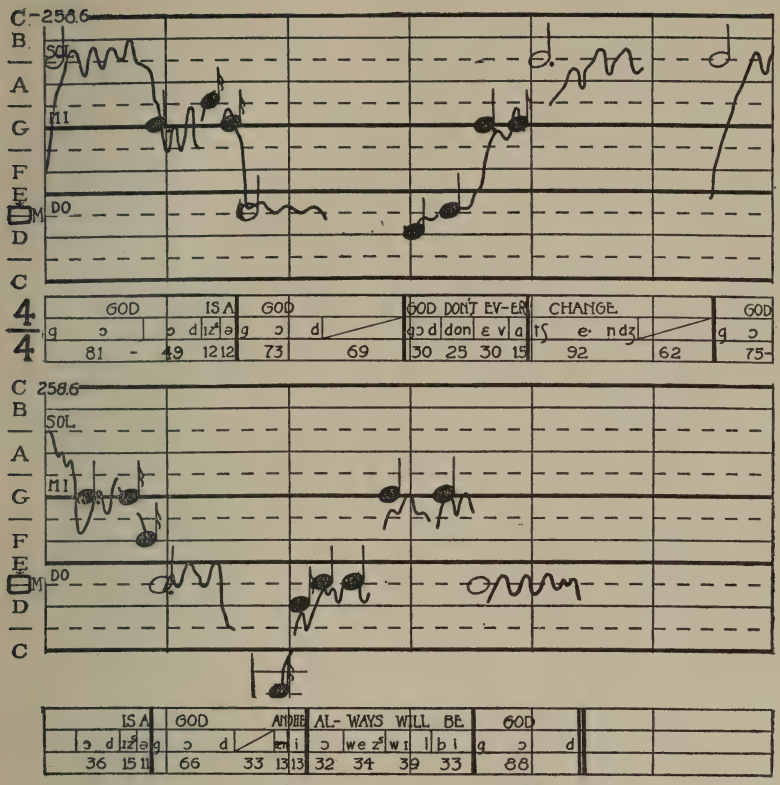


Fig. 26. Graphs 1, 2. God is a God.

No. 11. God is a God. Fig. 26 is an example of one of the less complicated "church songs," as sung by a workman. It would be possible to class this song with the "Workaday Religious Songs," but on the basis of its musical structure, it has a greater resemblance to the spirituals than to the former. The melody shows a simple fall, rise, fall, and rise as it progresses. *God,* graph 1, sec. 1, and *God,* sec. 6, have the characteristic Negro attack following a breath. *God,* graph 2, sec. 2, has the falling intonation release before a breath.

Ev- and *change,* graph 1, are the only tones with any upward leaning effects, all the rest, except *God,* graph 1, sec. 1, occurring quite pointedly on a given level. The tones, *Will be God,* graph 2, are quite a contrast to some of the intonations the same singer puts into his work songs.

Is, graph 1, sec. 2, *is,* and *a,* graph 2, sec. 1, are intonations, the first rising and the latter two falling.

The vibrato may be traced in most tones. The usual Negro extremes are illustrated in the slow rate of graph 1, sec. 5, and the fast rate in the second note of *God,* graph 1, sec. 2; the half-step extent on *change,* graph 1, and the quarter-step extent on graph 1, secs. 2, 3.

No. 12. Little David. The most satisfactory method of recording a number of voices at a time, in order to study harmonious effects, would involve the use of wide photographic paper with a separate sound wave for each voice. The present phonophotographic camera is equipped to take only one voice at a time, but in order to follow the adequate method just suggested it would be necessary only to increase a number of dimensions.

The individual voices of the quartet of this study were recorded one at a time, and a separate analysis made for each voice. The graph-curves were then brought together on one staff. The singers went through their song four times, each member of the group stepping up to the mouthpiece in his turn. The three not being recorded were a short distance away, their singing being sufficiently loud to give the singer his bearings but not strong enough to affect the camera.

The four-on-one graphing method, when the voices are recorded at different times, is not accurate in solving problems of actual harmonies. Were it not for the fact that harmony is quite evident in a general way by the adjusted synchronization of the four graph-curves, each part would have been placed on a separate staff. Relatively, the frequency representations of the

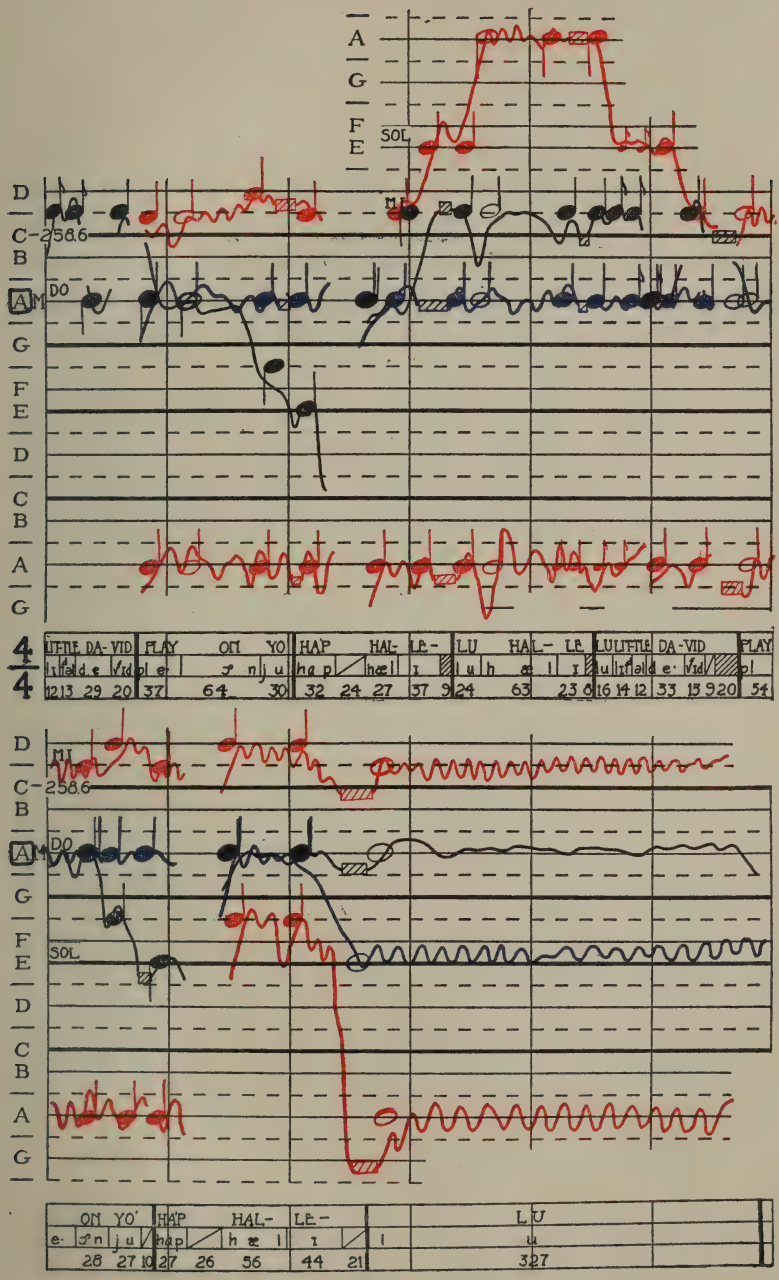


Fig. 27. Graphs 1, 2. Little David.

graph-curves were not tampered with, and changes in duration are signified on the notation by obliquely-ruled rectangles. The actual singing of each part is therefore left intact in placing the four together.

Each of the four graph-curves starts equally with the others at the measure bar. Since the time varied slightly with each repetition of the song, the graph-curves do not end on the same points in a given measure. The duration of the composite measure was arbitrarily set by the longest single measure. Sometimes one singer would determine the measure length, sometimes another.

The slight variations in key from one rendition to the next were taken care of by centering the key-notes of all graph-curves on the established key-note. The original graphs were copied on the four-on-one graph without further frequency alteration. For instance, one of the singers sang the tones on the key-note actually two-tenths of a step below. When copied, all the frequencies were plotted two-tenths of a step above what he actually sang.

Blue, red, and black inks are used to keep the voice lines of each part distinct. The tenor and second bass are shown in the same color. The second tenor's part is printed in black directly with the staff itself. The legend beneath the pattern notation refers to data from the singing of the "lead" only, although the measures are the result of the composite method of handling this particular type of notation.

The most unique effect of "Little David" (Fig. 27) was the harmony leading up to and including the exultant *Hallelu,* in the middle of the song, graph 1. Each of the two basses, an octave apart, sings the word without changing the note, while the "lead" and the tenor take the first *Hallelu* on ascending intervals, maintaining the wide spread of the four voices on the second *Hallelu.*

Fig. 28. Little David. Quartet of the North Carolina State College for Negroes, Durham, N. C. Left to right, first tenor, "lead," first bass, and second bass.

Throughout the "lead's"[8] graph-curve (black), several places are found where there actually is a rise and fall in a pattern similar to that of the vibrato. This interpretative error may be avoided by reference to the phonetic symbols directly below. The graph-curves of a vibrato and of the two syllables *lit-tle* (the *t* sound is voiced, so that there is no break in the graph-curve) graph 1, sec. 1, look very much the same. In the case of the vibrato, the variation, repeatedly assuming the rise and fall form, takes places on the same sound.

With the exception of the last tone, the vibratos of the tenor, first bass, and second bass are given very little chance to get started, so sprightly is the nature of the song. With all its quick time, there was still a certain touch of weirdness in the way the quartet rendered "Little David," probably the effect of the many glides. The "lead" on *-le-*, graph 1, secs. 3, 4, glides for the total duration of the tone. The same is true of the tenor *-le-*, graph 1, secs. 3, 4, and the second bass *hal-*, graph 1, sec. 3.

The second bass introduces a speech-sound circumflex on the second *hal-*, graph 1. The "lead" releases *ha'p*, graph 1, sec. 3, with a falling intonation, and separates *-lu-* and *hal-*, graph 1, sec. 7, by a dip. There are few embellishments in the song, for harmony and rhythm alone are stressed.

No. 13. Swing Low, Sweet Chariot.[9] Referring to Figs. 29, A, 29, B, and 29, C, the "lead" sang the first *Swing low, sweet chariot* alone, and was joined by the others on *Comin' for to carry me home.* While the others held *home* for over ten

[8] Cf. "Go Down, Moses," No. 7, for a solo by the same singer.

[9] Sung by the Hampton Quartet. Three of the individual singers whose songs have preceded were members of the Hampton Quartet. Two were members of the organization when they were awarded a gold medal at the San Francisco-Panama-Pacific International Exposition. Curtis-Burlin (*Negro Folk Songs,* p. 9) says that it was the Hampton Quartet to whom Percy Grainger referred, when he paid the tribute: "To think that, having toured all Europe, I should find the most perfect four-part singing of the world among these American Negroes!"

seconds, the lead came out with another *Swing low, sweet chariot.* Then, with slackened tempo, united they gave a final *comin' for to carry me home.* The last tone was held as long as their breath lasted, but the total durations are not shown on graph 5. The slurred attacks and releases of tone characterizing the singing of this quartet exhibit neatly the Negro feeling his way into harmonious effects which strike his fancy. There are few changes of level without such an indication. The most interesting indication of the way the glides fit into harmonizing will be seen on graph 2. The second tenor dropped from A^b to B^b, and from there collided head on with the second bass who slowly touched intervening notes from E^b to C. The two locked for about two seconds on C, and then the second bass shook loose to locate on low A^b for over eight seconds.

The vibratos of the Hampton quartet are familiar from the preceding songs, but the four grouped together emphasize the individual characteristics. In a sense the vibrato is expressive of the personality of the singer. The slower and more ponderous vibrato of the second bass quite distinguishes his tone from the light and fast vocal pulsation of the first bass. The tenors strike nearer the average vibratos, although the second tenor's rate is characteristically a little faster.

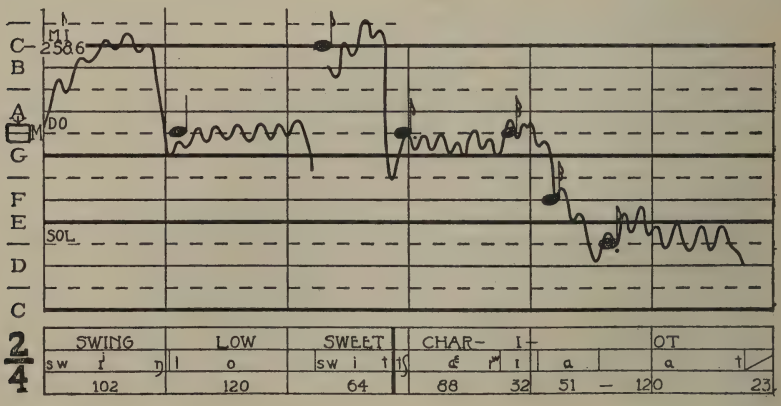
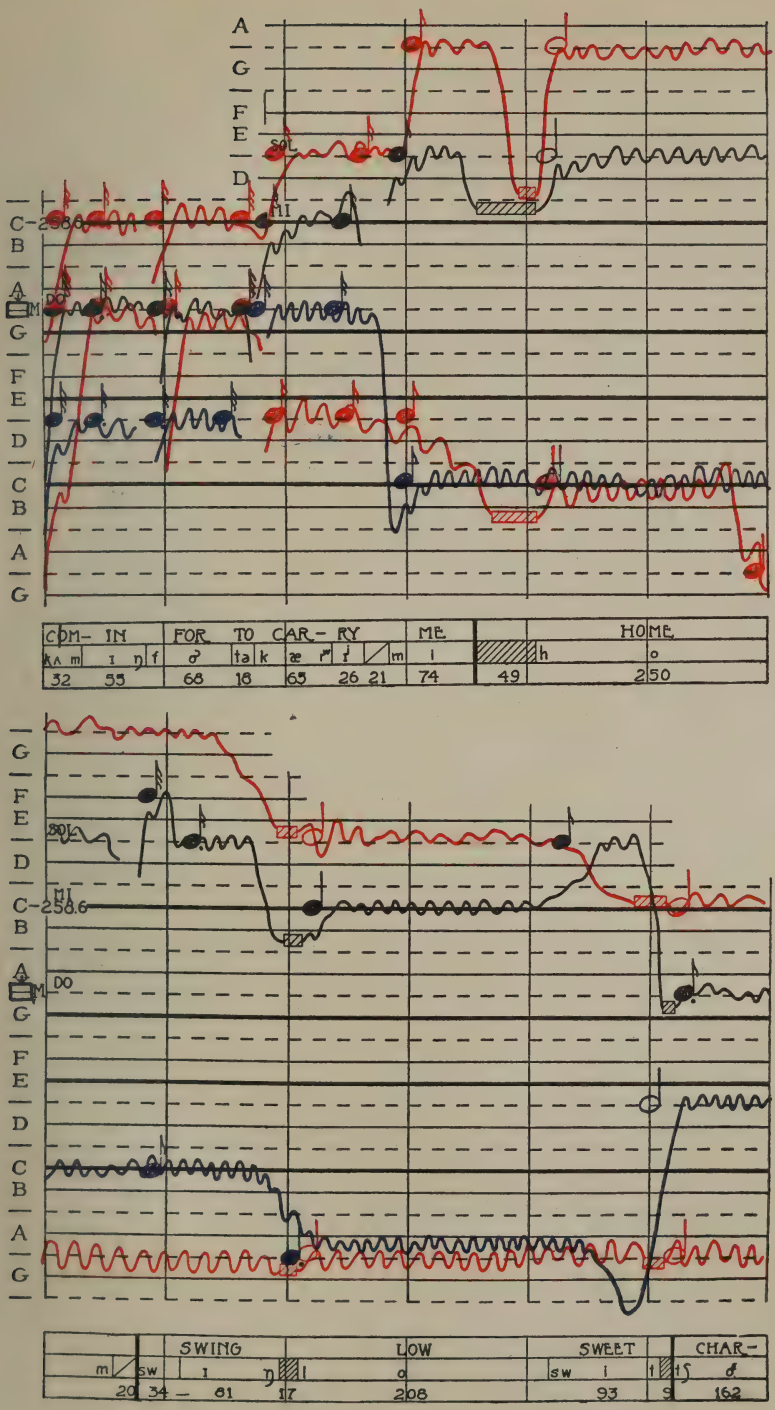
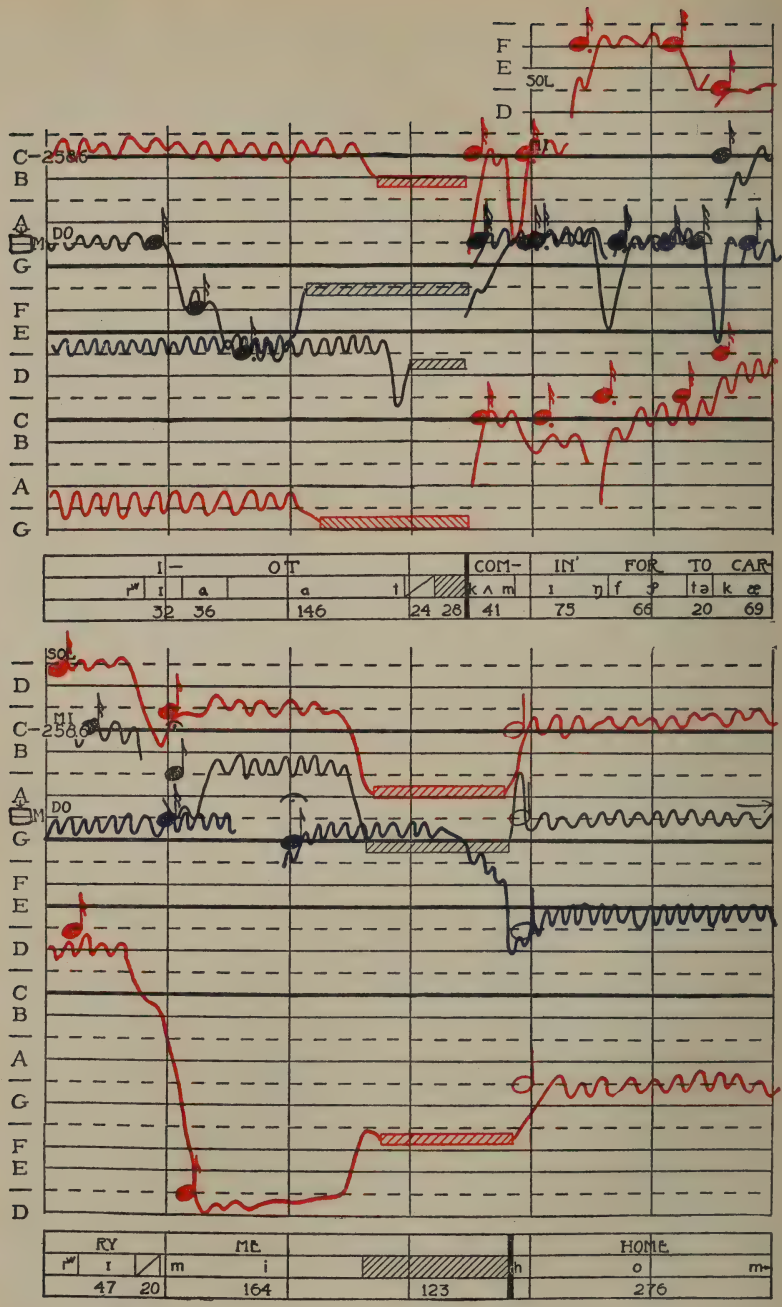


Fig. 29. A. Graph 1. Swing Low, Sweet Chariot.



B. Graphs 2, 3. Swing Low, Sweet Chariot.



C. Graphs 4, 5. Swing Low, Sweet Chariot.

The vibratos are about equal in regularity of extent, rate, and form. At some points there is a sudden slowing down or speeding up. At others there is a tapering off smartly into a very small cycle, and at still others a bursting suddenly into a wide swing.

The data for phonetic transcription were taken from the moving picture made of the second tenor's rendition. He did not pronounce the [r] by our standard. The lips were brought together and the sound was formed more nearly like [w]. Here is an indication of the trouble the colored man encounters with English consonants.

WORK SONGS

Because they are favorites of the same Negro group, the workaday religious songs and the work songs have much in common. The typical work song has a phrase, a short pause, a grunt, and another pause. The pick is in the air during the phrase and strikes the ground on the grunt.[10]

No. 14. You Ketch dis Train. The character of the *huh* is that of a speech sound adapted to a musical setting. In graph 1, secs. 2 and 4, graph 2, secs. 1, 2, and 4, and in graph 3, secs. 1 and 4, the *huh* occurs as a circumflex intonation. If tone-symbols were to be assigned to them, the upper section would be considered as the approximation. There is no steady pitch heard in the circumflex, but at its upper limits the pitch change is the least. *Huh* in graph 1, sec. 2 would then have a tone-symbol of G sharp, graph 1, sec. 5, on F sharp, and so on.

The singing shown on the moving pictures was not sufficiently the same from one time to the next to explain why the *huh's* varied so much in size, from great in graph 1, sec. 2, to small on graph 2, sec. 4. On an average the grunt takes less than a fifth of a second.

"You Ketch dis Train" has many intonations. *You,* graph 1, sec. 1, is mostly a rising intonation, as is *dis.* Farther on in

[10] Odum and Johnson, *The Negro and His Songs,* chap. VIII.

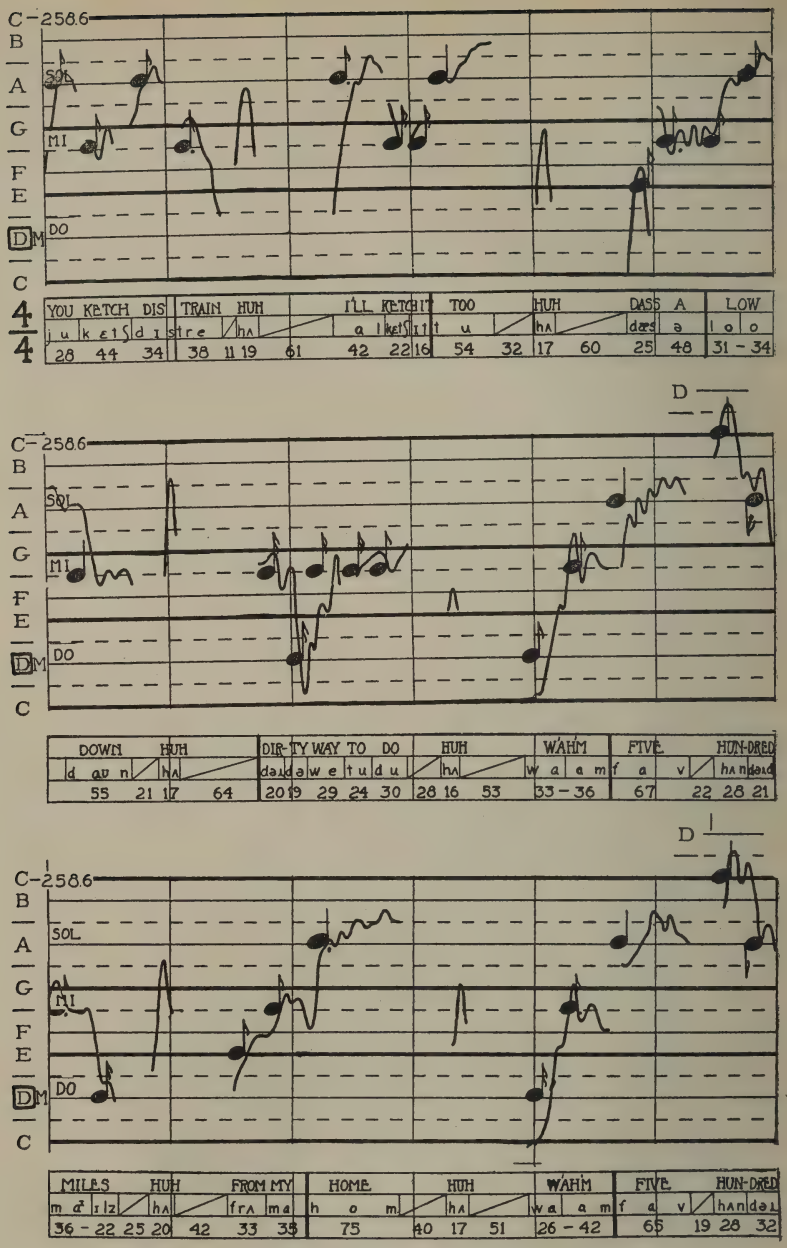
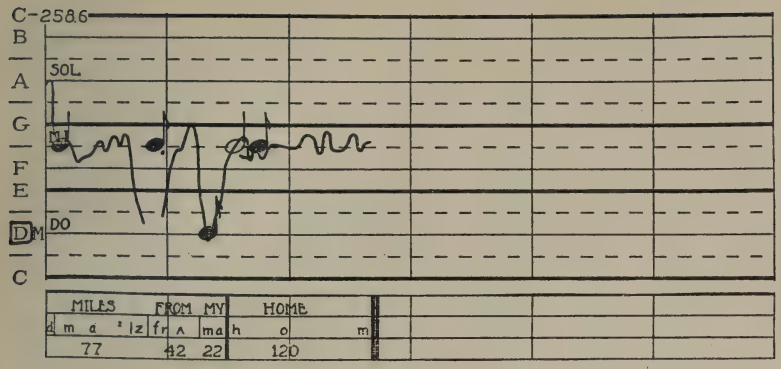


Fig. 31. A. Graphs 1, 2, 3. You Ketch dis Train.

Fig. 30. Work Song. Right, the *Huh!* as the pick strikes the ground.



B. Graph 4. You Ketch dis Train.

the song, *train* is falling, *I'll* a long rise, *ketch* a short fall, *it* a short rise, and *too* a relatively slow rise. *Dass* is a greater circumflex than most of the *huh's*. The first tone of *low* is rising, and *down* is half falling intonation and half note. *Miles,* graph 4, sec. 1, has a falling release, and is followed by a rising attack on *from*.

The singer's tones are not without vibrato. *A,* graph 1, sec. 6, *way,* graph 2, sec. 3, *five,* graph 2, secs. 5, 6, *home,* graph 3, sec. 3, *miles,* graph 4, sec. 1, and *home,* the last tone, all have indications of vibrato, although half of them are intonations with a slow rate of pitch change. The vibrato is irregular, fast, and narrow in extent.

No. 15. John Henry. "John Henry" tells a story, and in singing it the Negro workman produced a greater percentage of intonations than are present in any other of the work songs. A sampling of the predominance of intonations in Figs. 33, A, 33, B, and 33, C, is given on graph 1 alone. *John, Hen-,-ry, a,* the first tone of *steel, ca'd,* and *-mer* are examples of circumflex. *Dri-* and *the* are rising. The second tone of *a, -vin, ham-,* and *all* are falling intonations.

Two illustrations of interpolated-notes are *time,* graph 1, and *down,* graph 6. The interpolated-note in each case is below

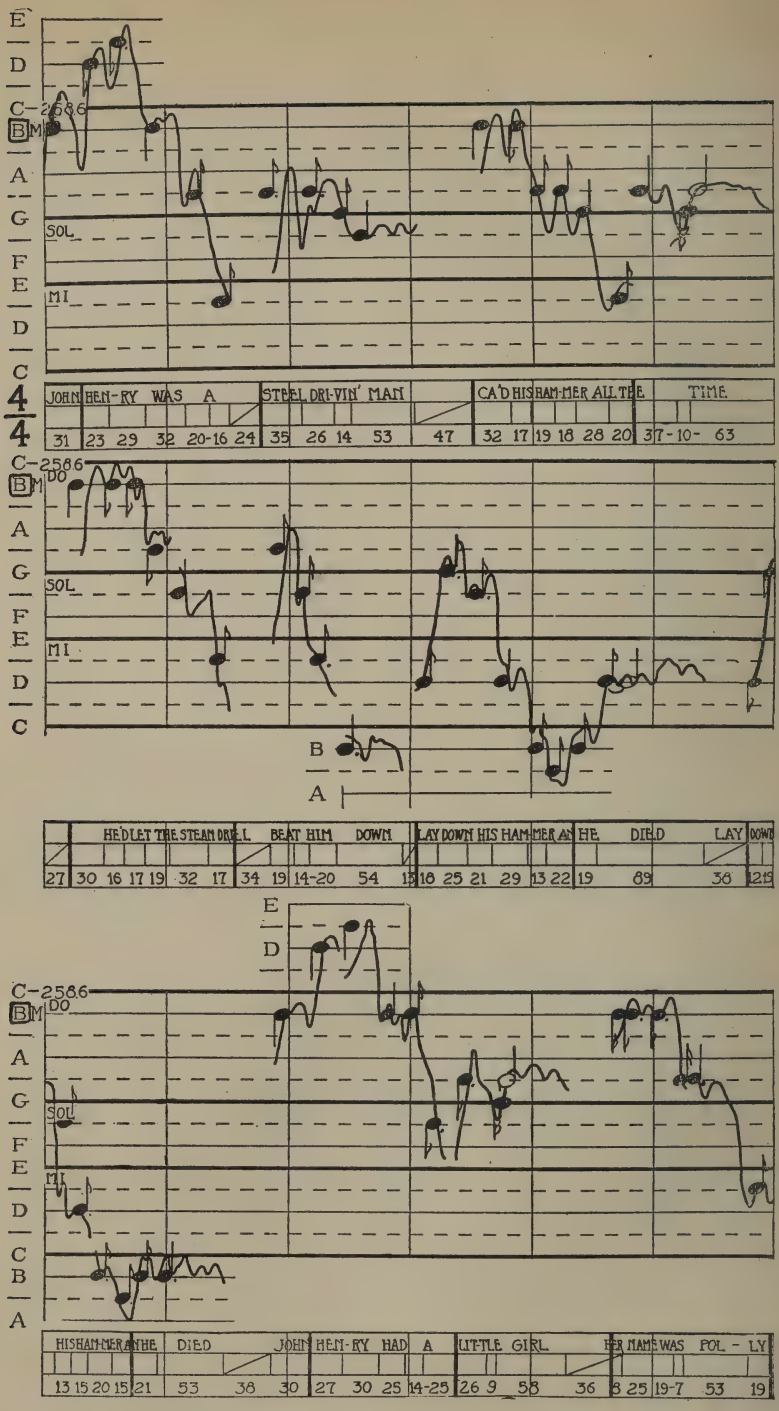
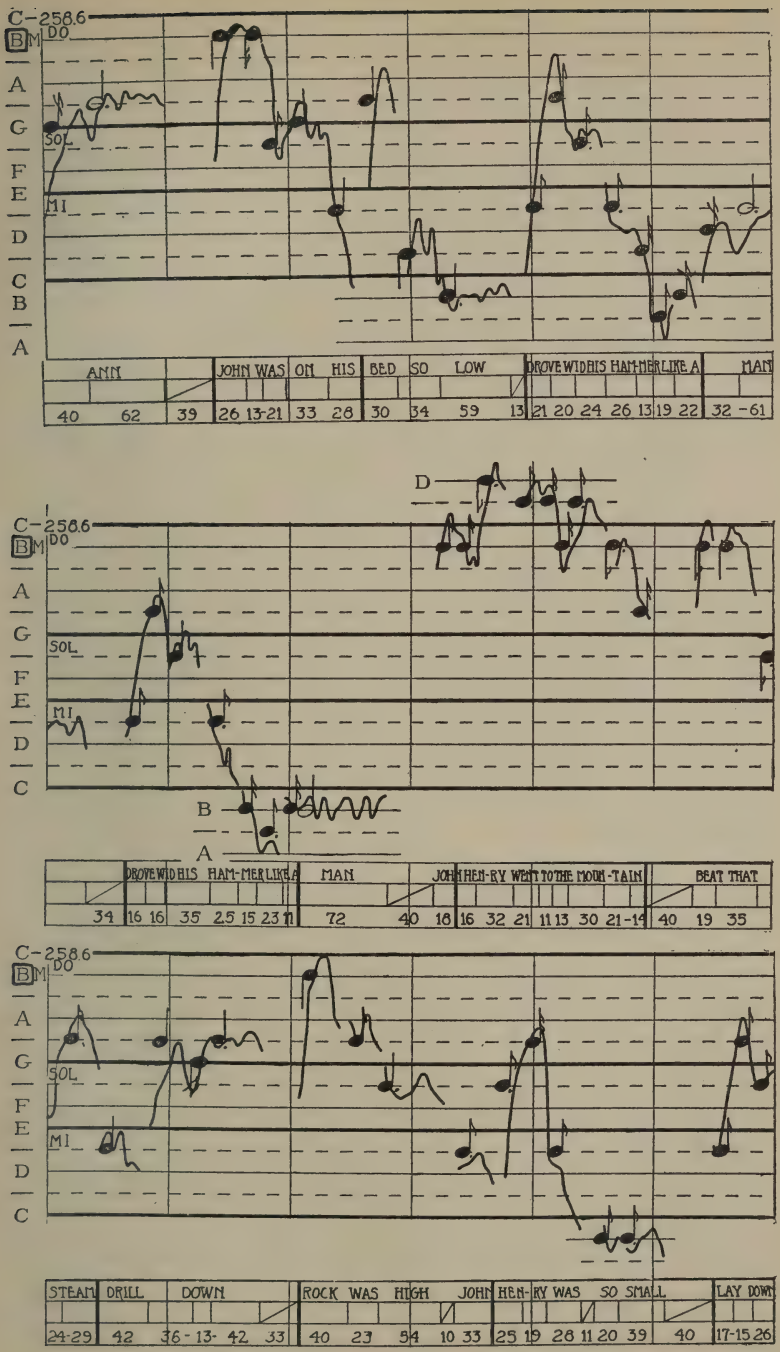
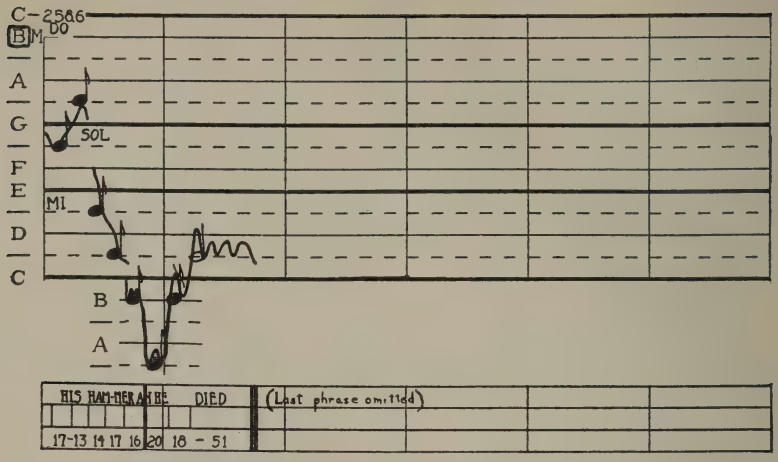


Fig. 33. A. Graphs 1, 2, 3. John Henry.

Fig. 32. John Henry. Close-up of quick sound shifts. Upper the vowel [*ah*] of *time*. Center, and lower, [f] and [o], respectively, of *'Force*.



B. Graphs 4, 5, 6. John Henry.



C. Graph 7. John Henry.

the tones before and after it. It occurs toward the beginning of the syllable *time* but in the middle of the syllable *down.* The latter is attacked with a rising intonation on the [d], but *time* starts on the general level of the note, since [t] is voiceless.

The circumflex-attack is represented twice, once on *Ann,* graph 4, and again on *man,* also graph 4. The upper limits of the circumflex are in each example a half-step below the note that follows.

So fast was the tempo that many of the phonetic elements, and even tones, were slurred over. Any syllable less than .15 sec. was probably not a distinct unit in perception. Under such circumstances the vibrato would be expected to be both rare and irregular, and such is the case.

No. 16. Shoot dat Buffey. The workman was not anxious that white or colored people should hear a sentiment which is not complimentary to either, and so the verse of "Shoot dat Buffey" (Fig. 34) was sung "under his breath." The result was a monotone effect. The graph-curve clings about A, which was approximately in the center of the singer's range, and would be considered as a colorless point on the scale. There

is a little melody breaking out on the chorus where the words are seemingly an unrelated covering-up of the intent of the song.

The vibrato is fast and narrow, although it is given little chance to get under way, except on *Ra-leigh, flo'* and *-'lo,* graph 2, secs. 5, 6. The breaks in the graph-curve on the chorus, without extended attacks or releases of tones, indicate a sharp division of tones by long consonants.

The entire graph-curve is compacted together, with little emphasis on intonations at either the beginnings or ends of tones. The repression felt by the singer not only makes itself known by a tight melody, but by a restriction of the freedom

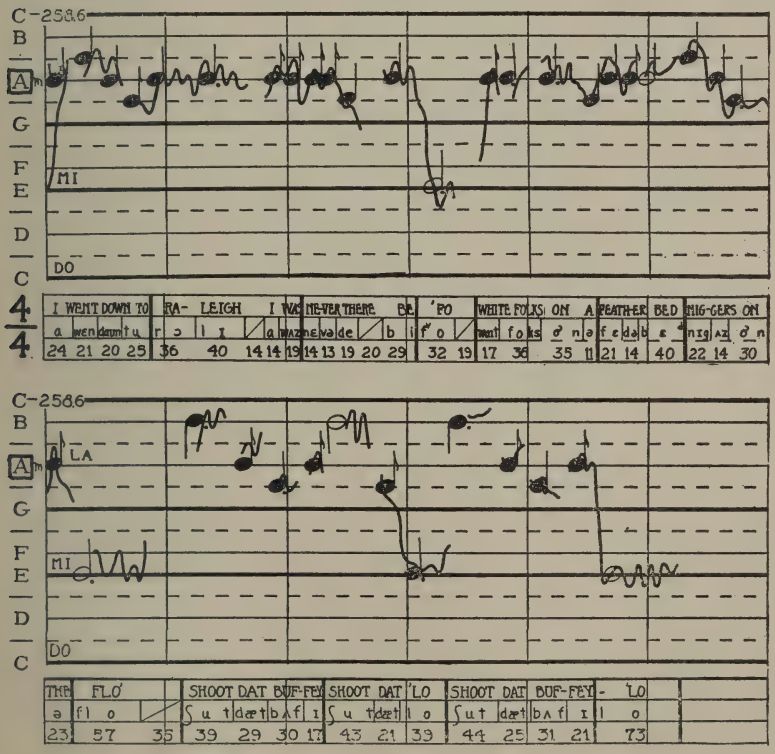


Fig. 34. Graphs 1, 2. Shoot dat Buffey.

which the Negro usually enjoys in soaring in and out of his tones.

No. 17. I Got a Muly (First Version). The notes of Figs. 36, A, and 36, B, contain both a crude vibrato and an erratic waver. *Ride,* graph 1, has three cycles that are rather smooth, and likewise *wan-,* graph 2, but the other vibratos are irregular. There are no traceable cycles on the notes of *ride 'im an-y,* graph 2, secs. 4, 5, or graph 4, sec. 4.

The usual wide variability of the Negro vibrato is exhibited on the slow rate on *I,* graph 2, sec. 6, and *long,* graph 4.

The interpolated-tone on *time,* graph 2, sec. 2, is a minor third above the two notes surrounding it. So is *time* of secs. 5, 6, same graph. In the former the interpolated-tone is about in the center of the syllable, but in the latter it occurs toward the end. The third example on graph 3, sec. 5, is still different in time relationship.

Some queer tricks take place on *I,* graph 3, sec. 6, and on *day* and *long* of graph 4. On *I* the first tone is an extended circumflex, ending below the level of the second tone, which is another circumflex. The dip occurs between *all* and *day,* graph 4, *day* itself being a great circumflex, giving way to another dip leading into *long. Long* has an inverted-circumflex release the same distance below that reached by the dip.

No. 18. I Got a Muly (Second Version). Reference to Figs. 37, A, and 37, B, on graph 1, secs. 3, 4, shows that the pitch jump becomes successively wider on *mu-ly, on a,* and *mount'n. I'm,* graph 1, sec. 4, has a falling release intonation. *I,* graph 1, is a rising intonation for the most part. The vibrato rides along on *mu-,* graph 2, sec. 1, as the tone gradually drops in pitch. *Mu-* and *-ly* in graph 2, sec. 2, are offset a half-step upward, but this momentary change was not recognized in placing the tone-symbols. The previous-note interval is still a minor third.

Fig. 35. I Got a Muly (First Version). The [*ah*] sound at the beginning.

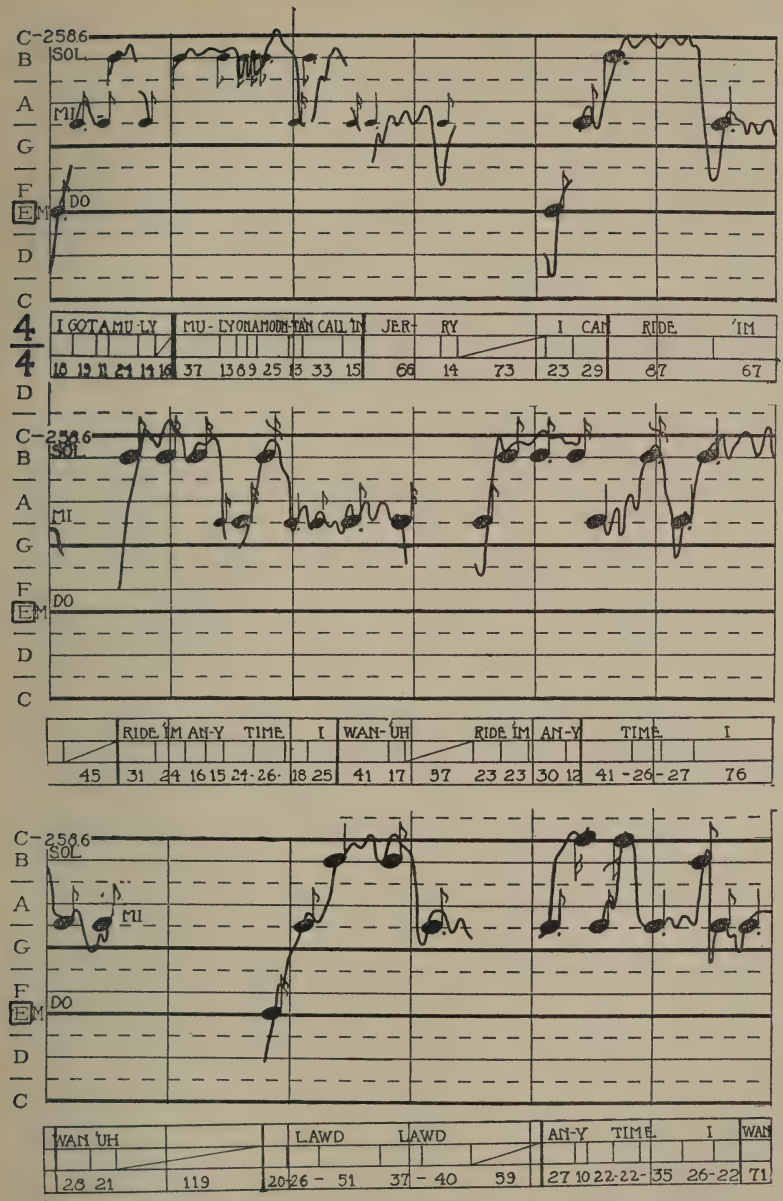
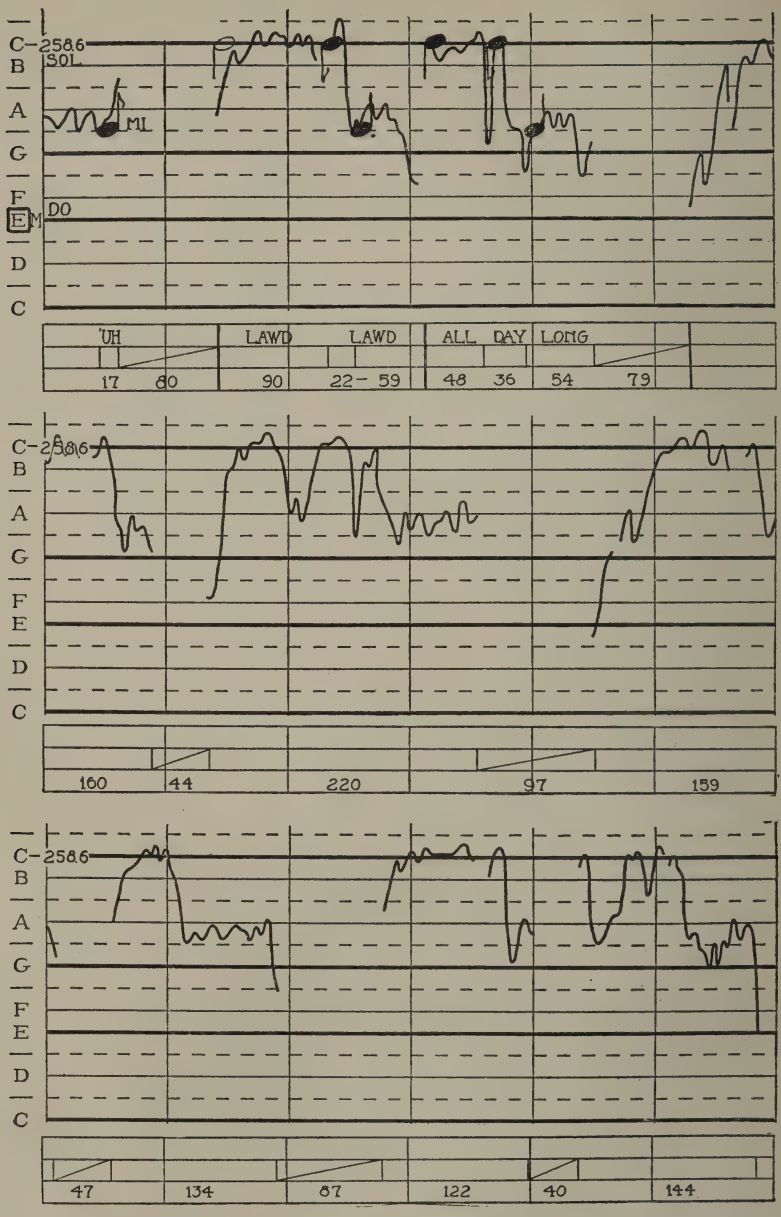


Fig. 36. A. Graphs 1, 2, 3. I Got a Muly. (First Version).



B. Graphs 4, 5, 6. I Got a Muly (First Version).

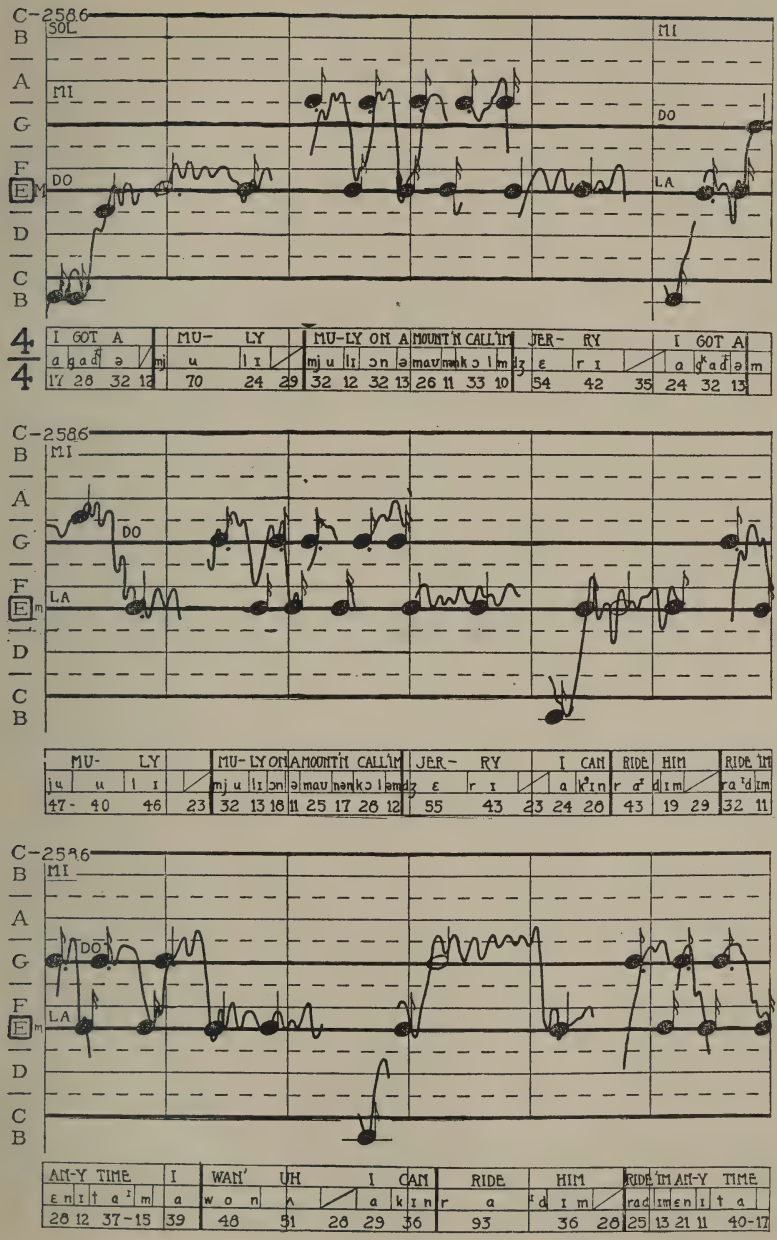
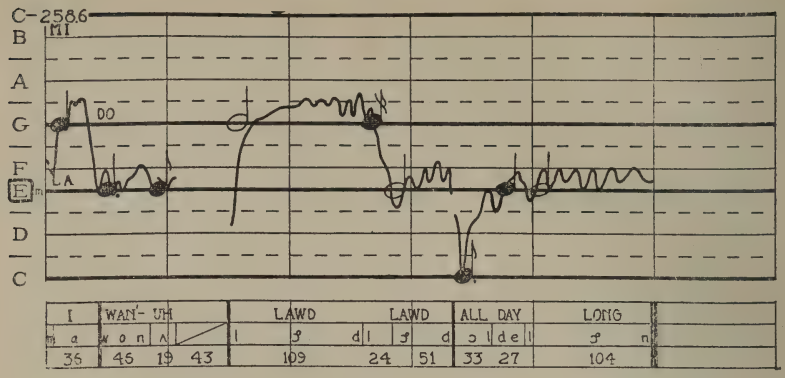


Fig. 37. A. Graphs 1, 2, 3. I Got a Muly (Second Version).



B. Graph 4. I Got a Muly (Second Version).

In the first version the syllable *time* was sung with an interpolated-note. Here that syllable is a slur, but the intervals remain the same. The *-uh,* graph 4, secs. 1, 2, though short, is an inverted circumflex intonation. The attack of *Lawd,* graph 4, is quite a typical Negro attack. The last tone of *Lawd* does not hold a steady pitch. *Day,* sec. 4, is a circumflex.

The singer gave some instances of "clipping" tones off short before a breath. On *-ly,* graph 1, *him,* graph 2, and *-uh,* graph 4, the final tone of a breath group is short. On *-ry,* graph 1, *-ly* and *-ry,* graph 2, *-uh* and *him,* graph 3, the tones are relatively longer.

No. 19. I Got a Muly (*Third Version*). The third version of "I got a muly" (Fig. 38) was sung under protest of the workman shown in Fig. 39. Anxious to get three variations of the same song, we pressed him to the task, and in the end he half-heartedly complied. The frown seen in the moving pictures and the queer sequence of notes and intonations in the song are expressive of the irritation he felt.

The range of his song is distorted from the standard set by the other two. For example, on graph 1, sec. 3, he jumps slipshod into falsetto, and the same occurred on graph 2, secs. 1, 2. In the latter instance, he did not seem at all sure where he

was going to end. In fact, he did carelessly change key on *I want to* at the end of the song. There is the long irritated falling intonation on *-ly,* graph 1, sec. 2; the steady climb in pitch on

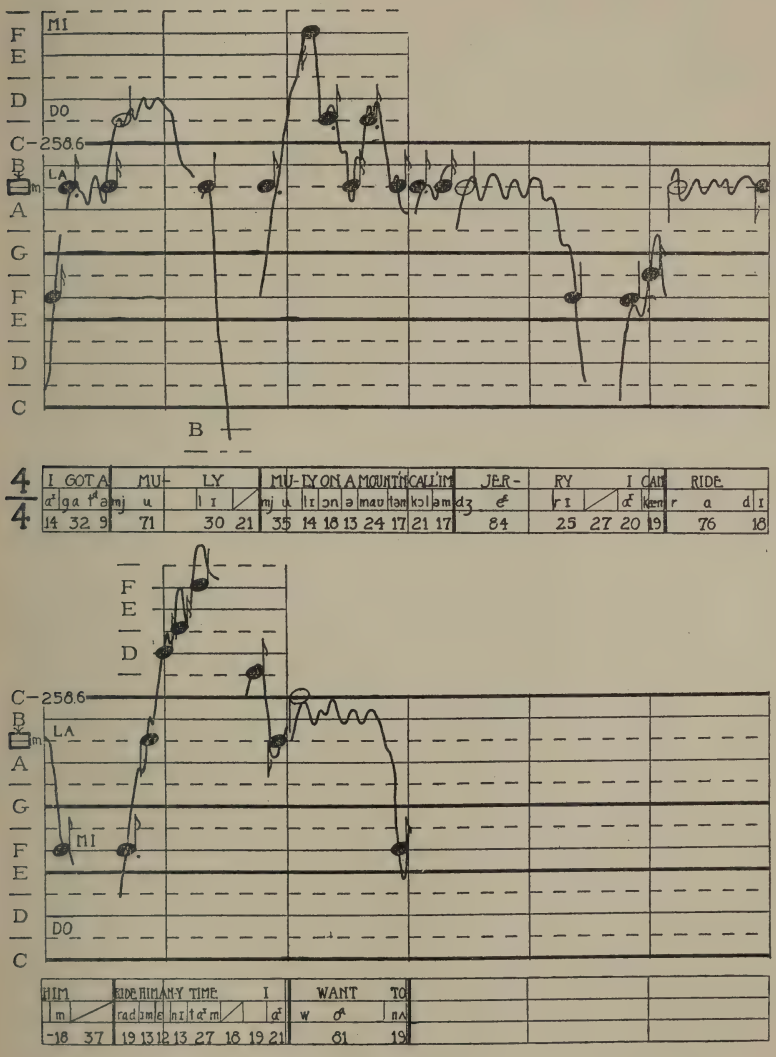


Fig. 38. Graphs 1, 2. I Got a Muly (Third Version).

mu-, secs. 2, 3, for an octave; the snappy falling intonation on *-ry,* sec. 5; together with the clipping effect before his short breathing periods, except in graph 2, sec. 2.

Intonations predominate. *I,* graph 1, sec. 1, is rising. *Got* and *a,* same sec., are both circumflex. *Mu-,* secs. 1, 2, ends with a prominent falling intonation. *Can,* graph 1, secs. 5, 6, is a circumflex. (*An-*)*y* and *time,* graph 2, sec. 2, are circumflex, and in the same section the two tones of *I* are successively circumflex and inverted circumflex. *To,* the last tone, is also inverted circumflex.

A slow vibrato is evident on *Jer-* and *ride,* graph 1, and *want,* graph 2, sec. 3. *Mu-,* graph 1, sec. 1, shows a faster rate.

BLUES

There are two apparently opposing kinds of musical expression brought together in many of the blues, which make them a distinct type of song. The dragging tempo, the mournful glides, and falsetto-twists give the satisfaction of expressing the "blue" mood of the singer. On the other hand, the pronounced and enlivening rhythm, with the "Scotch snap" and syncopations, gives the song an encouraging aspect. The effect is both relieving and cheering. A setting of weirdness of intonations over against lively primitive rhythms pervades Negro singing, and generally in a blues this combinational aspect has been exaggerated.

No. 20. My Gal Ain't Actin' Right.[11] The blues singer photographed on this song (Figs. 40, A-E) and the next, was a college student at Durham, N. C. (See Fig. 42). "My Gal Ain't Actin' Right" is well stocked with embellishments, all of which have been defined in comments on the songs preceding, but some are here found oftener or in a greater degree.

A falsetto-twist is inserted on graph 1, sec. 2. Other such twists are found on graph 2, sec. 1, graph 6, sec. 1, graph 7,

[11] The song was adapted from *Any Woman's Blues,* sung by Bessie Smith, Columbia Record 13001-D.

Fig. 39. Third Version of "I Got a Muly" by a reluctant workman. The [o] sound in *wohn-uh* (want to).

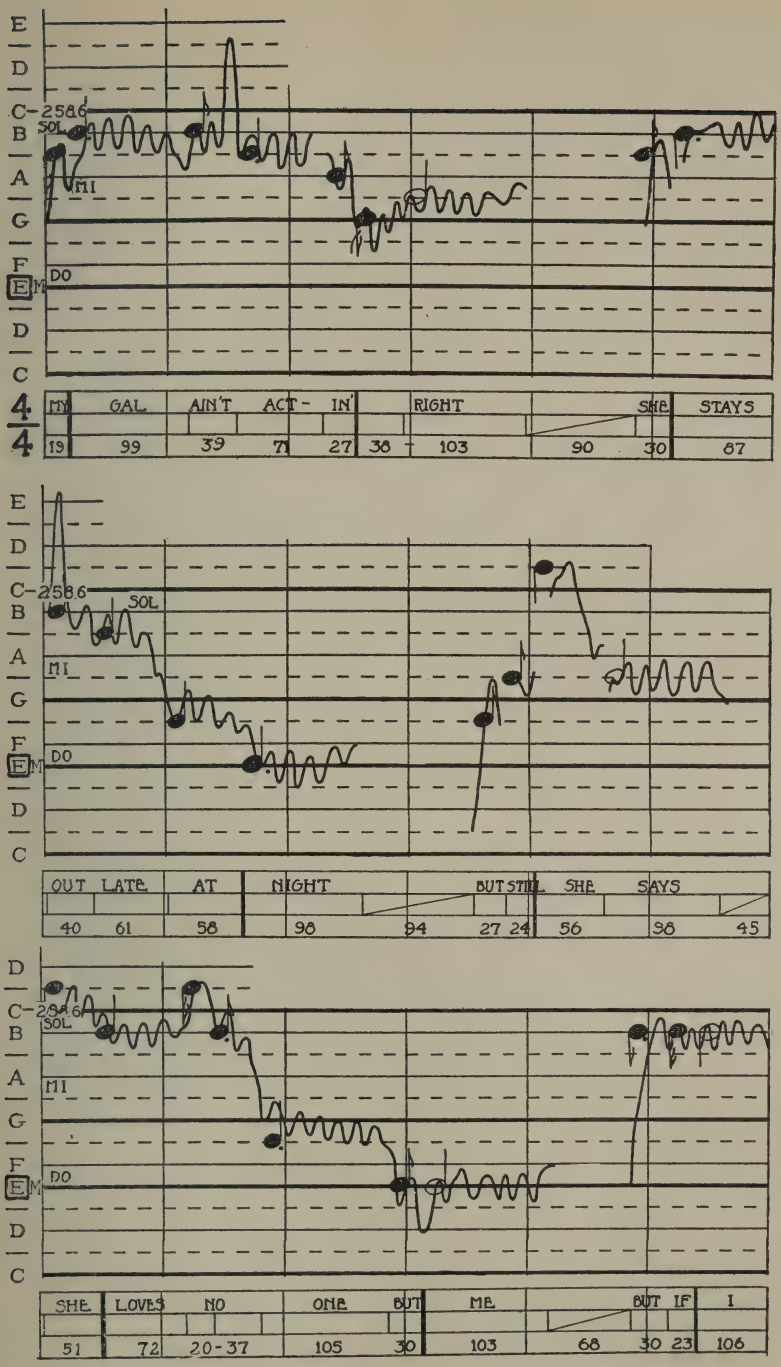
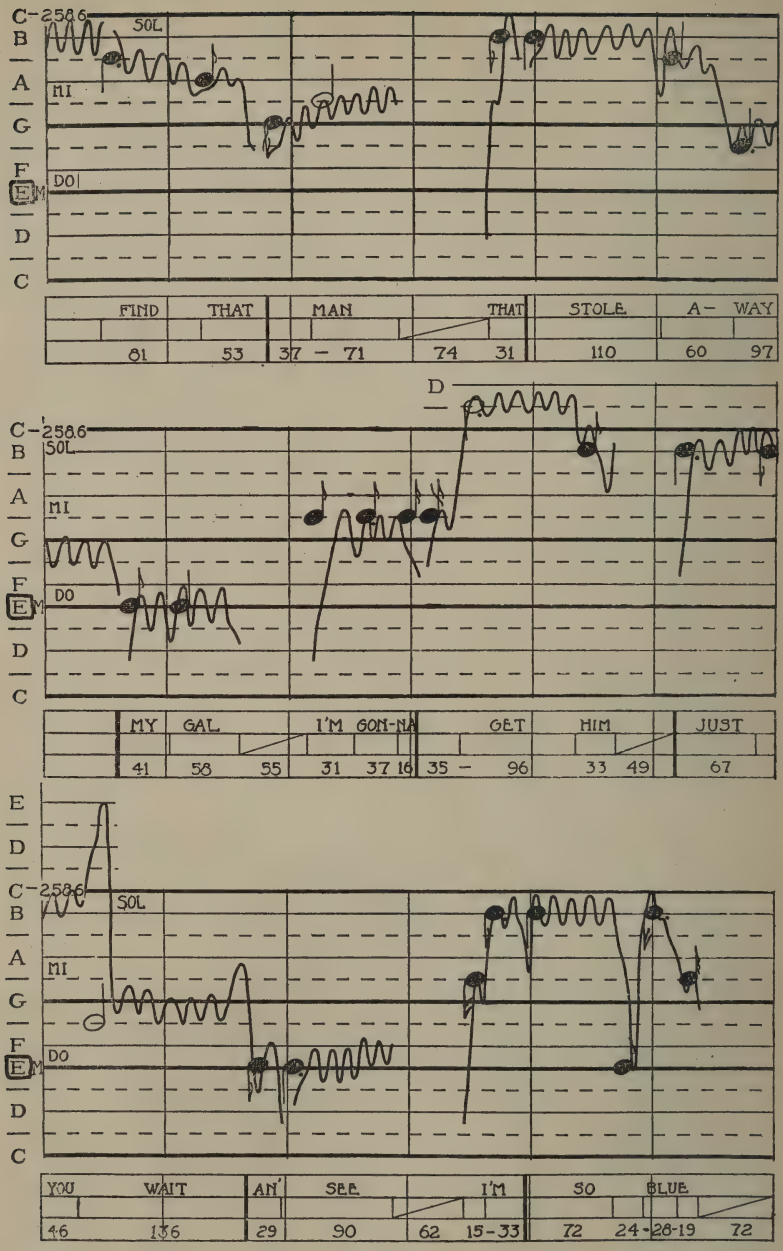
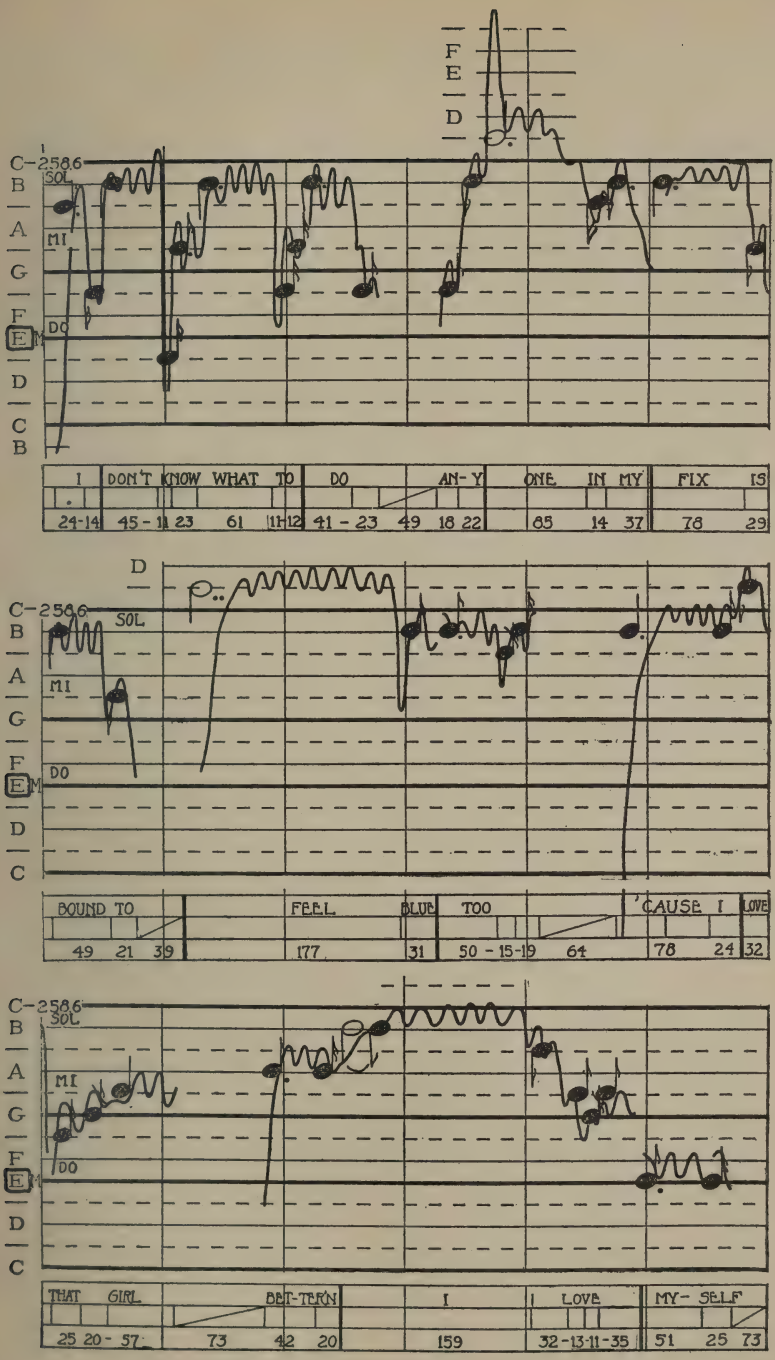


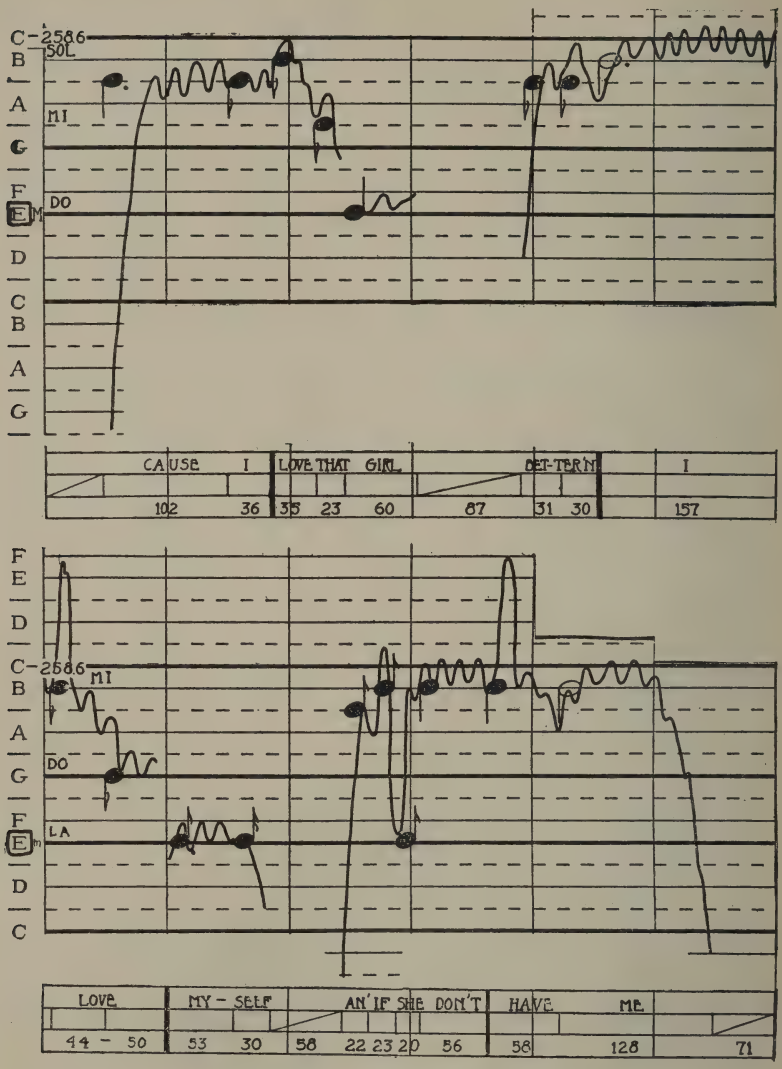
Fig. 40. A. Graphs 1, 2, 3. My Gal Ain't Actin' Right.



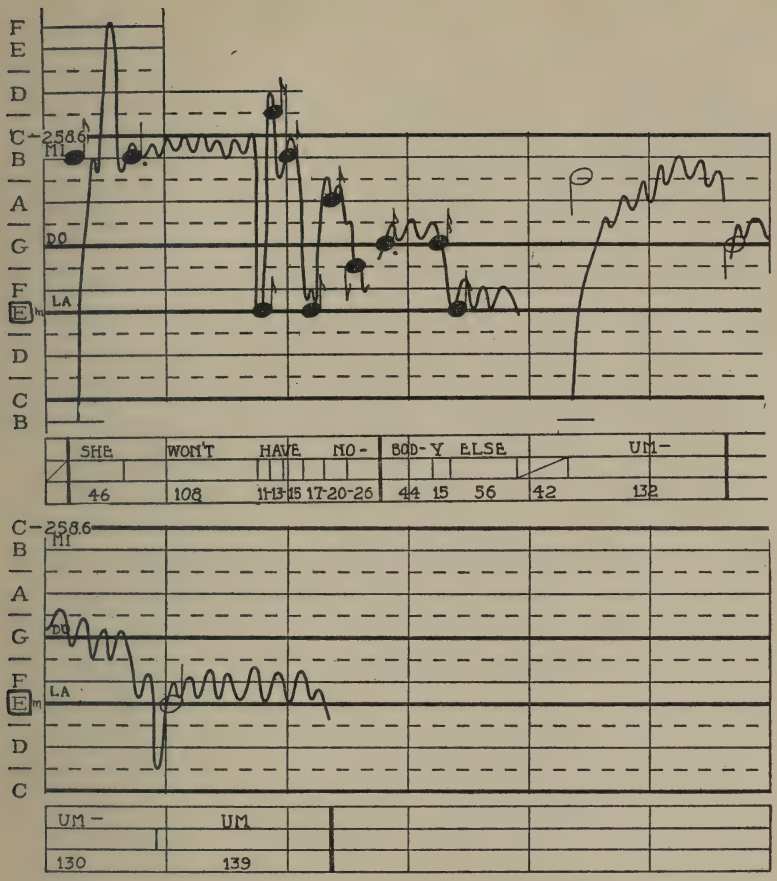
B. Graphs 4, 5, 6. My Gal Ain't Actin' Right.



C. Graphs 7, 8, 9. My Gal Ain't Actin' Right.



D. Graphs 10, 11. My Gal Ain't Actin' Right.



E. Graphs 12, 13. My Gal Ain't Actin' Right.

sec. 4, graph 11, secs. 1 and 4, and graph 12, sec. 1. Five out of the seven falsetto-twists take place during the attack, and two on the release. *Out,* graph 2, *wait,* graph 6, *one,* graph 7, *love,* and *have,* graph 11, constitute the former, and *ain't,* graph 1, and *she,* graph 12, the latter. *Wait,* graph 6, starts the twist on the level of the previous-note and glides down to the level of its own syllable after its penetration into falsetto. The falsetto-twist is neutral in the melodic arrangement. The

peaks vary from the vicinity of D sharp up to G, centering about E and F. Like the grunt in the work song, the twist can sometimes be fitted into the melody, but just as often it cannot. The peak of the twist is rarely blunt, denoting that there is little time spent in forming a note in the falsetto.

The slow gliding attacks, and the leaning effects of many tones, are exemplified by *right,* graph 1, *at,* graph 2, *she* and *one,* graph 3, *find, man,* and *a,* graph 4, *just,* graph 5, *wait* and *see,* graph 6, *one,* graph 7, *girl* and *I,* graph 9, *I,* graph 10, *love* and *me,* graph 11, and the moan at the end, graphs 12, 13. Out of these, *right,* graph 1, *man,* graph 4, and *girl,* graph 9, have an intonation-tone starting from the key-note minor third, resolving into the major third. Half way through, the long sweeping attacks begin. Even *feel* and *'cause,* graph 8, with voiceless consonants, do not make any difference. The extreme is reached on *'cause,* graph 10. The phrase, *An' if she don't have me,* graph 11, begins with a rising attack of an octave, and ends with falling intonation likewise an octave in extent.

Most of the releases before breath-groups are straight, with perhaps a slight upward intonation. The exceptions are *gal,* graph 5, falling intonation; *him,* graph 5, inverted circumflex; *to,* graph 8, falling; and, of course, *me,* graph 11. This does not include those tones like *-self,* graph 9, and *-self,* graph 11, where the entire tone is a falling intonation.

Other examples where there is no note are *my,* and *she,* graph 1, both circumflex; *but,* graph 2, combination rising and circumflex; *still,* graph 2, inverted circumflex; *she,* graph 2, combination circumflex and falling; *no* (first tone) graph 3, circumflex; and *but,* graph 3, secs. 3, 4, circumflex. The combination of rising and circumflex is frequent, because so many of the phrases start with a short tone.

The first instance of "clipping" at the end of a phrase occurs on *him,* graph 5. After that, *blue,* graph 6, *do,* graph 7, *to,* graph 8, *self,* graph 9, and *-self,* graph 11, clip off the phrase unexpectedly.

Fig. 41. A "good fellow" song leader singing "West Indies Blues."

Only one instance of a circumflex-release is found—on *wait,* graph 6. A falsetto-twist—and one happens to begin *wait*—may be one kind of circumflex-attack or release. The subdivision is based on the difference of the patterns as they are heard.

Two interpolated-notes are *too,* graph 8, and that falling between the second and third tones of *love,* graph 9. The interpolated-note is a half-step below in each case, but on *too* it is inserted almost at the end of the syllable, whereas on *love* it occurs toward the beginning of the temporal pattern, 13-11-35.

No. 21. West Indies Blues. "West Indies Blues" (Figs. 42, A, 42, B, 42, C) lacks the mournfulness of the previous song. The words of the song do not go into detail regarding the singer's thoughts about his blues, but tell rather what he is going to do to overcome them. As a result, there are few of the slow glides, and none of the falsetto-twists.

The singer had one of the most uniform vibratos of the group. It still has the wide variability of Negro vibratos from tone to tone, both in extent and rate, but the places are few in either song where it passes out entirely.

The attacks at the beginning of breath-groups are not like those found in other songs, but they are still pronounced. *Gwine,* graph 2, has the greatest extent.

There is a greater percentage of tones composed of a rising intonation than in most of the preceding selections: *Grip, trunk,* and *ship,* graph 1; *her, so,* and *good,* graph 2; *when,* graph 3; *hang,* and *liv-,* graph 4; *-ter,* graph 5; and *got,* graph 7, sec. 2, and *got,* sec. 5.

Evidently this intonation did not cut down on the usual quota of circumflexes, for *a, -bye, good,* and *New* (the latter three combined with a rising intonation) and *York* (combined with a falling) all are placed on graph 2. *Take,* graph 2, is the most evident falling intonation, taking up a whole tone, while *-ja-,* graph 3, is an inverted circumflex.

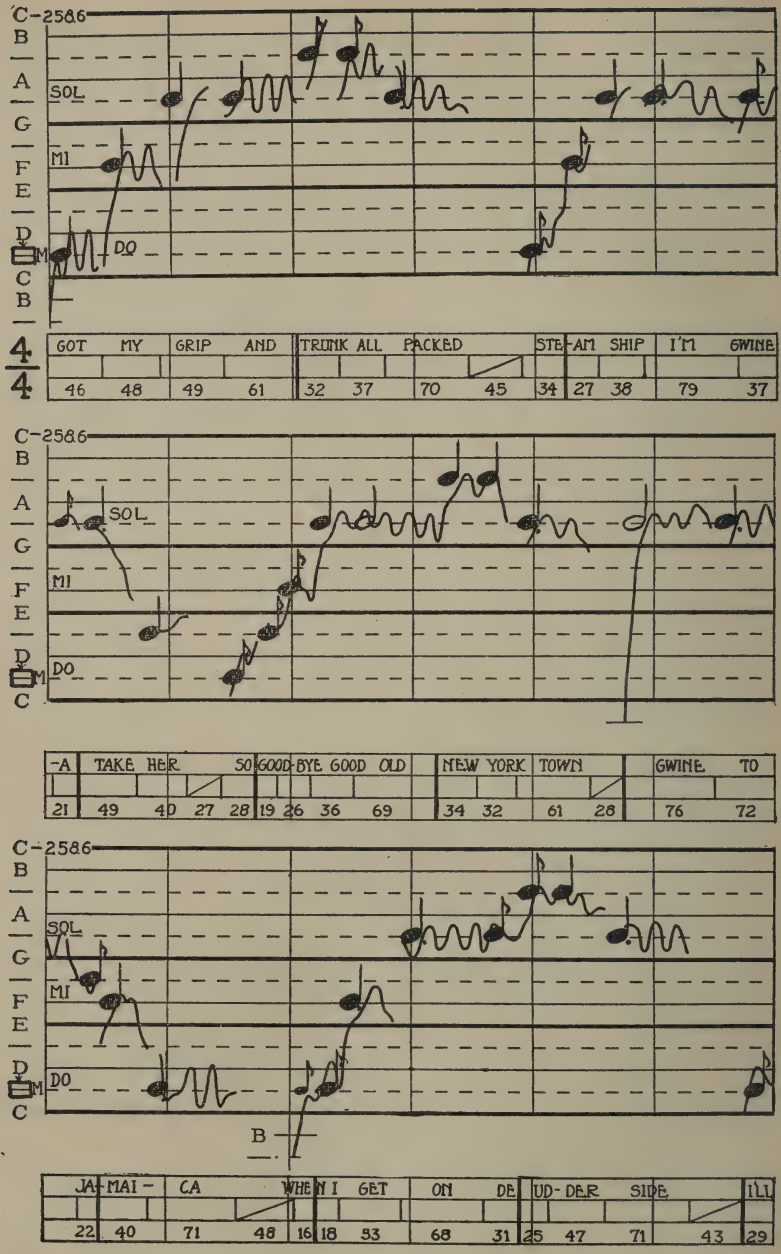
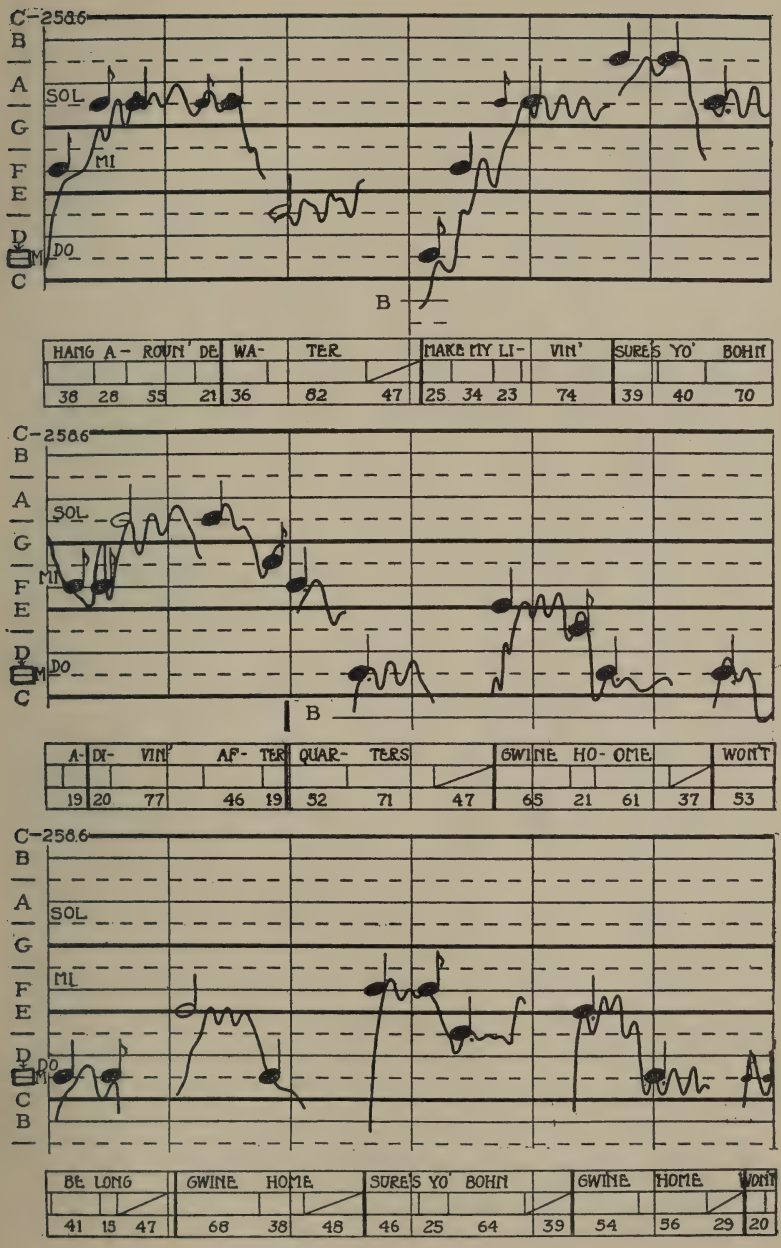
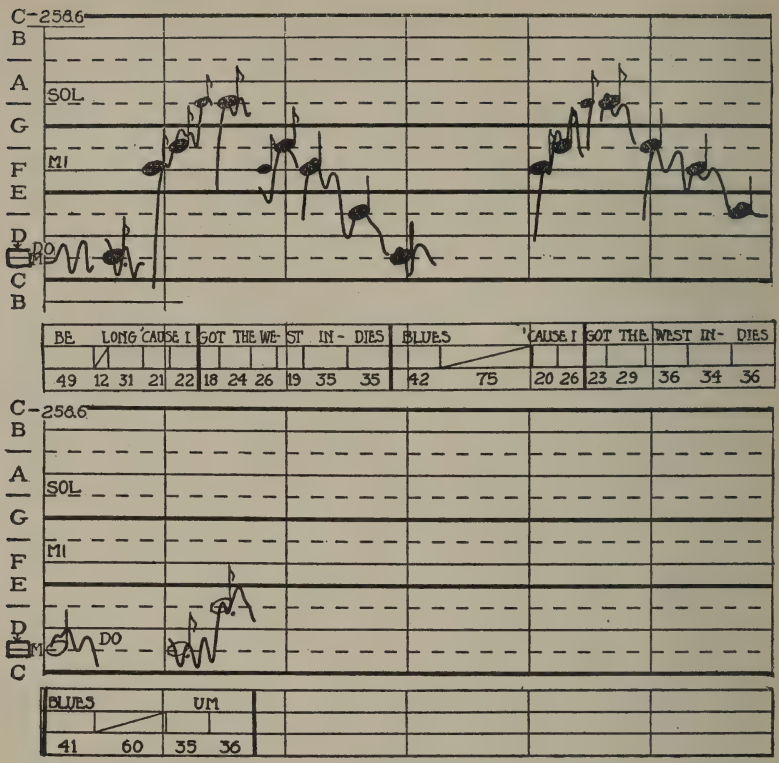


Fig. 42. A. Graphs 1, 2, 3. West Indies Blues.



B. Graphs 4, 5, 6. West Indies Blues.



C. Graphs 7, 8. West Indies Blues.

GENERAL SONGS

No. 22. You Doan Know My Mind. This quaint melody (Figs. 43, A, and 43, B) has been called a "ballad-blues."[12] *You* and *doan,* graph 1, are combined circumflex and falling intonations. *My,* sec. 2, graph 1, is an inverted circumflex. The note of *mind* carries an erratic-waver, and is in sharp contrast to the smooth vibrato cycles of *-in',* graph 2. *When,* graph 1, is a rising intonation, and *you* a circumflex.

A dip between *see* and *me* is not only extended but long in duration. Here the Negro habit of attacking so many notes

[12] Suggested by Professor H. W. Odum.

from below is exaggerated. There is a sequence of rising intonation and falling on the tones *laugh-in'*, end of graph 1. *Just to keep*, graph 2, are spoken, but have the time relation-

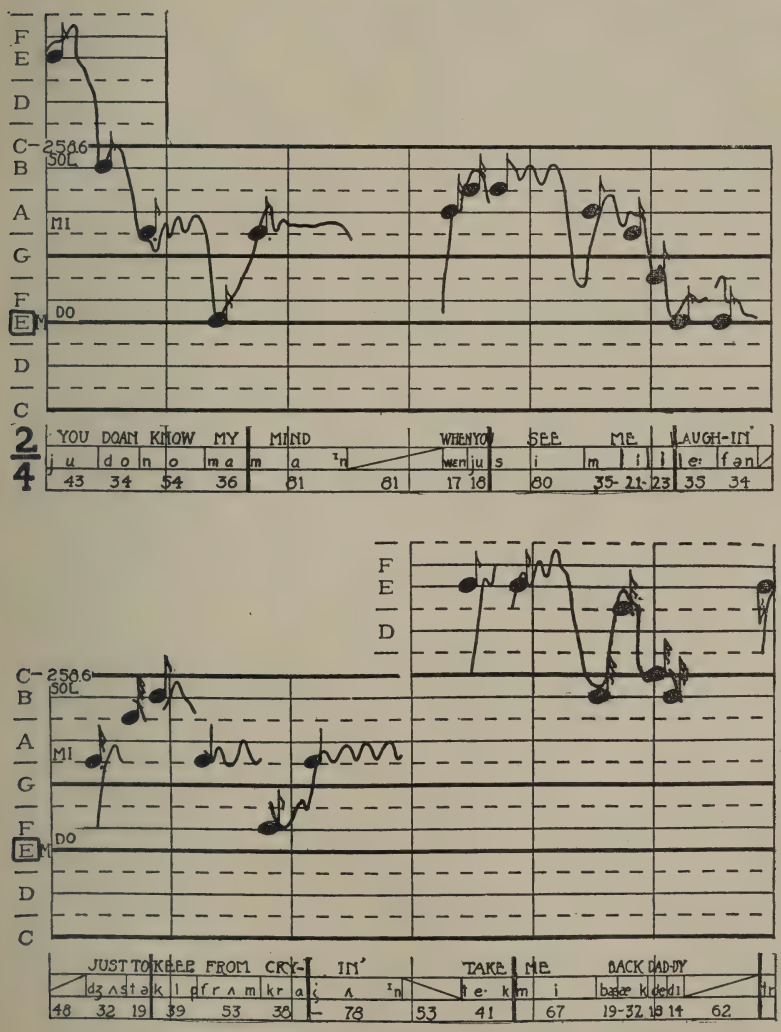
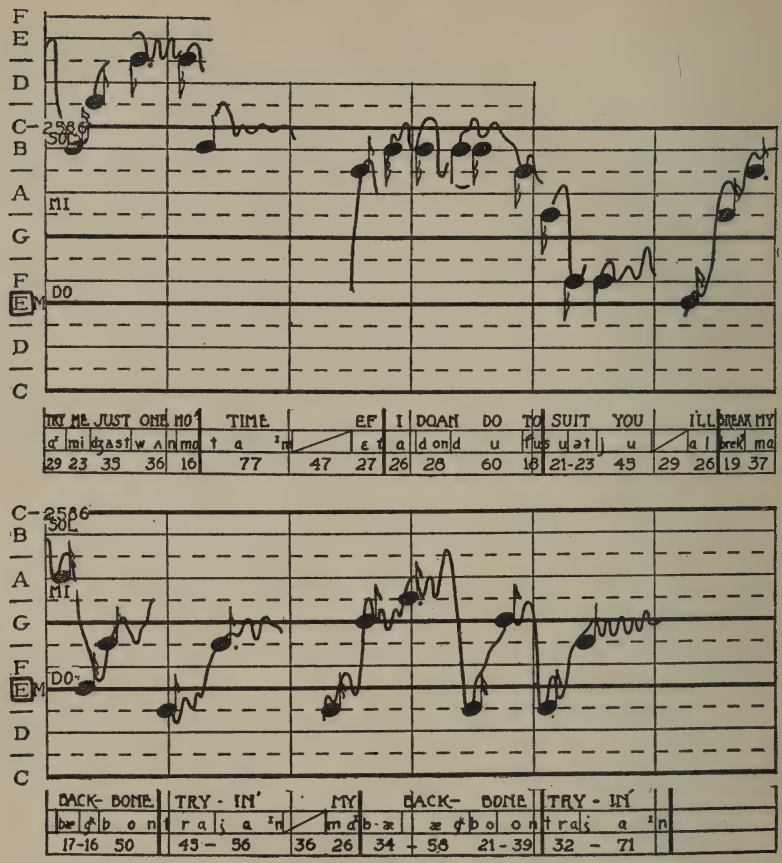


Fig. 43. A. Graphs 1, 2. You Doan Know My Mind.



B. Graphs 3, 4. You Doan Know My Mind.

ships and approach the notes of singing. *Cry-*, sec. 2, graph 2, is an inverted circumflex.

The clipping effect is apparent on *-dy,* before the breath in graph 2, sec. 6. The attack of *time,* graph 3, sec. 2, from above, and the release of *bone,* graph 4, sec. 1, are unusual. Numerous dragging slurs occur at the close of the song, with a very fast vibrato breaking out on *-in',* graph 4, sec. 5. The breathing periods are irregular, being successively .81, .48, .53, .62, .47, .29, and .36 sec.

No. 23. Ain't Gonna Rain No Mo'. The words were sung so fast on the verse (Fig. 45) that they became a jumble as far as the graph-curve is concerned, without distinct beginning or end. The graph-curve, minus the usual tone-symbols, still registers the general melody trend comprehensibly.

It could almost be said that the entire song is comprised of intonations. The most apparent intonations on a given syllable are the rising on *oh,* graph 1, sec. 6; the rising on *no,* graph 2, sec. 2, and the combined circumflex and falling on *mo',* same sec.; the circumflex on *it,* sec. 3; the rising on *mo',* sec. 4; the rising on *how,* sec. 4, and the falling attack and release of *old,* sec. 6.

The curious maneuvering of the graph-curve in *rain,* graph 2, sec. 1, is due to the singer's insertion of a little laugh.

In the succession of tones on *gon-na rain no mo',* graph 3, each circumflex climbs a half-step.

No. 24. My Lovie Came Back. The widest and fastest vibrato, on an average, of all the voices stands out in Fig. 47. On *-ie,* graph 1, secs. 2, 3, *back,* graph 1, secs. 4, 5, and *me,* graph 3, secs. 5, 6, it exceeds three-quarters of a step in extent, and eight cycles per second in rate. Its uniformity as a whole is second only to that of the blues singer.

The slow glides, downward on *lov-,* graph 1, sec. 2, and upward on *came,* graph 1, secs. 3, 4, *feel,* graph 1, sec. 6, and graph 2, sec. 1, and *to,* graph 3, sec. 4, take up the entire duration of the respective tones. *To,* graph 3, has one oscillation of the vibrato for each half-step rise of pitch, coinciding with the graph-curve effect at the close of No. 23. The two are different, however, for in the former the rise and fall is the vibrato, and in the latter it is a circumflex intonation for each syllable. There are the usual instances of Negro intonations, with the succession of rising intonations on *oh boy,* when the song begins and with the falling attack and release of *oh,* graph 2, secs. 4, 5, somewhat unique. There is also an example of a circumflex attack on *gee,* graph 2, sec. 6.

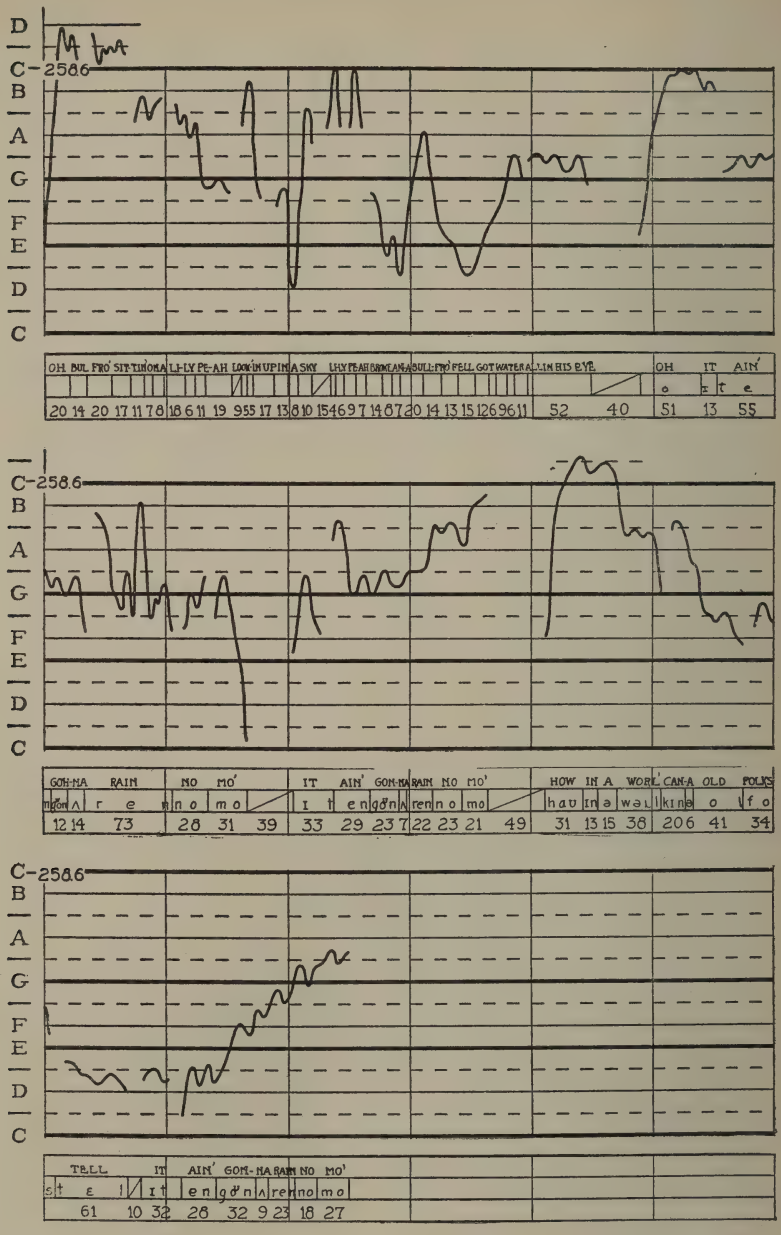


Fig. 45. Graphs 1, 2, 3. Ain't Gonna Rain No Mo'.

Fig. 44. The *oh* opening the chorus of "It Ain't Gonna Rain No Mo'."

Fig. 46. A college girl singing a popular song: "My Lovie Came Back."

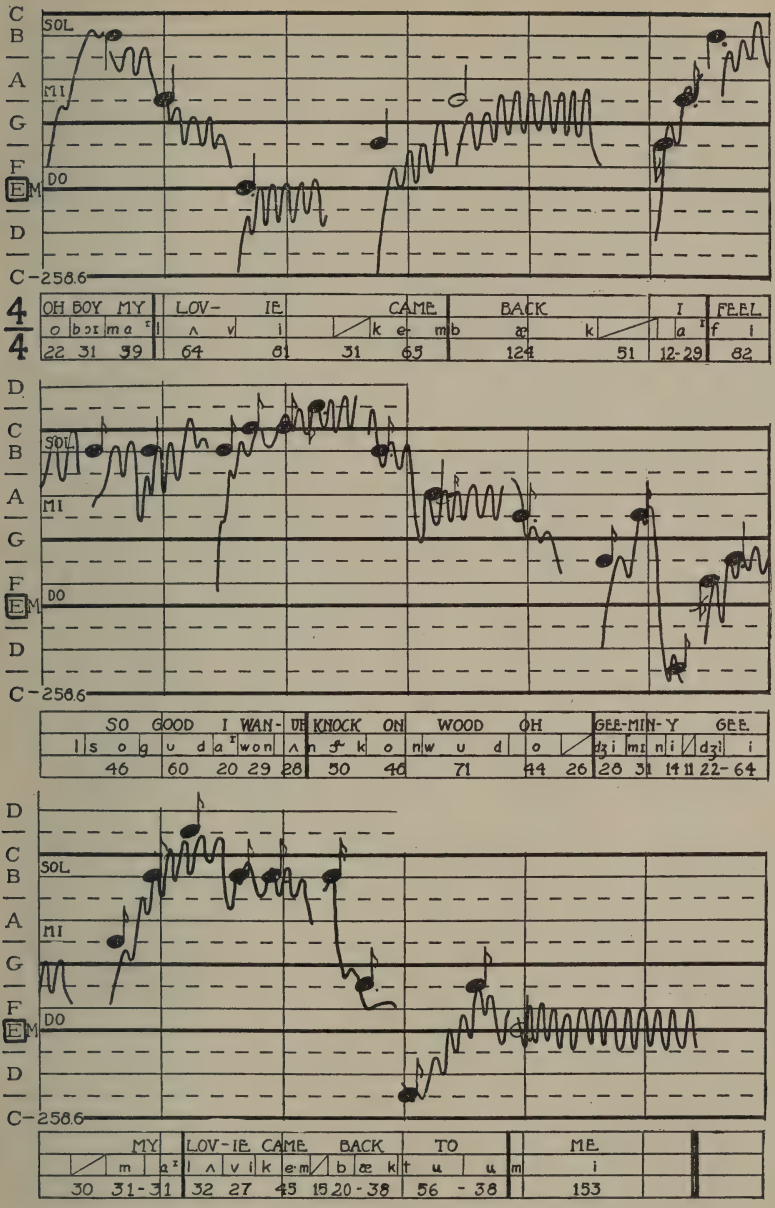


Fig. 47. Graphs 1, 2, 3. My Lovie Came Back.

No. 25. Shot Ma Pistol. Many syllables contain more than one tone in Figs. 49, A, and 49, B. Out of seventy-three separate notes in the selection, forty-four are joined to some other tone on the same syllable. *Oh,* graph 1, has four tones; *Lawd,* graph 1, four; *pis-,* graph 1, two; *-tol,* graph 2, three; *town,* graph 3, three; *hol-,* graph 2, two; *-low,* graph 3, four;

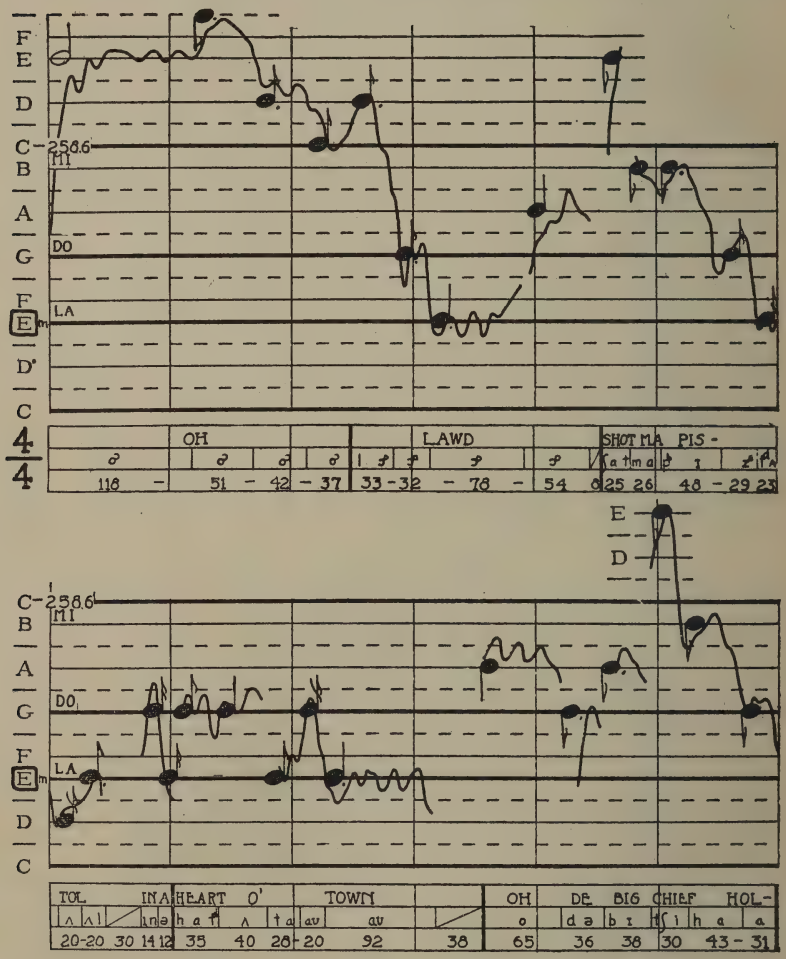
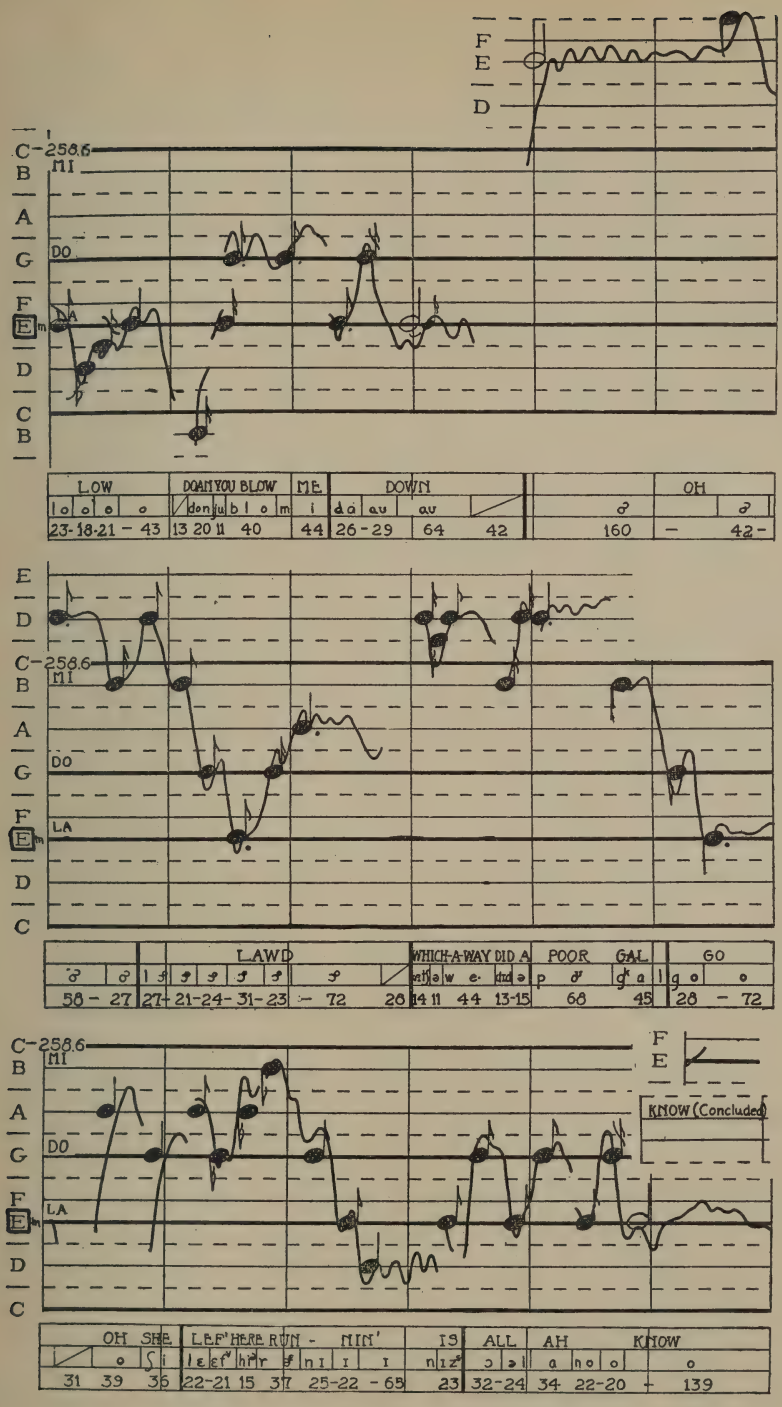


Fig. 49. A. Graphs 1, 2. Shot Ma Pistol.

Fig. 48. The [o] at the start of No. 25.
Lips are set for [*aw*].



B. Graphs 3, 4, 5. Shot Ma Pistol.

down, graph 3, three; *oh,* graph 3, four; *Lawd,* graph 4, six; *go,* graph 4, two; *-nin',* graph 5, three; *all,* graph 5, two; and *know,* graph 5, three.

Out of these, *-tol* and *town,* graph 2, *-low* and *down,* graph 3, and *know,* graph 5, have an interpolated tone apiece. *Town, down,* and *knows* are similar, each interpolated tone going a minor third above, and being inserted near the beginning of the syllable. The interpolated-tone *-tol,* graph 2, goes down a whole step in the middle of the pattern. *-Low* has two interpolated tones, grouped a little to the left of the center of the pattern, the first a whole step and the second a half-step below. *All,* graph 5, sec. 4, almost qualifies as having an interpolated tone, because of the attack of its first tone.

The way the *Oh, Lawd* was sung at the start of the song and in the middle, is a good example of the variation the folk singer introduces when he repeats a phrase. There is far more similarity than difference, but tones slid over the first time were definitely sung the second. There are two more notes the second time than the first. With the exception of the *Oh, Lawd's,* the tones of the selection are quite short, and the measures are crowded with tone-symbols.

The attacking of two successive tones, each far below their general level, is exemplified on *oh* and *she,* graph 5. Each begins in the vicinity of D sharp, and quickly leaps upward. Extended attacks are noticeably lacking, but the type intonations and vibrato are present.

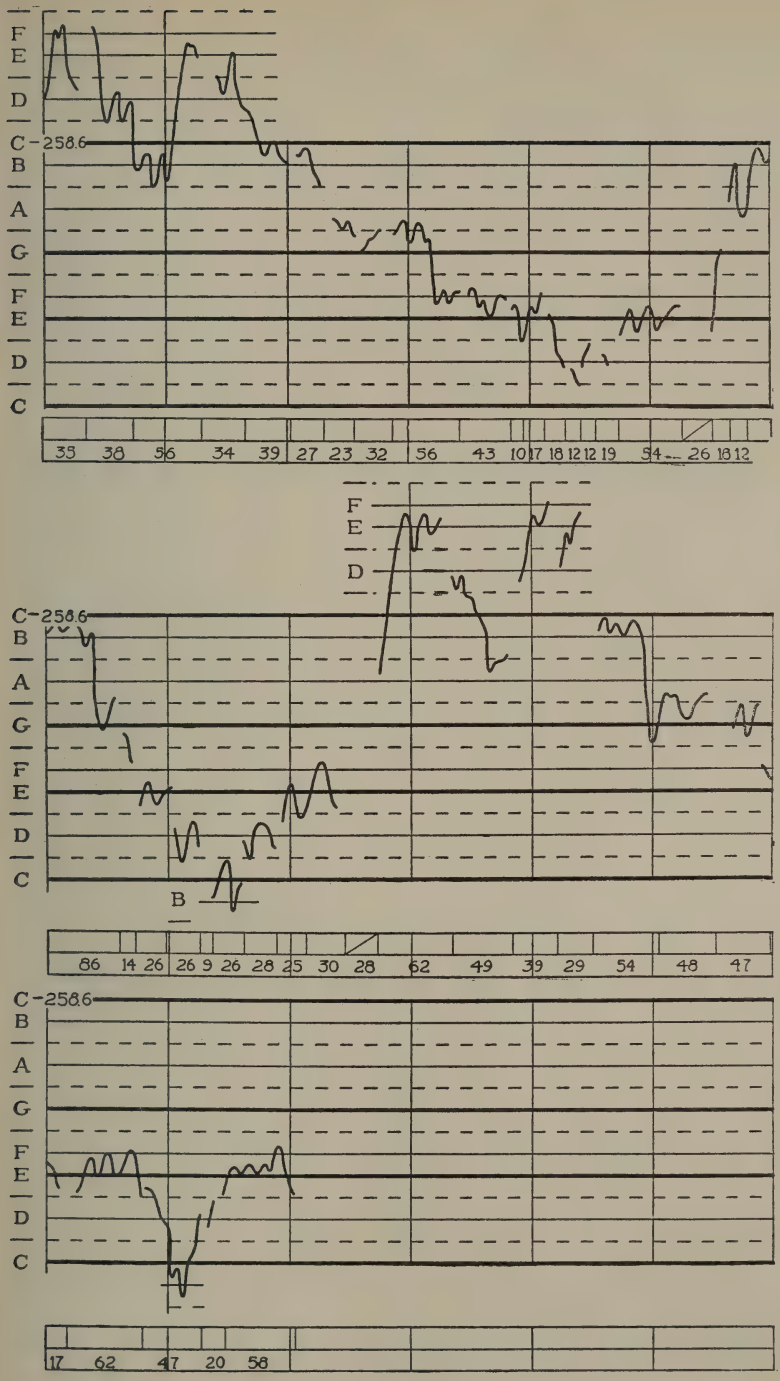


Fig. 50. Obscene Song.

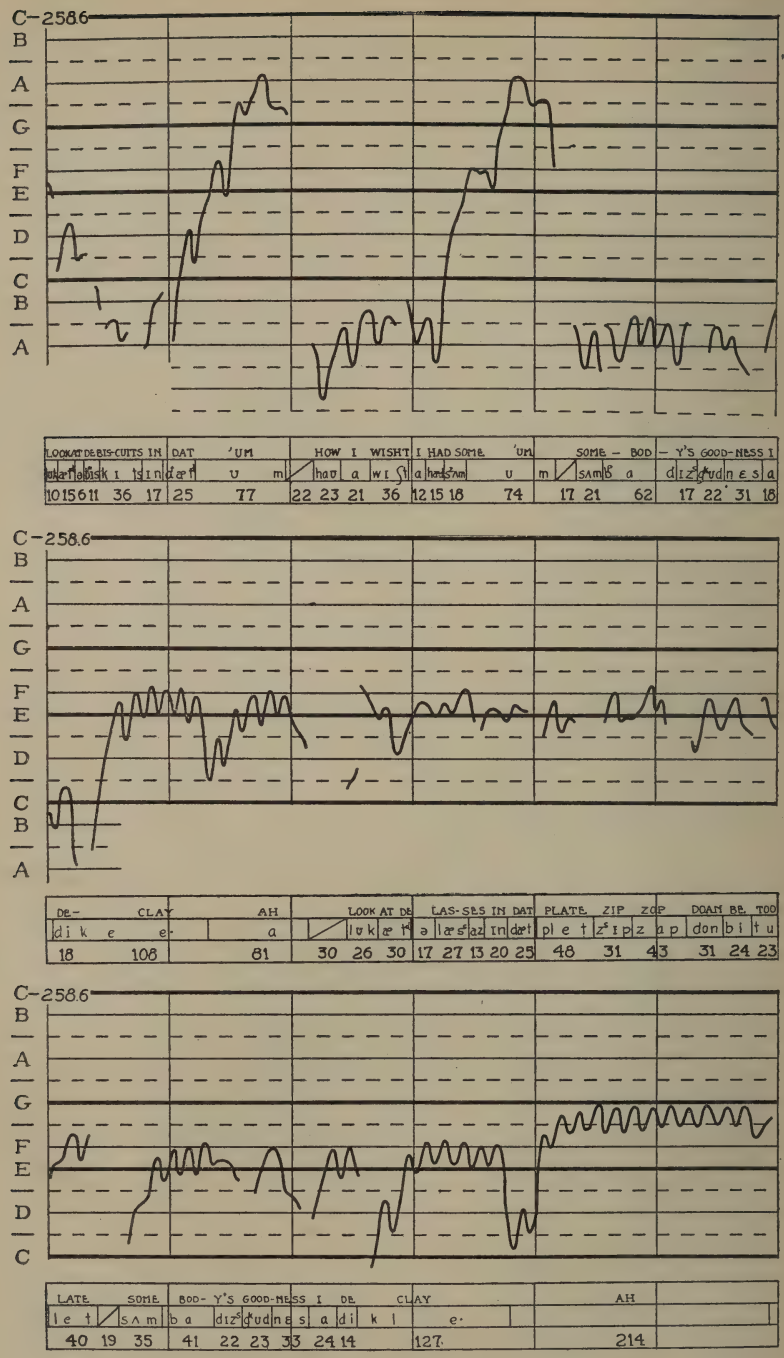


Fig. 51. Look at de Biscuits ("Lead").

Fig. 52. Look at de Biscuits. *Zip! Zop!* College Quartet singing their own composition, acting out the pictures suggested by the words.

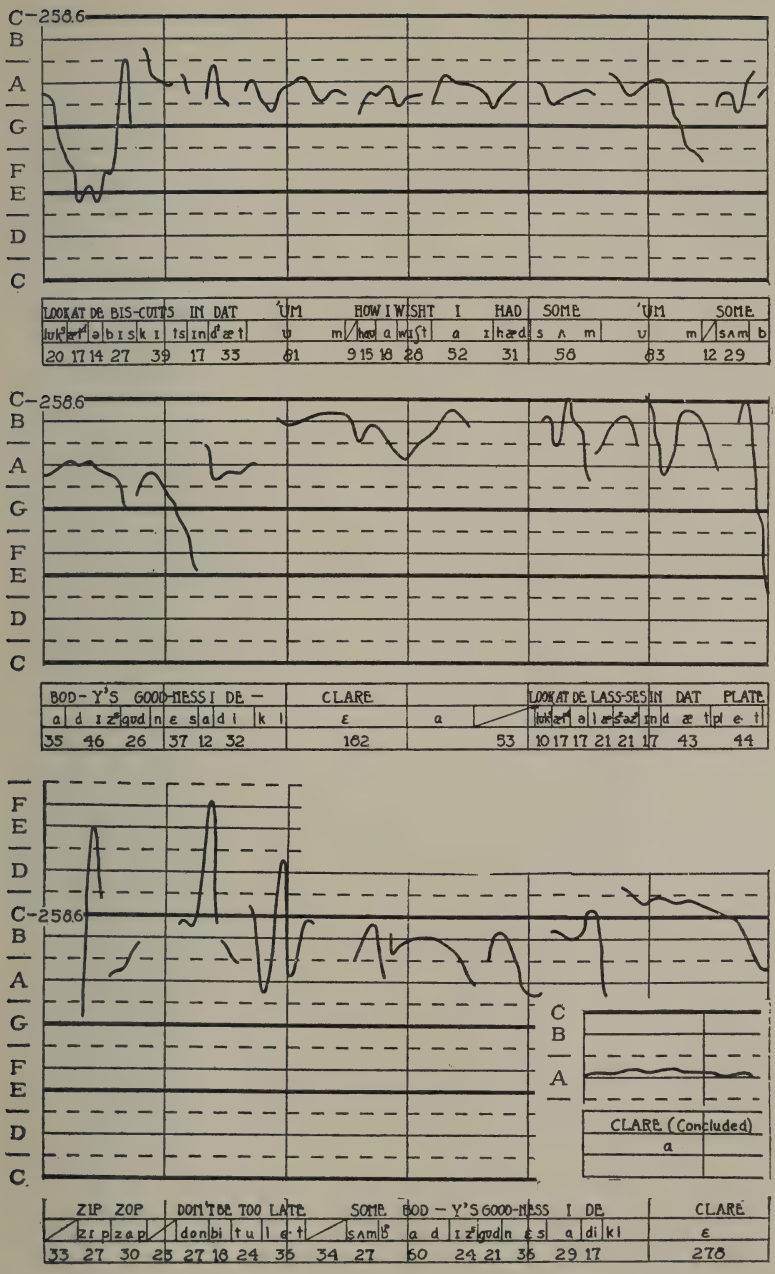


Fig. 53. Look at de Biscuits (Bass).

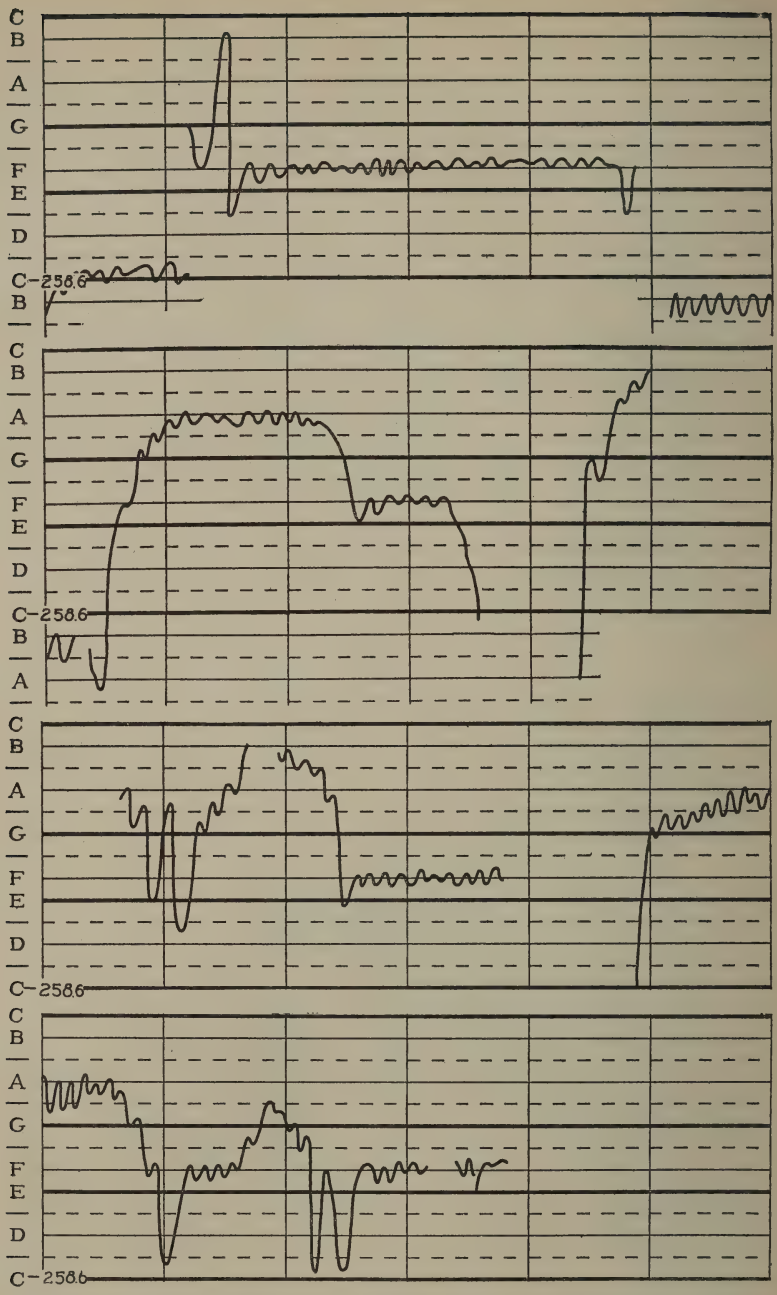


Fig. 54. Cornfield Holler (1). The singer's falsetto began in the region of D-E. The "holler" is sung mostly in falsetto.

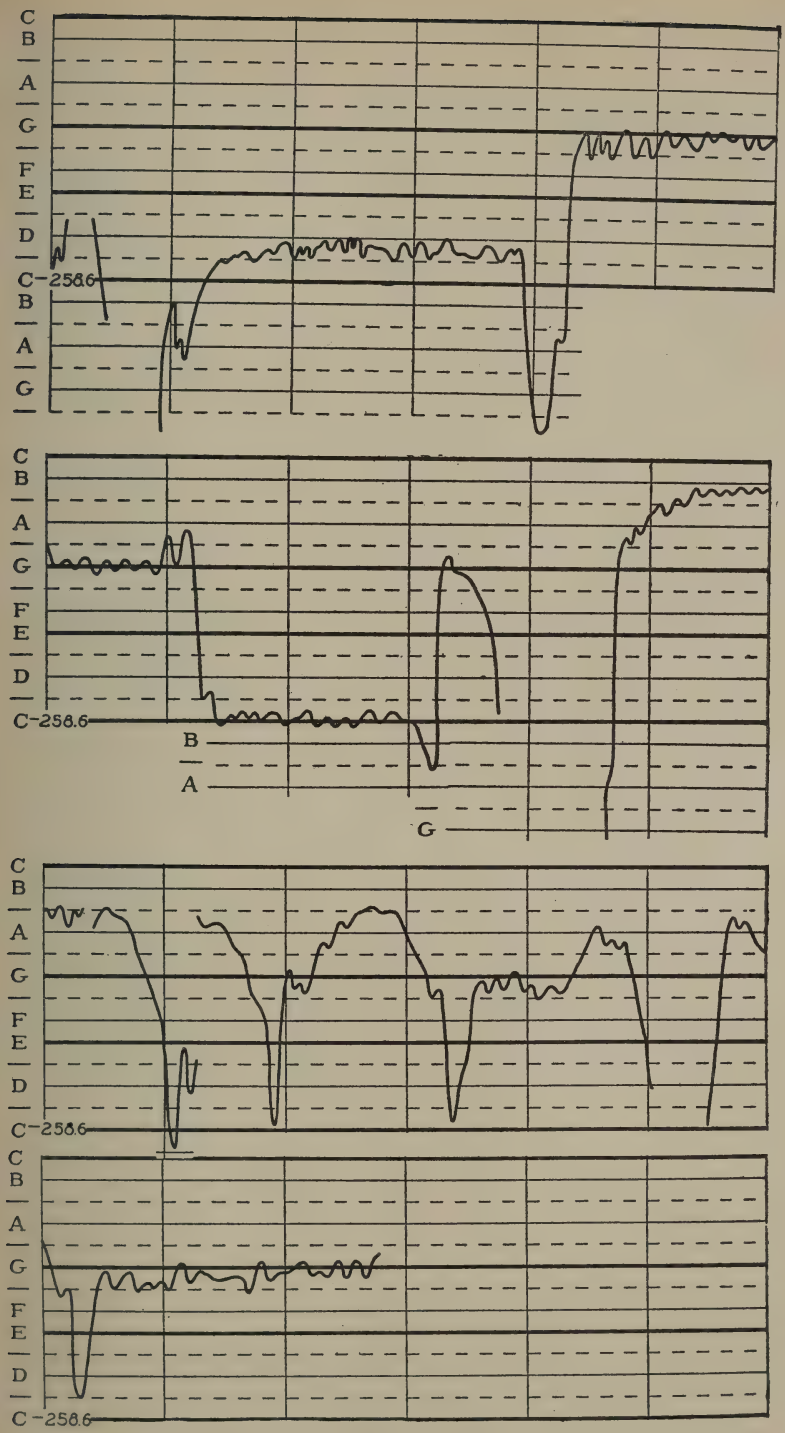


Fig. 55. Cornfield Holler (2).

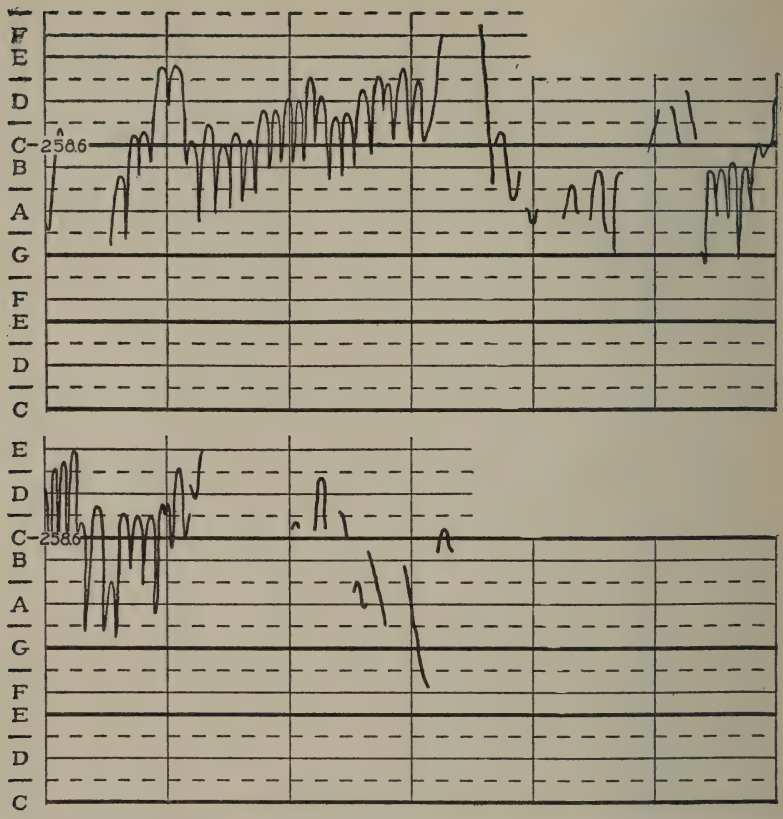


Fig. 56. A Negro Laugh. The recurrent oscillations are cycloid in form, at a rate of about nine per second, and an extent of more than a whole step on the average. The intonations are represented by all four types: rising, falling, circumflex, and inverted circumflex. They are spasmodic speech sounds, in contrast to the trill effect of the recurrent oscillations. The latter occurred in the region where the falsetto begins, moving in and out of the normal register.

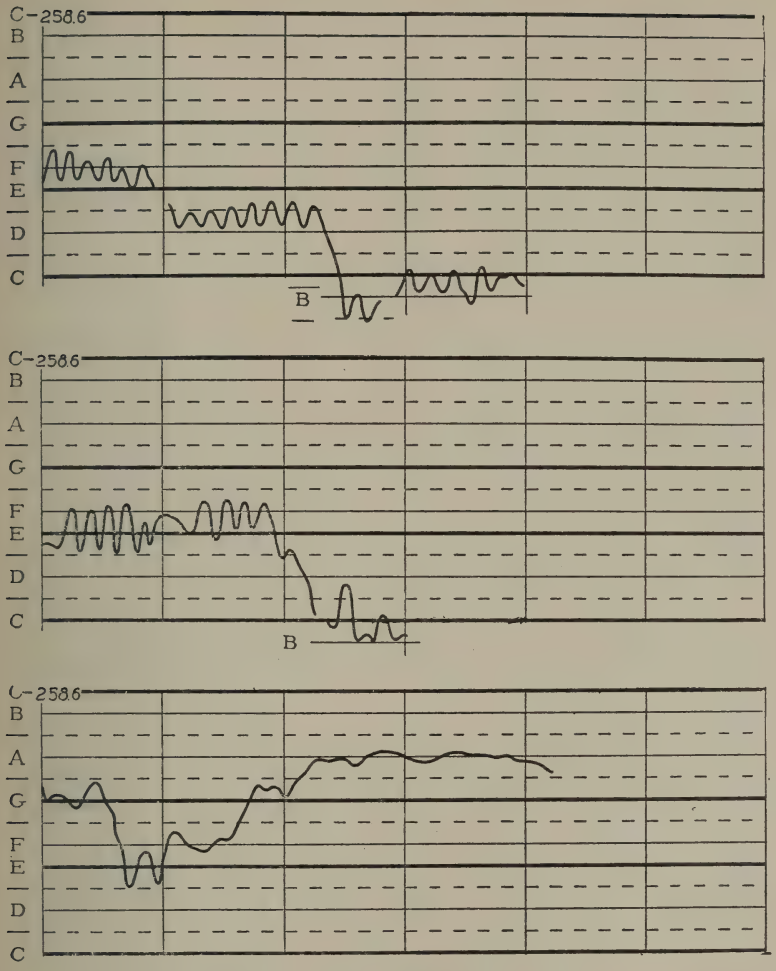


Fig. 57. High School Boys' Voices.

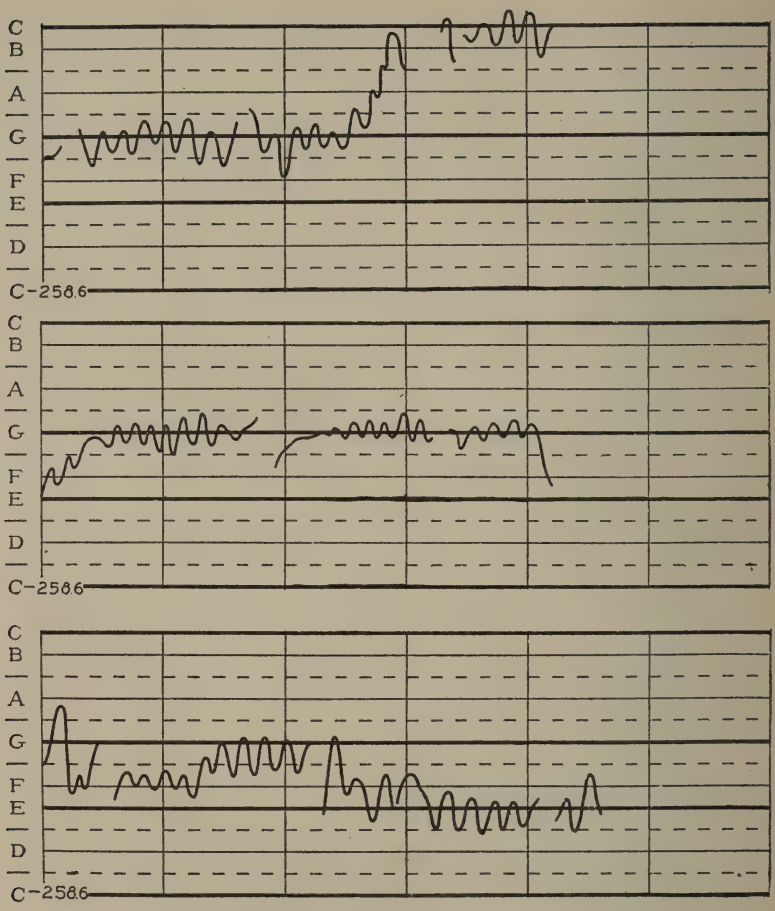


Fig. 58. High School Girls' Voices.

PART IV

ANALYSIS OF SONGS

Negro vocal ornaments. The personal decorations of primitive folk are no more tangible than the ornaments of voice, when the latter are brought out by phonophotography. The ornaments appealing to the hearing of their fellows may now be displayed in our museums alongside the appeals to sight. Any vocal ornaments may be classified and placed on exhibit as particular patterns on the new notation. With a phonograph record or film reproducing the music, it will be possible to hear the vocal ornaments which are pictured.

In the sections immediately following, some of the Negro vocal embellishments, such as vibrato, erratic-waver, falsetto-twist, and the like, have been isolated from commercial phonograph records, to show the type of display which may now be prepared by the anthropologist who returns to his museum with phonophotographic records of folk songs.

Intonation-tones. Three of the four graphs of Fig. 59 are verifiable instances of those tones, so frequent and important in Negro singing, which are made up entirely of intonations. The fourth, Fig. 59, C, has an example of a tone which is on the border line between an intonation and a note, and probably could be called either one. Above the G sharp line, the rate of change undergoes a momentary decrease; yet upon listening to the record the entire movement seems slurred. The use of the intonation-tone is typical of the freedom the Negro enjoys in singing. It is an instrument of unhindered emotional expression, arising out of situations in which the entire organism is stirred up and the voice excitedly breaks away from stilted notes.

Other than the types called rising, falling, circumflex, and inverted circumflex, intonations may be classed as slow or fast. The slow intonation is a slur, or portamento; the fast is speech-

like. When the latter is fitted into the rhythm of a song it adds a touch of the dramatic. That is what happened on Fig. 59, A. *But* is an extended rising, *now* is circumflex, *I've* is a narrow rising, and *got* is a narrow falling. The latter two

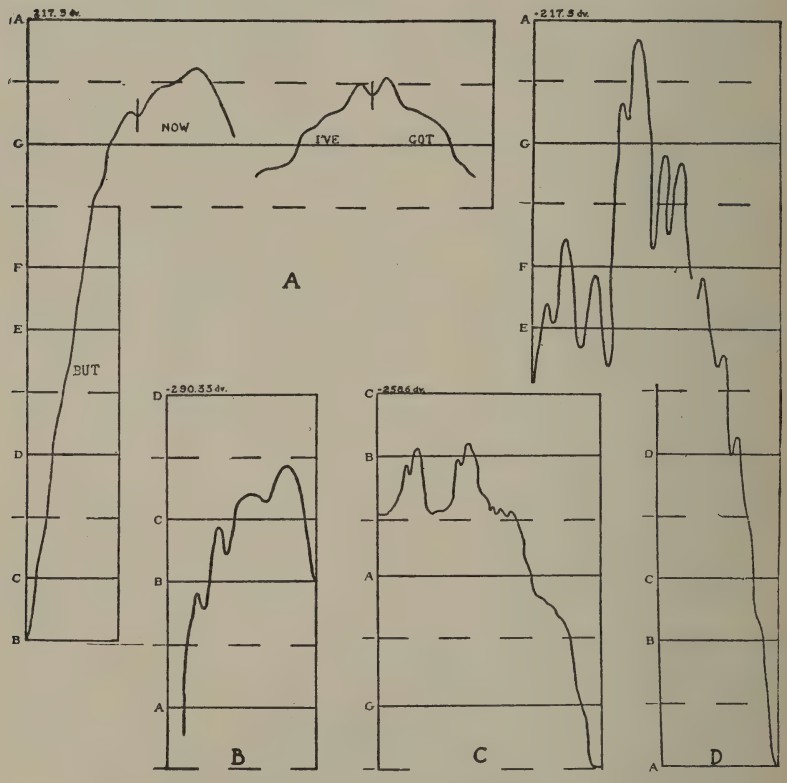


Fig. 59. Intonation-tones.

A. Mistreatin' Daddy. Columbia, 14000-D. Sec. 149.
But now I've got. . . .

B. My Soul is a Witness for My Lord. Columbia, A-3819.
Sec. 2. *Soul.*

C. I Done Done What You Told Me To Do. Columbia, A-3919.
Sec. 2. *Lord.*

D. My Soul is a Witness for My Lord. Columbia, A-3819.
Sec. 111. *An-gels.*

balance each other in extent and time. The syllable *soul* is for the most part a long upward slur, Fig. 59, B. D♯ is made of complicated combined intonations on the syllable *an-*, and has an extended falling intonation on *-gels*.

The slow intonation-tones were most evident in No. 20, "My Gal Ain't Actin' Right," and No. 24, "My Lovie Came Back," while many of the spirituals had touches. The fast intonation-tones were found in greatest number among the work songs, especially No. 15, "John Henry." Many of these were combined, either by a rising followed by a circumflex, or a circumflex followed by a falling.

The circumflex intonation is relatively much more frequent in Negro singing than in Bryan's speech,[1] where circumflex, rising, and falling, are more evenly distributed. The reason for this can be understood, because as just stated, certain fast and narrow circumflexes are on the border line between notes and intonations. The circumflex, with but a slightly changing pitch, can give the effect of being somewhat like a note, and still have the pitch variability and freedom which the intonation expresses.

Attack and Release. One of the most obvious differences between Negro and artistic singing[2] is in the attack and release of tones. Singing based on the conventional notation has for its standard the clean attacking and releasing of notes. This, however, is a standard based on naïve perception, for Schoen has experimentally shown that in artistic singing "a tone is

[1] Conclusions based on analysis of Bryan's "Immortality."

[2] The point of view maintained in comparing Negro singing with artistic singing is justified by the fact that the latter is held up as a standard of the European type of singing. There are Negro artists, of course, who have through training become artists of the European schools. They may keep a few of the touches of Negro folk singing, or sing standard spirituals which from the very nature of conventional notation have been cast in the European mold. In our sense, this group of Negro artists are not Negro folk singers. Throughout the range of our choice of singers, we have passed from an almost primitive type to an almost artistic European type. Negro folk singers thus are on middle ground between the two.

almost invariably attacked below the pitch intended when it is preceded by a lower tone, and in the majority of cases it is released above,"[3] and again, "the movement from tone to tone is predominantly in the form of glides, but varying in degree for the different singers, being heavier for some than for

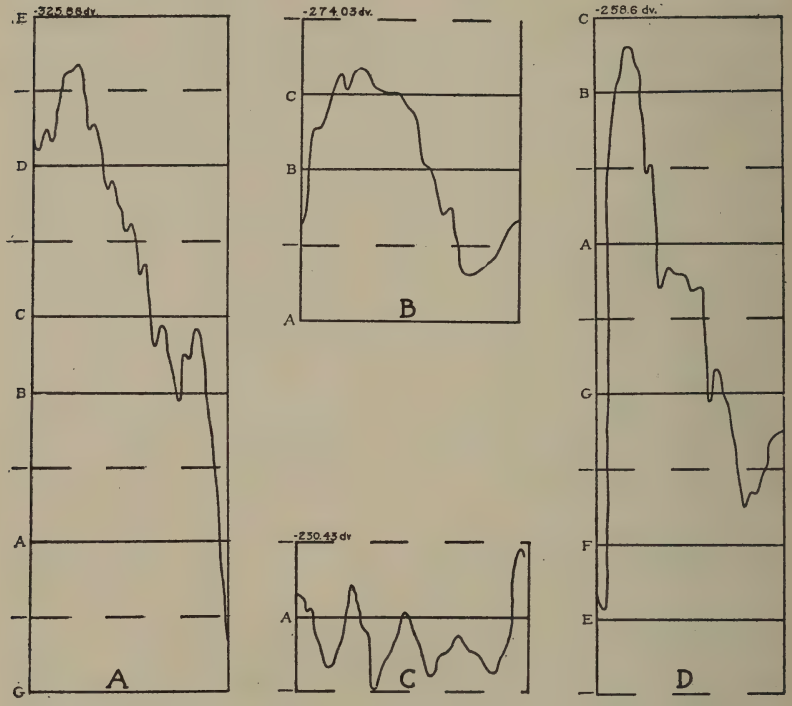


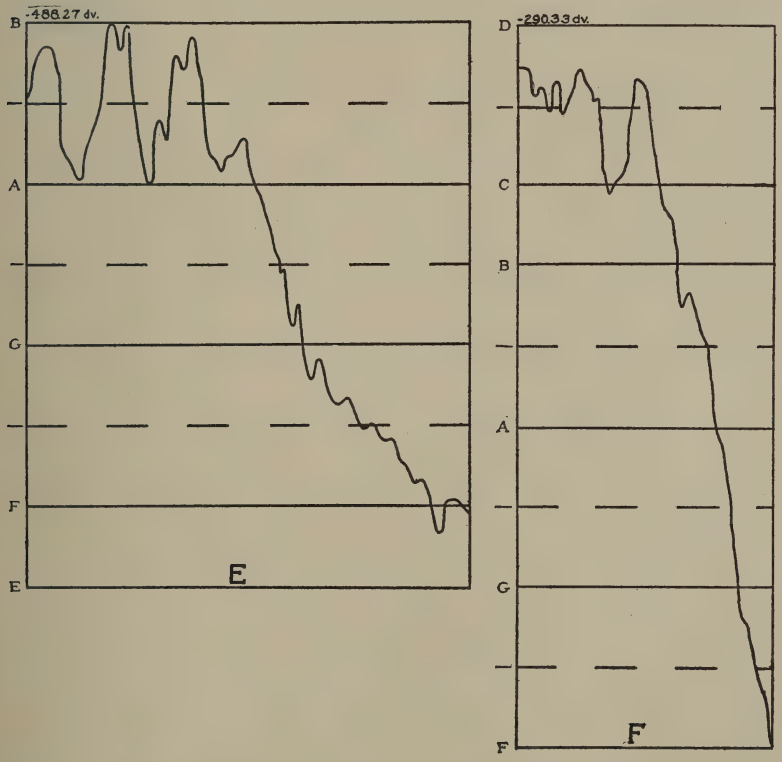
Fig. 60. Attacks and Releases.

A. Cemetery Blues. Columbia, 13001-D. Sec. 17. *'Liz.*
B. I'm Going Back to My Used to Be. Columbia, 13007-D. Sec. 57. *Love.*
C. My Soul is a Witness for My Lord. Columbia, A-3819. Sec. 1. *Oh.*
D. Were You There? Columbia, A-3919. Sec. 8. *My Lord.*

[3] Schoen, "The Pitch Factor in Artistic Singing," *Iowa Studies in Psychology, Psychological Monographs,* XXXI (1922), 239.

others."[4] There can be a slight slurring up to a tone which will ordinarily pass unnoticed as such because of speed and brevity.

The Negro outdoes the attacks and releases of artistic singing in variety of type, extent, and duration. Whereas in European singing, to quote Schoen, "when the preceding tone is above the tone sung, the attack is clean,"[5] the Negro will in a fair percentage of his tones go out of his way to get a running start from below.



E. Cemetery Blues. Columbia, 13001-D. Sec. 19. *Down.*
F. Golden Slippers. Victor, 16453-B. Sec. 14. *Wear.*

[4] *Ibid.*, p. 240.
[5] *Ibid.*, p. 239.

Another variation in releasing a note is evident on Fig. 60, C. Schoen's source material does not exhibit a release of this type. When he speaks of "high release" he refers to a more gradual and less extended rise, as on *roll,* No. 5, graph 1, sec. 5. Song No. 22, graph 6, sec. 4, is an example of this type of release among the folk songs.

The more characteristic Negro release preceding a breath is exemplified in Fig. 60, A. A note on its release slides down to a second short note, which is in turn followed by a sharply falling intonation. Sometimes the release-note leaves off the falling intonation, as Fig. 60, B. Again the release may be almost entirely a falling intonation such as Fig. 60, F. In Fig. 60, E, there is a still further variation introduced by a long slur preceding the release-note.

The extent of the falling intonation preceding a breath is variable, depending partially on the emotional expression of the singer and the height of the tone. The long drop on the third verse of "I Got a Muly," No. 20, will be recalled as an expression of irritation.

When the short release-note is on a different syllable from the tone preceding, it has been referred to as "clipping." Examples of clipping were named in the discussion of No. 19. The singer uses this effect much as he does syncopation, changing the situation by sometimes clipping and sometimes not. A very short note before a breath is often unexpected.

The long, fast pitch swoops, so frequently seen on the pattern notation following a breath, are found in artistic singing only rarely and then in extremely emotional singing. The Negro makes use of it in matter-of-fact singing, such as No. 4, "Burden Down," where the singer was quite unmoved.

When two tones follow each other, the general level of each being approximately the same, both artistic singers and Negroes have a dip in the graph-curve. It was pointed out in Fig. 7 on the release of *braes* and the attack of *are.* On song No. 10,

graph 3, there is a good example of the Negro type of dip. By overdoing the extent and sometimes the duration of the dip, the Negro acquires a unique embellishment. He does not confine himself to dips when one note follows another on the same pitch, for even when the note following is more than a whole step above, he will release the first note with a falling intonation of a whole step, followed by a rising of more than two steps. An example of this was seen on No. 2, graph 4, sec. 2.

The attack and release of tones is sometimes modified by the consonants ending or beginning a syllable. The voiceless consonant, either by pointed explosions or duration, is utilized

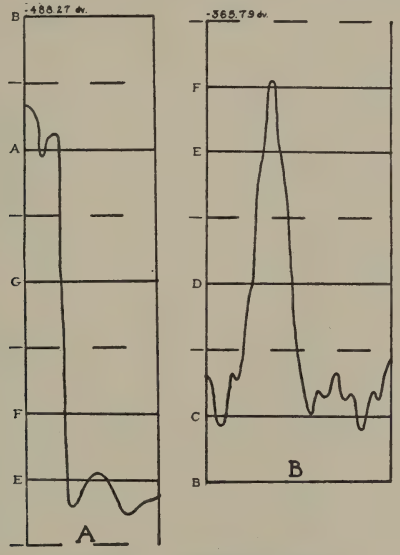


Fig. 61. Falsetto-Twists.
A. Far Away Blues. Columbia. 13007-D. Sec. 136. *Hear.*
B. Chain Gang Blues. Columbia. 14049-D. Sec. 47. *Blue.*

much as the dip is for rhythmical effects. Consonants often cut down the extent of an attack or release so far as pitch is concerned.

A number of instances of circumflex-attack and release were referred to on the graphs. This type of voice-pattern is

like the ordinary grace-note except that it is an intonation rather than a note. It is an infrequent embellishment, but the fact that it does occur in folk singing is significant.

Falsetto-twist. When a circumflex (often in the attack or release of a tone) extends into the falsetto on its upper limits, the effect is unique. We have called this the "falsetto-twist." The uniqueness is partly dependent on the greater extent of the circumflex, but mostly on the sudden changes that take place in the timbre of the voice due to the transition from one register "quality" to another. The example in Fig. 61, B, is very much like those falsetto-twists found in No. 20, "My Gal Ain't Actin' Right." This example is not a falsetto-twist attack, but more like an interpolated tone. A of Fig. 61 has a voiceless consonant preceding; so there is no graph-curve on the [h].

This voice-pattern resembles the voice breaking under emotion, especially grief, and it has been crystallized into a Negro singing habit regardless of whether the emotion is experienced or not. Once in a while, it is found in a spiritual, such as the tenor on *down* in "My Soul is a Witness for My Lord."[6]

In picking out falsetto-twists from the phonograph records, something of an illusion was uncovered when the "whining" timbre evident on so many tones at their beginning was mistaken for the falsetto-twist. The graph curve did not go into the falsetto as was expected. The nature of a "whining" tone can be determined only by a study of its wave form and timbre.

Vibrato.[7] Fig. 62 has many different degrees of vibrato rate, extent, and form. There are fairly smooth cycles, like A or B, and there are the irregular like E and H. There are fast rates, but no slow rates. The widest extent is found on E, and the narrowest on C. If these were compared with a group of artistic vibratos on the same types of songs, the latter would be much more regular. Except in extremely agitated passages, the artistic vibrato is relatively regular.

[6] Columbia Record A-3819, sec. 124.

[7] In this section some of the data are taken from unpublished studies on the vibrato of artistic singers.

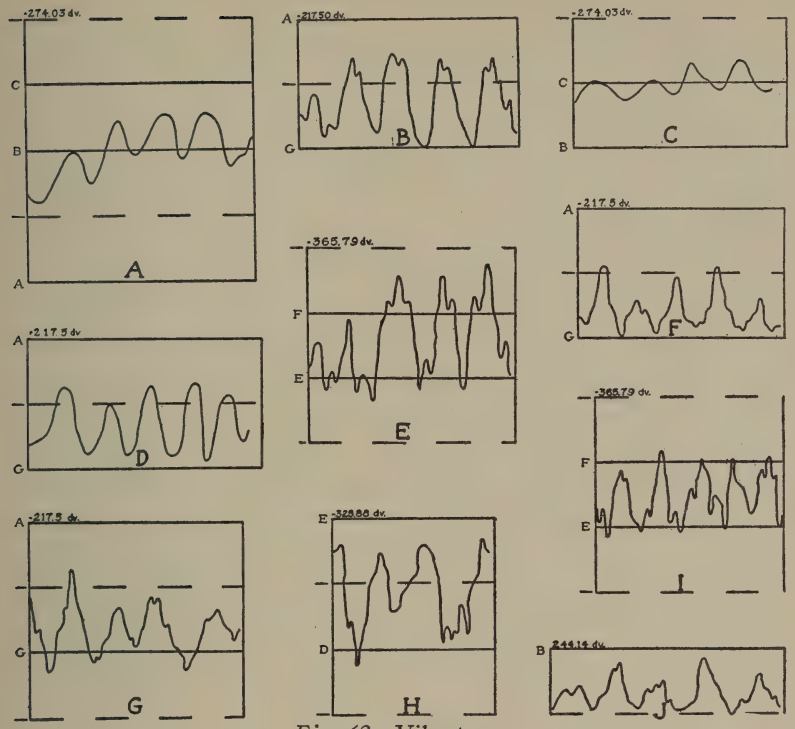


Fig. 62. Vibratos.

A. Go Down Moses. Victor. 17688-A. Sec. 66. *Lan'.*
B. Swing Low, Sweet Chariot. Victor. 16453-A. Sec. 2. *Low.*
C. Walk in Jerusalem Just like John. Brunswick. 3497-B. Sec. 5. *Read-(y).*
D. Shout All Over God's Heaven. Brunswick. 3497-A. Sec. 2. *Got.*
E. The Great Campmeeting. Victor. 16487-B. Sec. 56. *Pray.*
F. Swing Low, Sweet Chariot. Victor. 16453-A. Sec. 4. *Char-(iot).*
G. Give 'Way Jordon. Columbia. A-3819. Sec. 2. *'Way.*
H. Give 'Way Jordon. Columbia. A-3819. Sec. 21. *Oh.*
I. The Great Campmeeting. Victor. 16487-B. Sec. 59. *Tire.*
J. Were You There. Columbia. A-3919. Sec. 3. *There.*

The rate and extent of the Negro's vibratos have a wider spread than in artistic singing, where the standards are more confining. Like long pitch swoops, the vibrato is flexible and indicates little restriction in the Negro's self-expression in song.

A finished tone quality is rarely found in Negro folk singing. The Negro may enjoy good tones, but he makes little effort to produce them. He is interested in the more obvious embellishments and rhythmical devices rather than in the subtle effects of beauty resulting from the relatively regular vibrato of artistic singing.

It is in a blues that the vibrato, sundry embellishments, and rhythmical devices go together. In the work songs, the tones are not prolonged, and the vibrato is not a prominent factor in the singing. The spirituals, with their lengthy tones, place more emphasis on subtle tone quality than do the other classes. They are nearest to the type of songs which are sung by artists. The workaday religious spiritual is halfway between a spiritual and a work song or blues, such songs as "Ah Ray," No. 2, having sufficient time for the vibrato to be noticeable.[8]

Erratic-Waver. The erratic-waver is due to the unsteadiness of the vocal muscles in maintaining a pitch. The voice fluctuates about a general level without any uniformity of pattern.

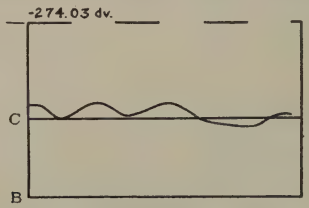


Fig. 63. Erratic-Waver. I Want to Be Like Jesus. Victor. 17688-B. Sec. 34. *Want.*

It was difficult to find instances of the erratic-waver on phonograph records, because nearly all singers commanding popular attention have a vibrato. Fig. 63 most clearly approaches it, although there is an even cycle of some sort present near the beginning. It may or may not be a vibrato.

[8] The cycles of successive frequencies in the vibrato are ordinarily accompanied by cycles of energy in phase with it, but as mentioned in Part I, these factors are not here taken into account because of great errors involved, and because of our imperfect knowledge of the relationship between energy of vibration and perception of intensity.

The erratic-waver occurred among the singers with vibratos when they strained, either on a high, low, or loud note.

This voice-pattern is not necessarily a fault, as it may be a better medium of expressing humility and simplicity, for example, than the rich vibrato.

Slow Quaver. The only instances of the slow quaver among the folk songs are to be found in No. 1, "Ah Ray." Fig. 64 shows essentially the same voice pattern, with variations in rate and extent.

The slow quaver sometimes has a perceptible rhythmical alternation of a short and a long cycle. For the most part, its changes can be heard as different pitches.

In Fig. 64, A, the upper and lower limits of the second cycle are a fairly straight line, indicating that notes are defi-

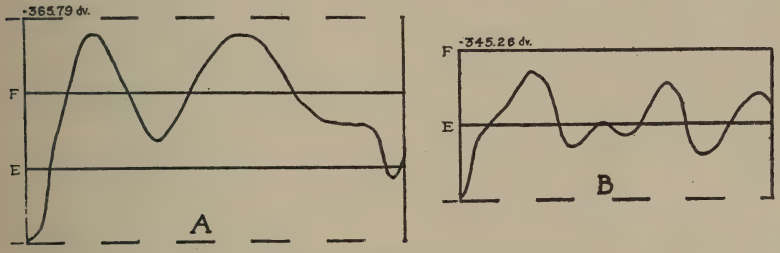


Fig. 64. Slow Quavers.
A. Chicago Bound Blues. Columbia. 14000-D. Sec. 74.
B. Any Woman's Blues. Columbia. 13001-D. Sec. 171.

nitely heard at those points. The same thing occurs on some of the quaver cycles on the graphs of song No. 2.

Interpolated-tone Patterns.[9] This pattern has been put to many variations in our folk songs. Some of the tones interpolated between two tones on the same general level have been intonations, some notes, and others could be classed as either.

[9] In a conversation, Mr. Ballanta suggested to the writer that the interpolated tone probably originated from the tone-languages of Africans. The African sings much as he speaks, Mr. Ballanta said, and when he speaks the pitch position is an integral part of the meaning of a word. (Jones and Plaatje, *A Sechuana Reader,* p. xxv.; *Introduction to the Study of African Languages,* p. 79.) A syllable spoken on a high pitch

Each pattern has its own peculiar rhythmical grouping of notes, the interpolated tone being either near the beginning of the pattern, toward the center, or close to the end. There are examples where the interpolated tone is the shortest tone of the complete pattern, and where it is longer than one of the other tones, but in none of our examples has it been longer than both.

The interpolated tone varies in interval, examples being found among the graphs varying from a half-step to five half-

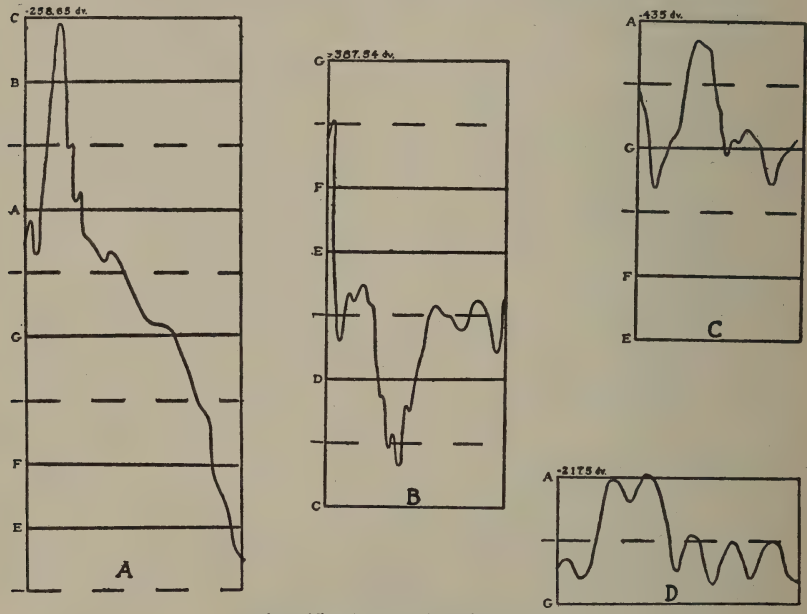


Fig. 65. Interpolated Tones.
A. Chain Gang Blues. Columbia. 14049-D. Sec. 75. *Ball.*
B. Anybody Here Want to Try My Cabbage. Columbia. 14063-D. Sec. 77. *Way.*
C. Cemetery Blues. Columbia. 13001-D. Sec. 73.
D. Chain Gang Blues. Columbia. 14049-D. Sec. 22. *Day.*

means something quite different from the same syllable spoken on a low pitch. The interpolated tone in American Negro singing, according to Mr. Ballanta, is the vowel pitch of African speech, while the other two tones in the complete pattern belong to the melody of the song. This may possibly account for the origin of inserting a tone within a tone, the writer assuming the responsibility for correctly interpreting Mr. Ballanta.

steps. It is essentially a part of the melody when it is a note or close to it, but it is "neutral" when a type intonation. Sometimes the tone interpolated is upward, and sometimes downward, from the two tones grouped with it.

The four examples of Fig. 65 show a few of the variations.

Classification of Voice Patterns of this Collection. The question as to which of these patterns just described are distinctively American Negro must await phonophotographic studies of European and African folk song. Undoubtedly many of them are common to both types or occur in any untutored singing, but it is difficult to state at the present time any comparison other than that between Negro singing and artistic singing. Table VI is presented as a classification of *kinds* of voice patterns.

TABLE VI

1. Notes
   1. Irregular and widely variable vibrato
   2. Erratic-waver
2. Intonations (As a separate tone or in attack or release)
   1. Rising
   2. Falling
   3. Circumflex
   4. Inverted circumflex
3. Succession of notes
   1. Interpolated-notes
   2. Grace-notes
   3. Slow quaver
4. Succession of intonations
   1. Rising with circumflex
   2. Circumflex with falling
   3. Rising tone with rising tone
   4. Rising tone with falling tone, and vice versa
   5. The dip
5. Succession of notes and intonations
   1. Interpolated-intonations
   2. Falsetto-twist
   3. All intonation types in attack or release of notes

Dialect in Negro Songs. Negro dialect has become such an integral part of Negro songs that even after it passes from

American Negro speech some of the more evident dialect sounds will probably be left in singing. Such syllables as *mah, de, doan,* and *Lawd* have a secure place. This section is devoted to a description and explanation of some phases of Negro dialect, in the hope of clarifying a number of problems rather loosely considered in books on Negro music.

The African slave referred the new sounds he heard in English to those most like them in his own language. Not alone many sounds of English, but combinations of sounds, were strange to him. Both his ear and speech motor habits had been set to function differently than in English.

When Westermann asked an African (an Ewe) to pronounce *book, school, sugar,* and *matches,* the response, in order, was *buku, suku, sukli,* and *matsisi.*[10] Meinhof found still more radical deviations. A Kafir pronounced *scrub* as *kolo'ba,* and *governor* as *i-r'uluneli-.*[11] The early slaves probably made similar pronunciations at first, and their spoken English was as different a language from ours as their own had been. The slave, therefore, had to learn new habits even though handicapped by older and opposing ones. The Negroes as a group probably stopped in the learning process at the point where the sense was conveyed.

The African languages as a whole (with the exception of Helos and some East Coast peoples) seem not to contain the *th-* sounds, as in *then* and *thin.*[12] The voiced *th-* (*th*en) was heard as *d,* and the voiceless *th* (*th*in) as *t.* Some writers have spoken of the Negro "dropping the final *h*" when he substitutes *t* or *d* on *th*en or *th*in. There is in reality nothing "dropped," but one sound is substituted for another. The same applies to "dropping the final *g*" in *singin'.* The [n] and [si*ng*] sounds are quite different, and when heard the [si*ng*] is not [n] plus [g].

[10] *Grammatik der Ewe-Sprache.*
[11] *Hottentottische Laute und Lehnworte im Kafir.*
[12] Koelle, *Polyglotta Africana.*

Englishmen and many Americans have a tendency to glide into an extra vowel of lesser prominence on such syllables as *go* and *day*.[13] The [o] becomes [ou] and [e], [ei]. In most African languages the vowels are "pure," that is, they are of approximately the same timbre throughout. The "pure" vowel is a part of Negro dialect. Even the educated Negro would respond to my request for a blues with, "Those songs are very *ba-a-ad,*" whereas, as a Northerner, the writer was accustomed to *ba-a-ud*.

Crabtree says, "The African way (of sounding an [o]) is to use full lip-rounding and much less lowering of the back of the tongue. Hence the African sound always has a suspicion of the [*aw*] sound."[14] The American Negro likewise has some such vowel. In this study one singer would ramble from [o] to [*aw*] even in the same song. In No. 25, "Shot Ma Pistol," the *oh* of *oh, Lawd* was made with lips in the [*aw*] position, and the *Lawd* with lips in the [o] position, but of course the sound in the latter case was still more [*aw*] than [o].

The African indulges in a wide variety of single vowels and consonants, but his speech habits do not include intricate combinations of sounds. His syllable is always ended with a vowel. Meinhof states, "A process which is very familiar to us and has largely modified the sounds of our own language, is the combination of consonants. But this is not of frequent occurrence in the languages of the black races—I mean those belonging to the Bantu and Sudanian families. These in general follow the rule that every consonant is followed by its vowel; a close syllable—that is, one ending in a consonant, is unknown, so that no combination of consonants can take place."[15]

The Negro at first may have made the final consonant of English words an initial. This he did by adding a vowel which had a tongue position near to the place the tongue occupied in

[13] Jones, *An Outline of English Phonetics,* p. 22.
[14] *Primitive Speech,* pp. 26-27.
[15] *Op. cit.,* p. 65.

pronouncing the consonant. In *Ma-tsi-si* for *matches,* the [s] at the end was made an initial consonant of a new syllable of which [m*ee*t] was the vowel. But this threw the word out of balance, and he was better understood when he made two syllables of the word. In that case he probably dropped the final consonant, and his syllable still ended in a vowel. So today, even when there are two consonants ending an English syllable, the Negro leaves out one, or even both when they are not necessary to convey the meaning.

The use of the vowel-ending syllable in African languages may have something to do with the presence of the enclitic which is written as *-a-*. As an example, Odell Walker sang *which-a-way* for *which way.* The same may apply to other enclitics reported by Murphy.[16] We would expect their presence when the final consonant could not be dropped without changing the sense. Work says this custom was much more common in the past than it is now.[17] It is possible that the *-a-* has become firmly attached to certain phrases; even though it is not the part of the dialect it may once have been. Today a phrase often begins with an enclitic.

The syllable divisions of the written words of the pattern notation do not always follow the authorized dictionary usage. Words like *nu-thin',* in "On Ma Journey," *cros-ses,* No. 2, *hea-ven,* No. 6, *Mo-ses,* No. 7, *hea-vy,* No. 8, and *li-vin'* or *di-vin',* No. 21, have the consonant shifted to the last syllable. There is room for speculation as to whether the vowel-ending syllable of African languages is not the cause of this transfer. Each of the first syllables above ends in a spoken vowel because of the shift of the consonant.

Meinhof has no records of diphthongs such as are heard in English.[18] The Negro hearing English did not combine [*ah*] with [b*i*t] to produce our [b*i*te]. Instead he resorted to plain [*ah*], as in *ah'm* for *I'm.*

[16] *The Survival of African Music in America.*
[17] *Folk Songs of the American Negro,* p. 39.
[18] Meinhof, *op. cit.*

Some African languages do have a diphthong exactly the opposite of the English type, in which the first vowel is of little prominence and the second is stressed.[19] When the Negro makes an attempt at [b*i*te] instead of [*ah*] in speaking *I*, he sometimes uses the diphthongal characteristics found in Africa. That is, the [*ah*] is touched very lightly and [m*ee*t] is jerkily given the greater stress. There are Negroes who approach the sound of the English diphthong, but [m*ee*t] is not glided into but tacked on. A still different response to the trouble the English diphthong gives the Negro is found in his sharp division of some syllables into two vowels, somewhat the same, as *da-ade* and *cha-ain*.

Tempo. The unexpected tempo change of No. 20, "My Gal Ain't Actin' Right," is illustrative of the jerks introduced by many blues singers. About the middle of the song the movement is suddenly accelerated, and then slowly retarded to about the rate of the first half. A change such as occurs at the beginning of No. 21, "West Indies Blues," is probably only indicative of the singer's feeling his way into a desired tempo.

The most regular tempo over a long stretch is apparent on No. 21, Fig. 66, C, "West Indies Blues." "On Ma Journey" moves evenly with the exception of the slowing down at its close. No. 4, "Roll, Jerdon, Roll," has a sudden retardation in the middle of the song, when the two tones of *die* are held. No. 6, "Let the Heaven Light Shine," has a slackened tempo at the end.

"Shot Ma Pistol," No. 25, is the most irregular, the rupture occurring in the center of the song contributing most to the irregularity. There are many examples of temporary increases in speed, lasting one measure in No. 18, and two in No. 7.

No. 5, "All My Days" gives evidence of a consistent variation of tempo in alternating measures about halfway through. To a lesser degree the same is true of No. 3, "Burden Down,"

[19] Meinhof, *Lautlehre der Bantu-sprachen.*

but No. 1, "Ah Ray," has measures more than twice the length, and therefore the deviations are not as significant.

While the tempo is not uniform as in parts of No. 21 and the first part of "On Ma Journey," there are places where there is a very gradual change of tempo in a given direction. In general, No. 2, "Do Lawd," speeds up as it progresses. No. 3, "Burden Down," begins with a medium retardation and acceleration, followed by a gradual slackening. No. 9, "I'm So Glad Trouble Don't Last," No. 15, "John Henry," and No. 16, "Shoot Dat Buffey," gradually slacken as the end is approached. No. 14 is for the first part a medium progressive retardation.

The songs written in 4/4 time (all except No. 1 and No. 22) mostly group themselves between 100-300 hs. The fastest tempo is No. 16, "Shoot Dat Buffey," and the slowest, No. 6, "Let the Heaven Light Shine." No. 7, "Go Down, Moses," and No. 10, "Nobody Knows the Trouble I've Seen," have average measures between 300-400.

All in all, our work songs have the fastest tempo of all the group and the spirituals the slowest.

Intervals. It is the design of the Interval graphs to introduce the concept of interval *regions* on the scale instead of the conventional thinking of a single point. This *region* theoretically has the characteristics of a normal distribution, in which the largest number of cases are grouped close to the exact pitch, with fewer and fewer the farther away from the pitch intended to be sung. Such a normal distribution is evident on Unison (P1) of Fig. 68.

The concept of a *region* takes into account the personal equation in music. It can be applied to other musical elements as well as to intervals. No two people would have the same regional characteristics. One person might have a region with a narrower spread than another, indicating that by talent and training he is more liable to sing "in time" or "in tune." In comparing the intervals of artists with those of the Negro folk

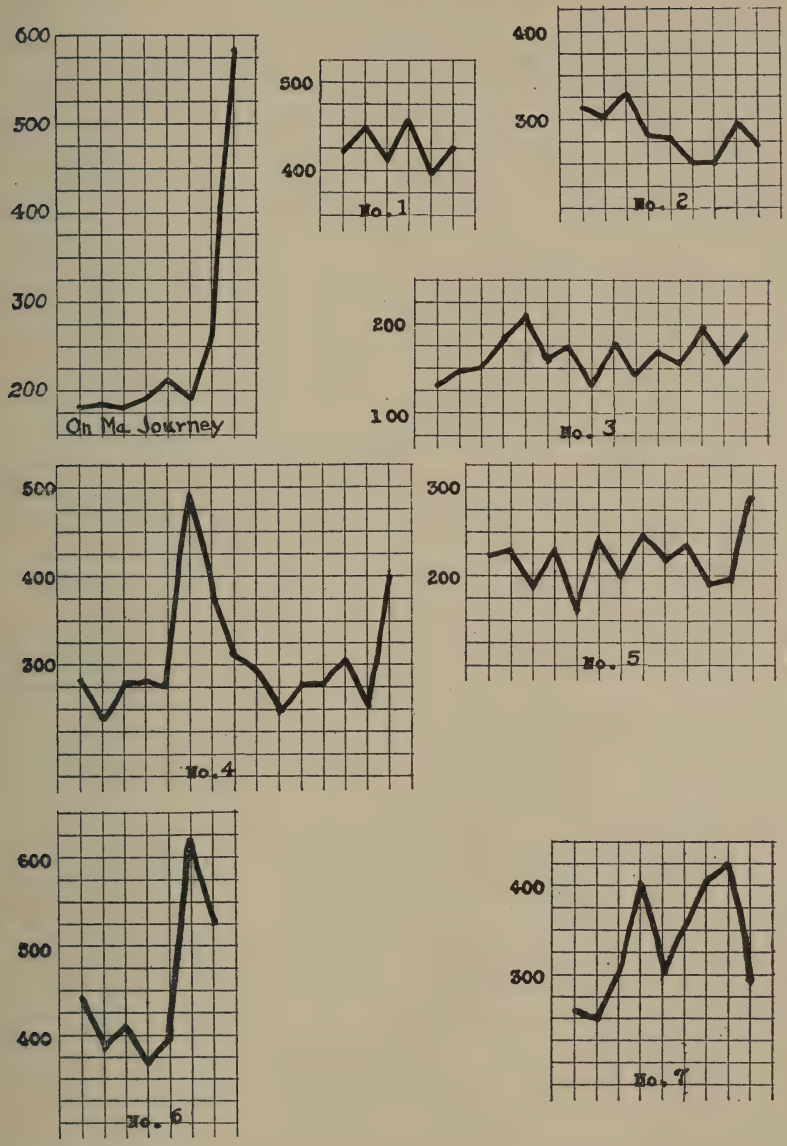
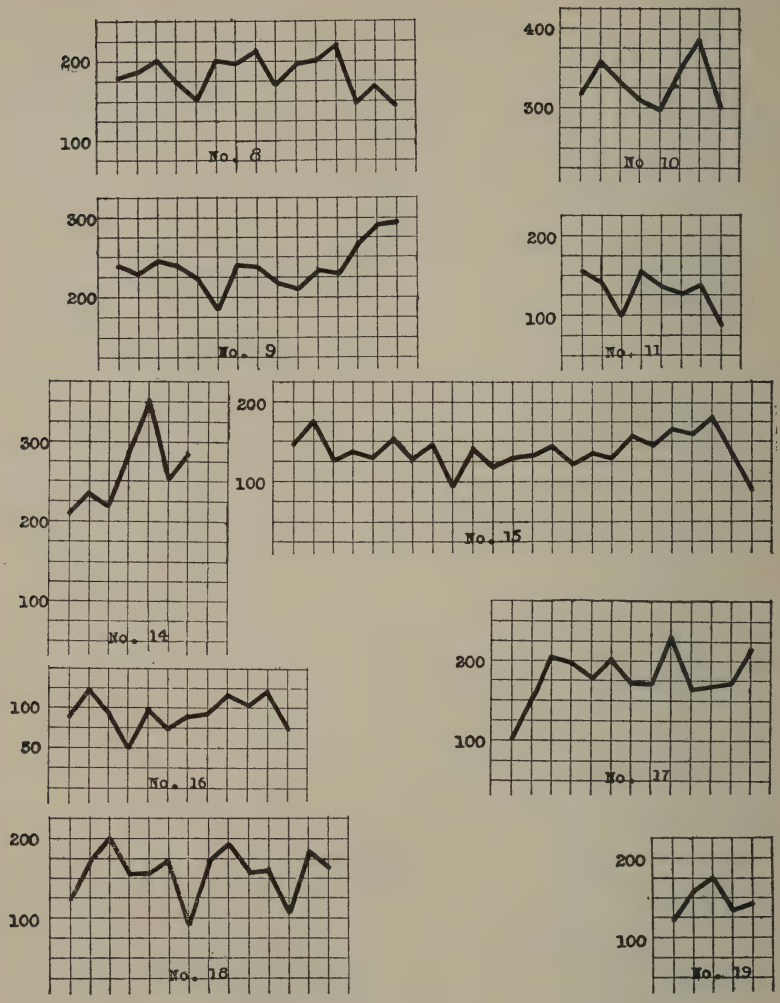
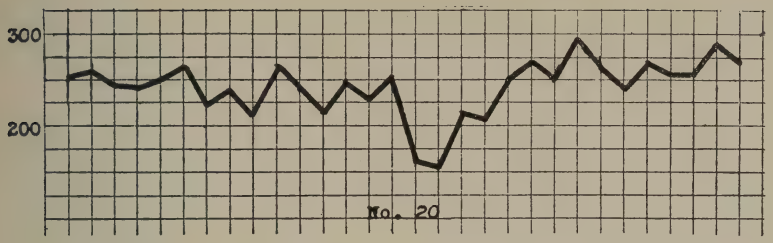
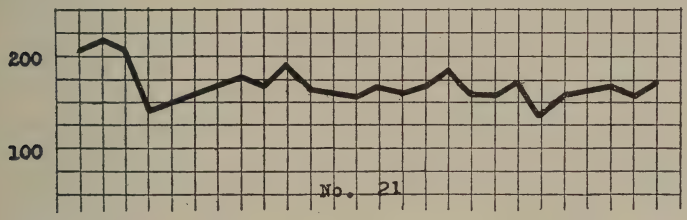


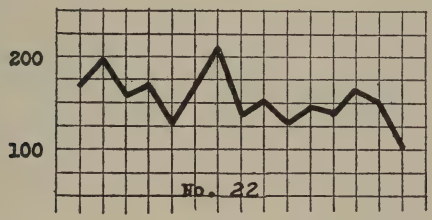
Fig. 66. A. Tempo. Each vertical square, 25 Sec. Horizontal, one square to a measure.

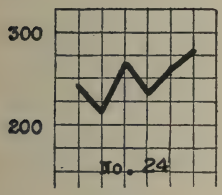


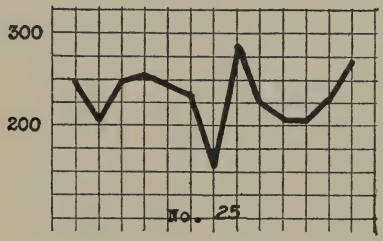
B. Tempo. *Continued.*











C. Tempo. *Continued.*

singers, there is no question but that the latter are more variable. Negroes do not make it a point to sing on pitch, even though their ability for singing intervals correctly may be about the same as that of an artist.

By comparing the relationships between *regions* it is possible to determine the intended intervals and scales of a folk music.[20] If the singer habitually sang a different interval than is included in the tempered scale, the *region* would be displaced on the scale. That is what happened in No. 17, "I Got a Muly" (First Version). Can any other interpretation be offered to the region on the Interval Graph, L, where the intervals group themselves between the key-note minor to major third, except that the singer meant to sing a neutral third? The proof here is that the region is centered half way between m3 and M3, whereas if the singer aimed at either of the exact half-step points on the scale above or below it, the region would be centered there. In all the other intervals of that song, there is a general tendency for the *region* to be concentrated about the half-step lines as a center.[21]

[20] A different conclusion has been reached by Sigmund Spaeth. ("How Good is Primitive Music?" in *Harper's Magazine* for March, 1928.) He states, "Granting that the primitives, like all other musical illiterates, do sing and play quarter-tones and even smaller intervals, there is no way of proving that they do this intentionally or that they are aware of the musical significance of the result. They are aiming instinctively at the intervals which create a common response in all mankind, but their ears are bad, and so they seldom if ever strike them exactly." Those intervals "which create a common response in all mankind" are a part of the "civilized, tempered scale," in the opinion of the above writer. When auditory habits are built up to hear music in terms of the tempered scale, deviations from it could easily be referred to its nearest half-step, and lightly waved off as sharping or flatting. With no better method of scale determination, it is true that "there is no way of proving" that primitives intentionally "sing and play quarter-tones and even smaller intervals."

[21] For such a determination of intervals, the more tones sung by a singer the better the result for conclusions based on his own pitch execution, and the more singers the better the result for a folk group. Right at this point, a recent quotation from Densmore ("The Melodic Formation of Indian Songs," *Journal of the Washington Academy of Sciences,* vol. 18, no. 1, January 4, 1928) will help to put the benefits of phonophotography in relief: "It would scarcely be possible to show, by any system of notation, the

In a statistical survey of all the previous-note intervals, the following is the order of interval frequency:[22]

TABLE IV

	Interval	No. of cases		Interval	No. of cases
1.	P1	282	11.	P4 ascending	42
2.	m3 descending	152	12.	P5 descending	14
3.	m3 (A2) ascending	135	13.	P5 ascending	9
4.	(M2) D3 descending	123	14.	P8 ascending	7
5.	M2 ascending	117	15.	(D5) A4 ascending	6
6.	(m2) A1 ascending	93	16.	M6 ascending	5
7.	m2 descending	72	17.	(M6) D7 descending	4
8.	(M3) D4 descending	70	18.	(m6) A5 ascending	3
9.	P4 descending	51	19.	(A4) D5 descending	2
10.	M3 ascending	47	20.	m6 descending	2

The key-note intervals are similarly presented:

TABLE V

	Interval	No. of cases		Interval	No. of cases
1.	P1	281	13.	(m6) A5 ascending	20
2.	P5 ascending	192	14.	(m7) A6 ascending	12
3.	M3 ascending	172	15.	(m2) A1 ascending	7
4.	(m3) A2 ascending	120	16.	m6 descending	6
5.	M2 ascending	84	17.	M9 ascending	5
6.	P4 descending	68	18.	(M2) D3 descending	5
7.	M6 ascending	59	19.	M7 ascending	5
8.	P4 ascending	49	20.	P5 descending	3
9.	P8 ascending	39	21.	(m10) A9 ascending	3
10.	m2 descending	34	22.	M10 ascending	2
11.	m3 descending	31	23.	(M3) D4 descending	2
12.	(D5) A4 ascending	28	24.	(A4) D5 descending	1

gradations of pitch that occur in the singing of many Indians during a period of an hour, and it would be even more impossible to study the music of a tribe or group of tribes by such a method." When the mean frequency of the patterns constituting a note is measured as the pitch heard, by the psychophysical law explained in Part II, the pattern notation reveals all the "gradations of pitch." In future studies, it might be advisable to draw a straight dotted line through the mean frequency of the graph-curve of a note, in order to represent the steady pitch heard. This would head off any misconceptions that the vibrato patterns might induce, concerning a lack of unity or "focus" of a note.

[22] For a translation of the terms of intervals used here into half-steps, the reader is referred to Table II.

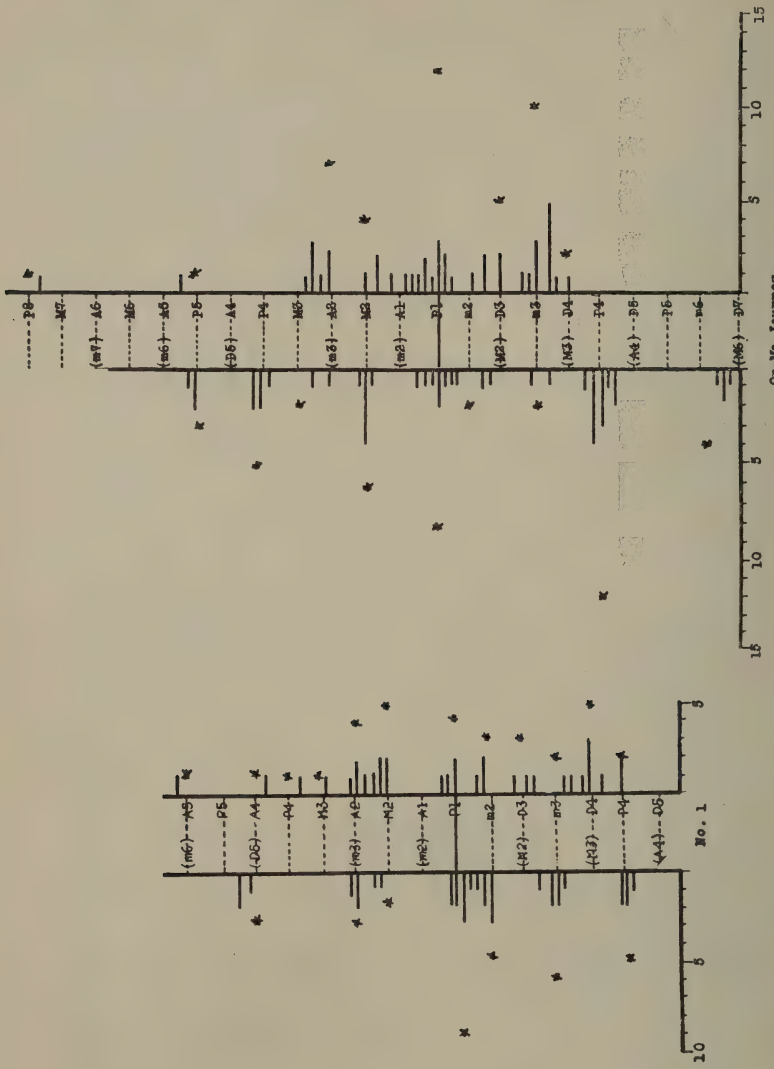
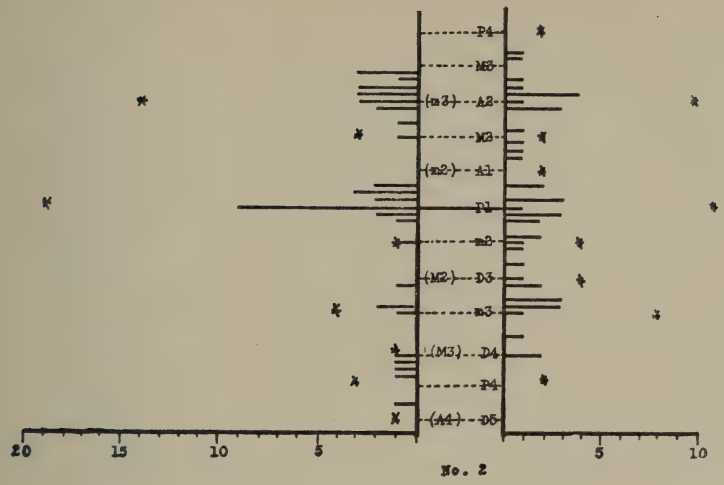
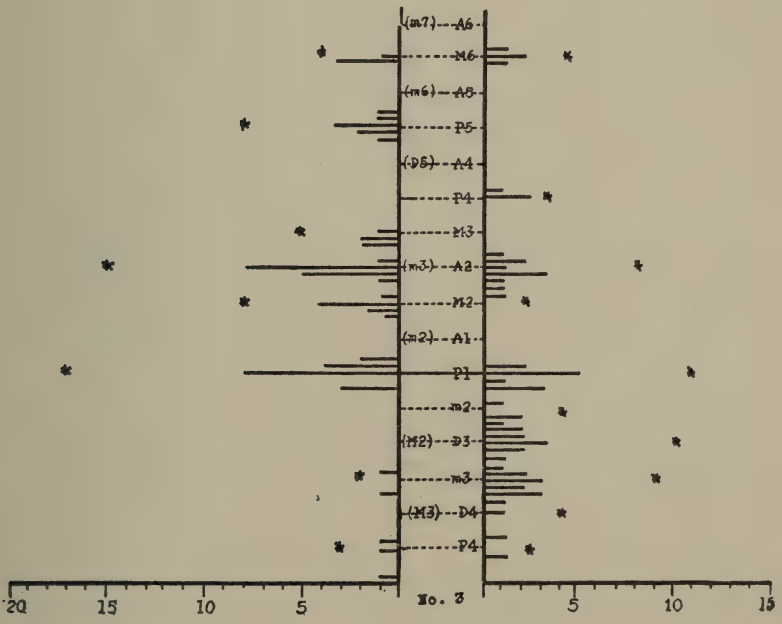


Fig. 67. A. Intervals. Left of pillars, key-note intervals. Right, previous-note intervals. Above Pl-lines, ascending intervals. Below, descending. Position of stars computed from conventional tone-symbols. Horizontal lines from mean frequency of a note, or slowest changing part of an intonation. Cf. Table II.

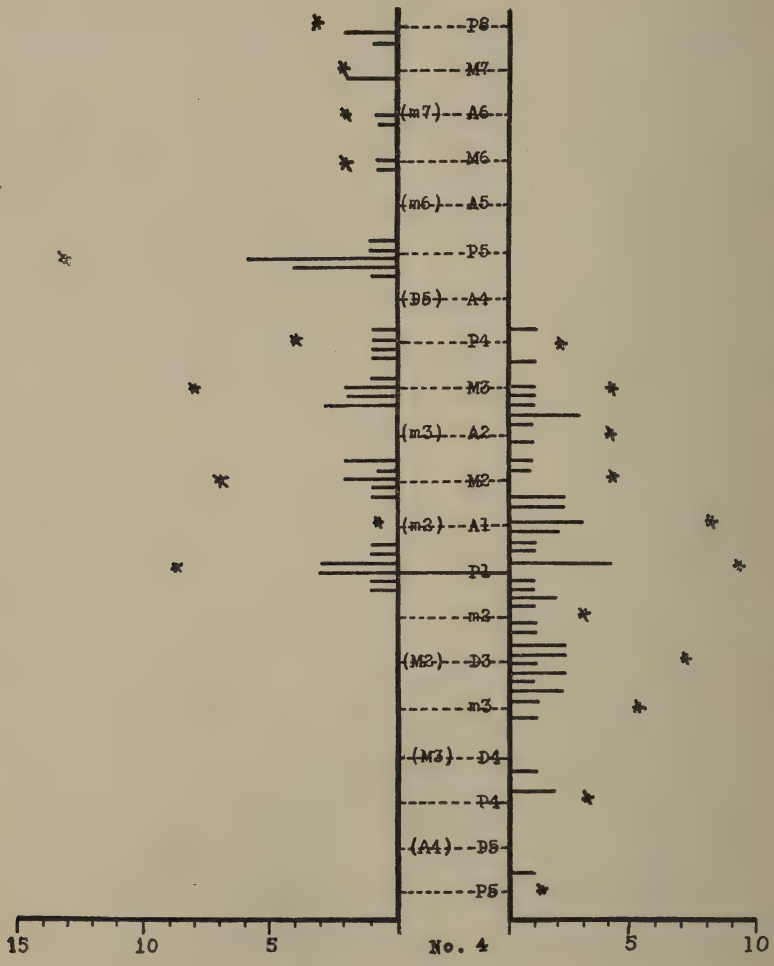


No. 2

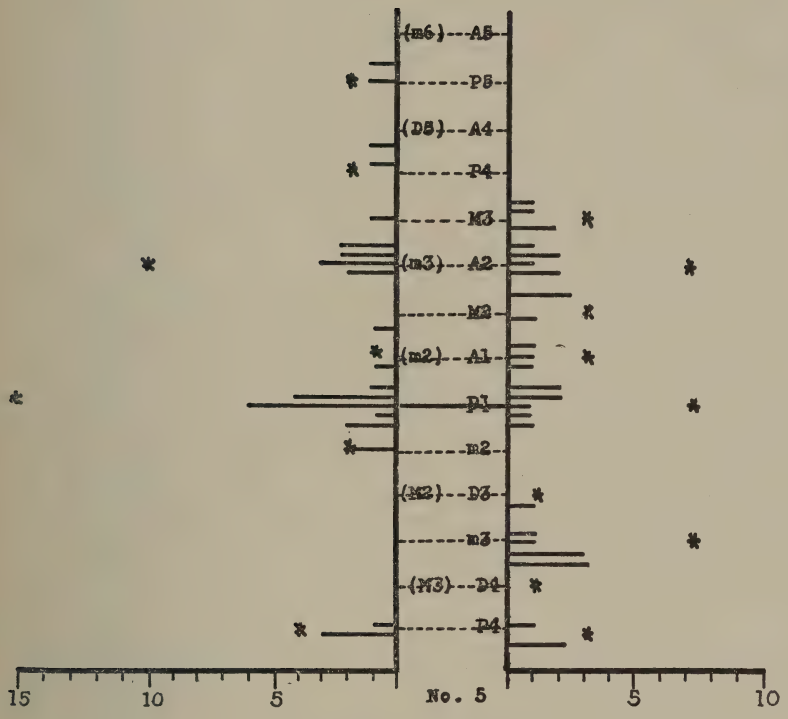


No. 3

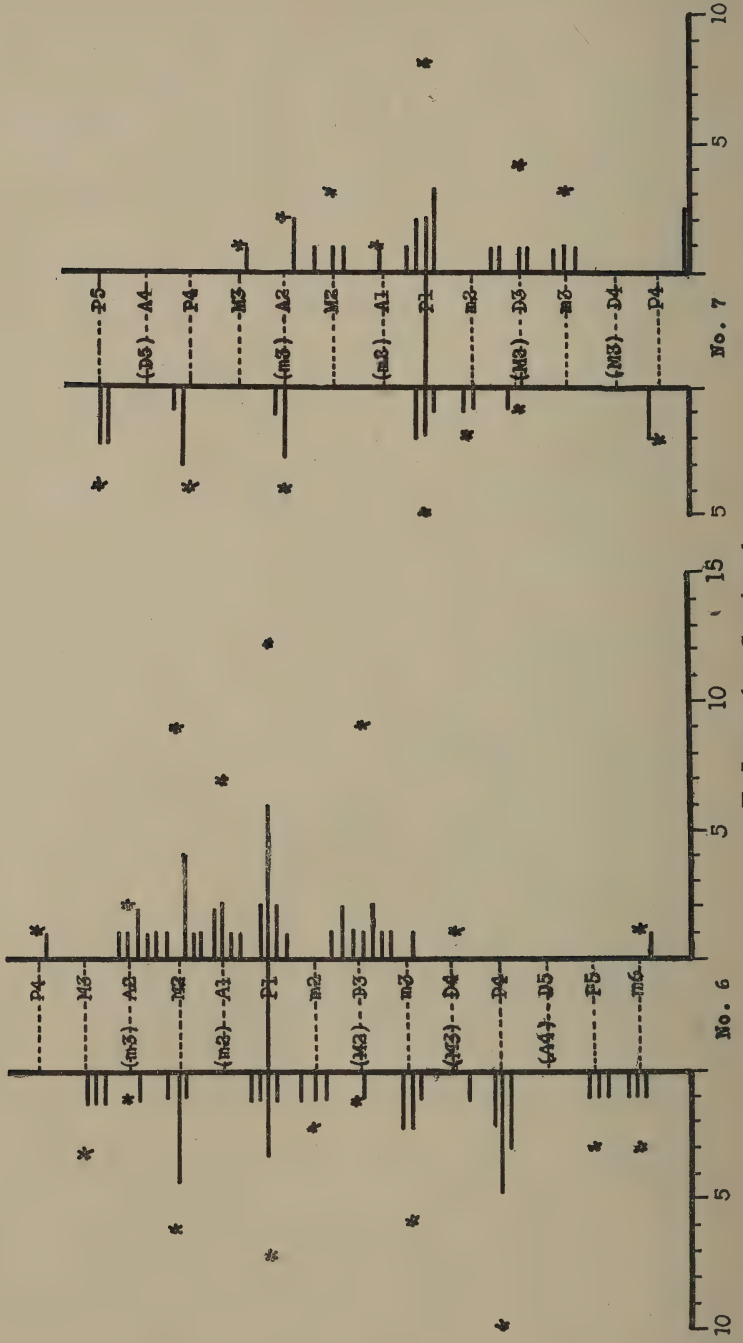
B. Intervals. *Continued.*



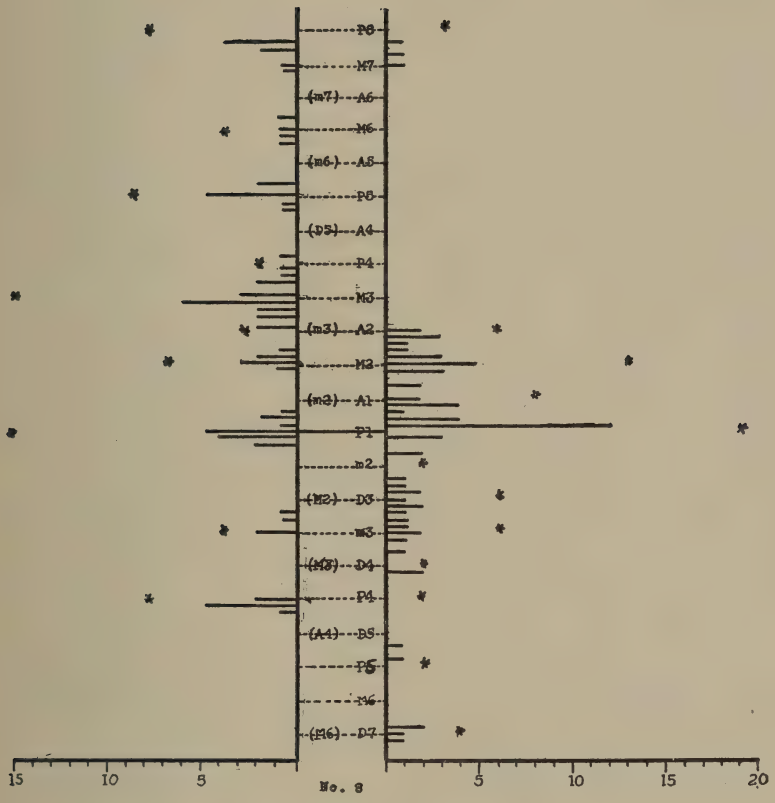
C. Intervals. *Continued.*



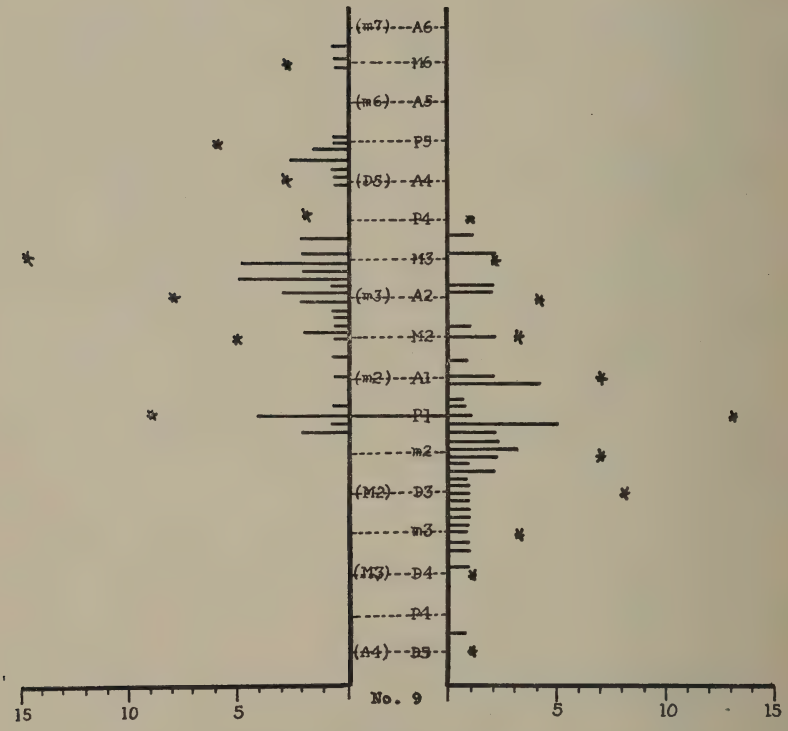
D. Intervals. *Continued.*



E. Intervals. *Continued.*

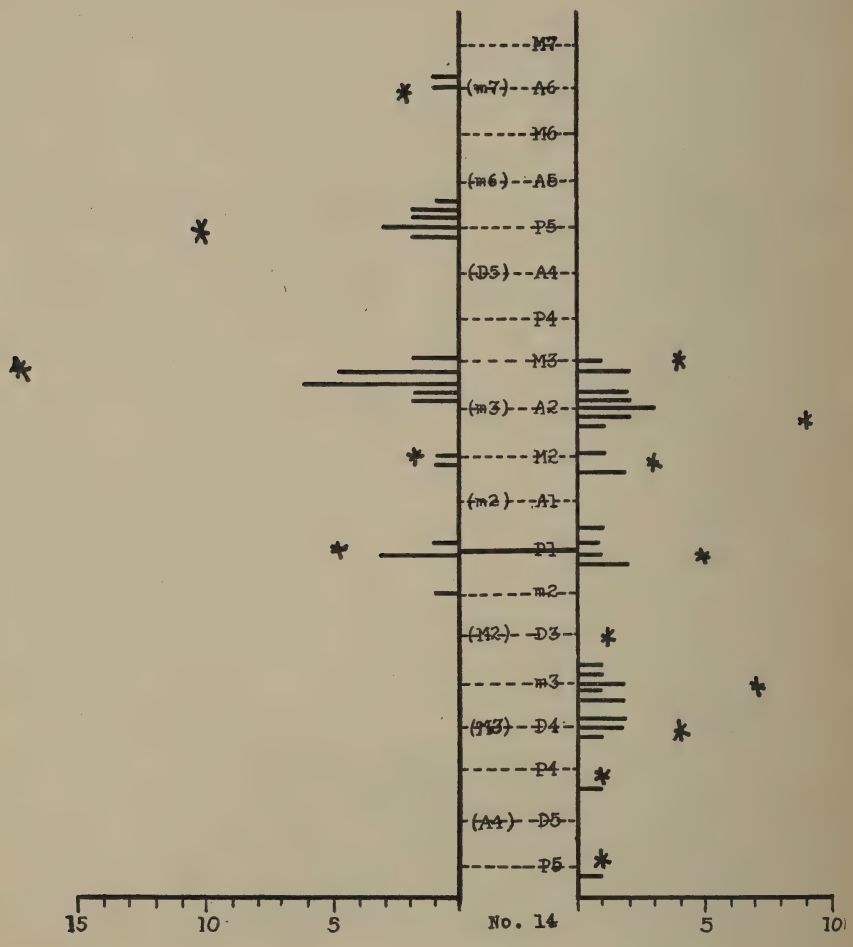


F. Intervals. *Continued.*

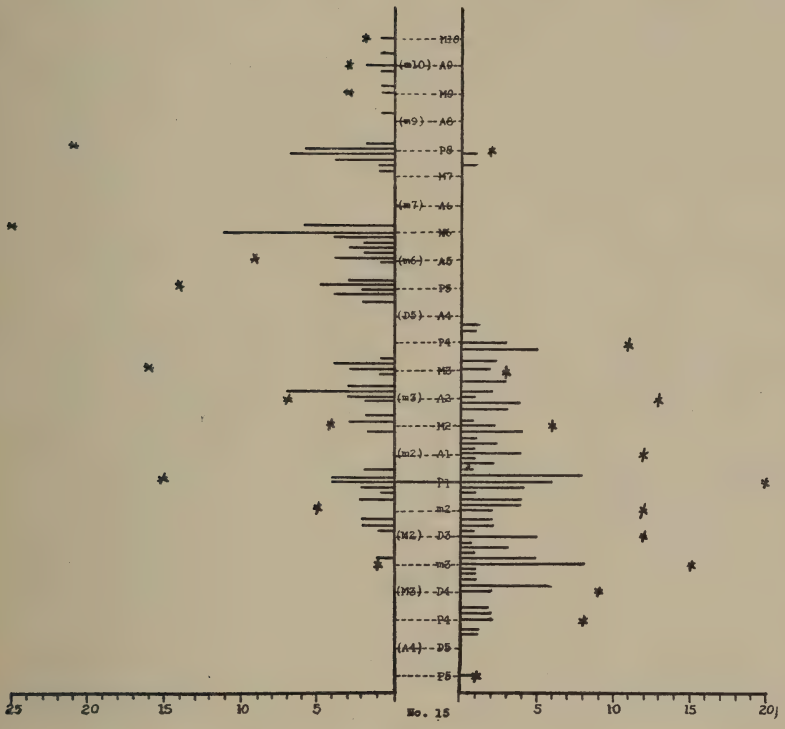


G. Intervals. *Continued.*

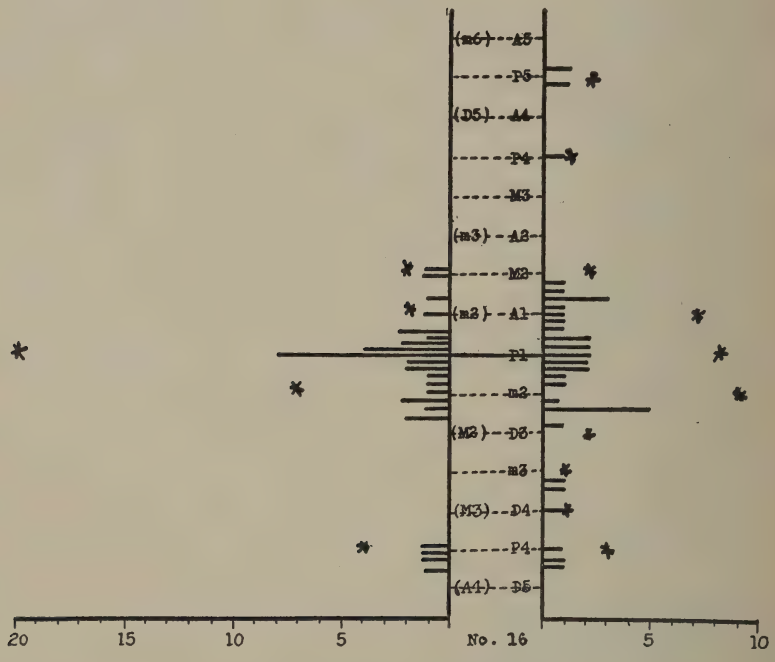
H. Intervals. *Continued.*



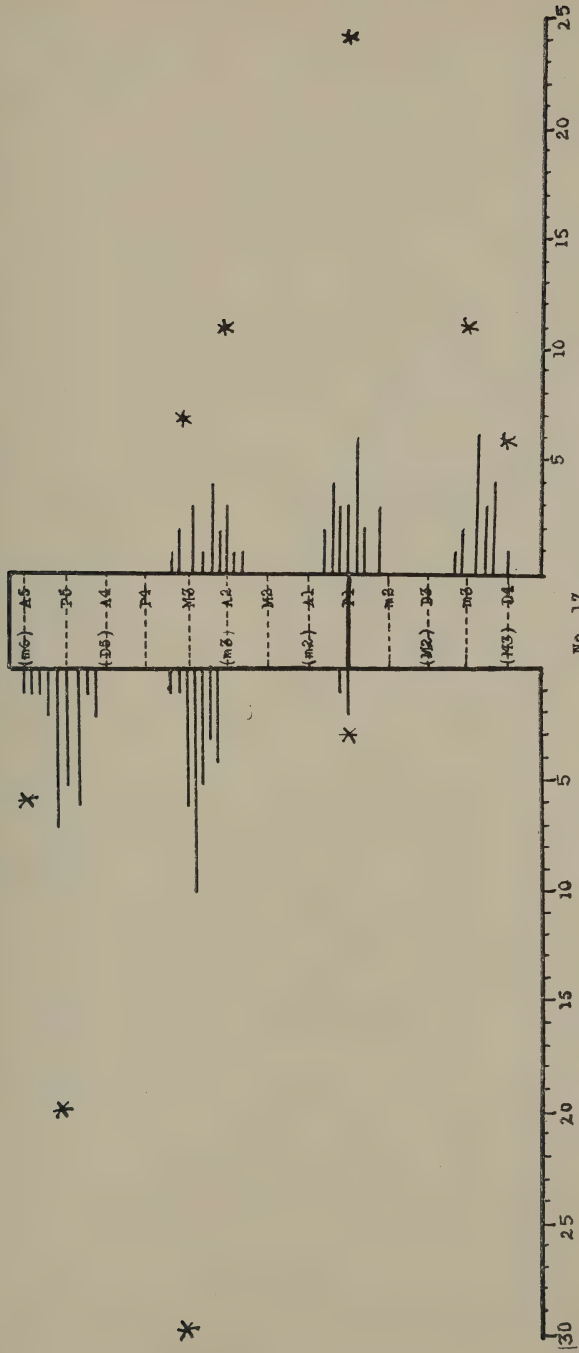
I. Intervals. *Continued.*



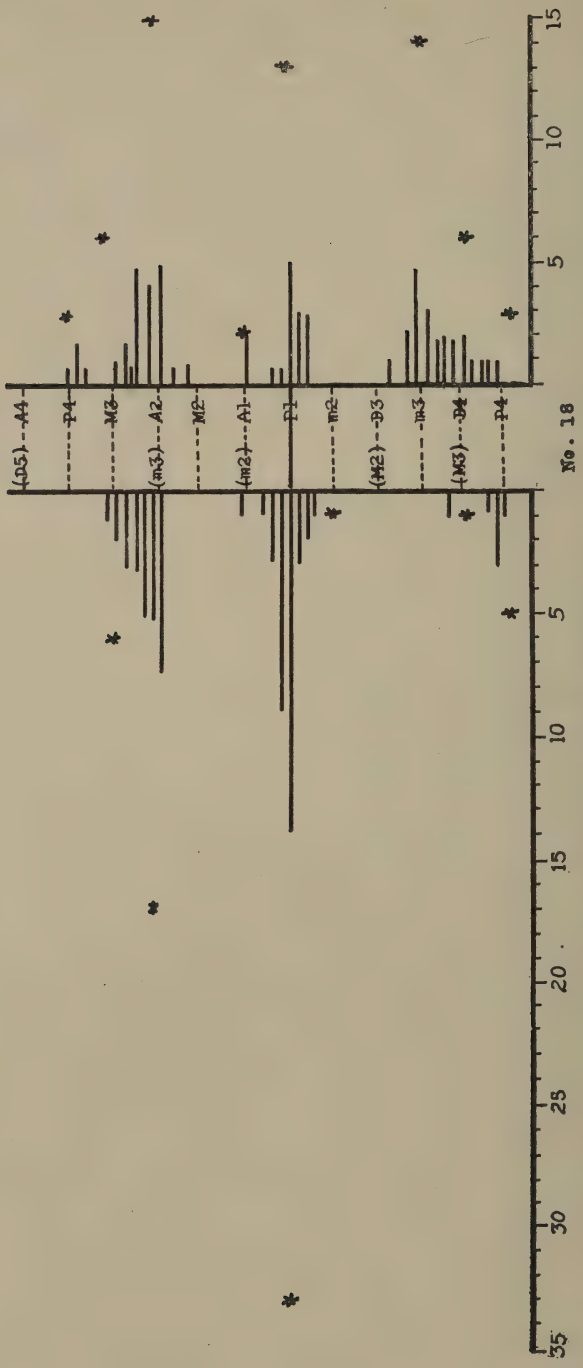
J. Intervals. *Continued.*



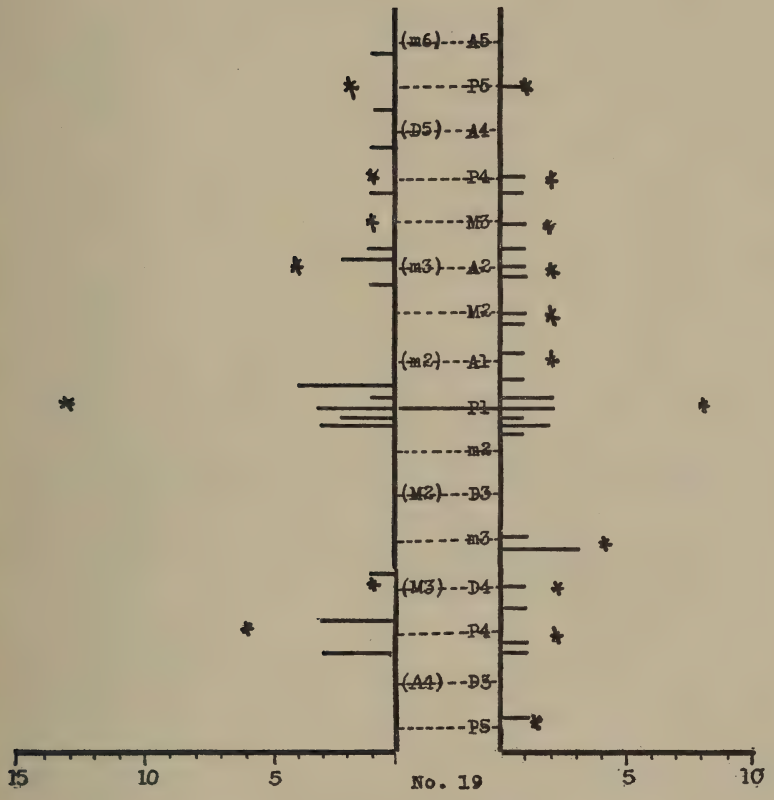
K. Intervals. *Continued.*



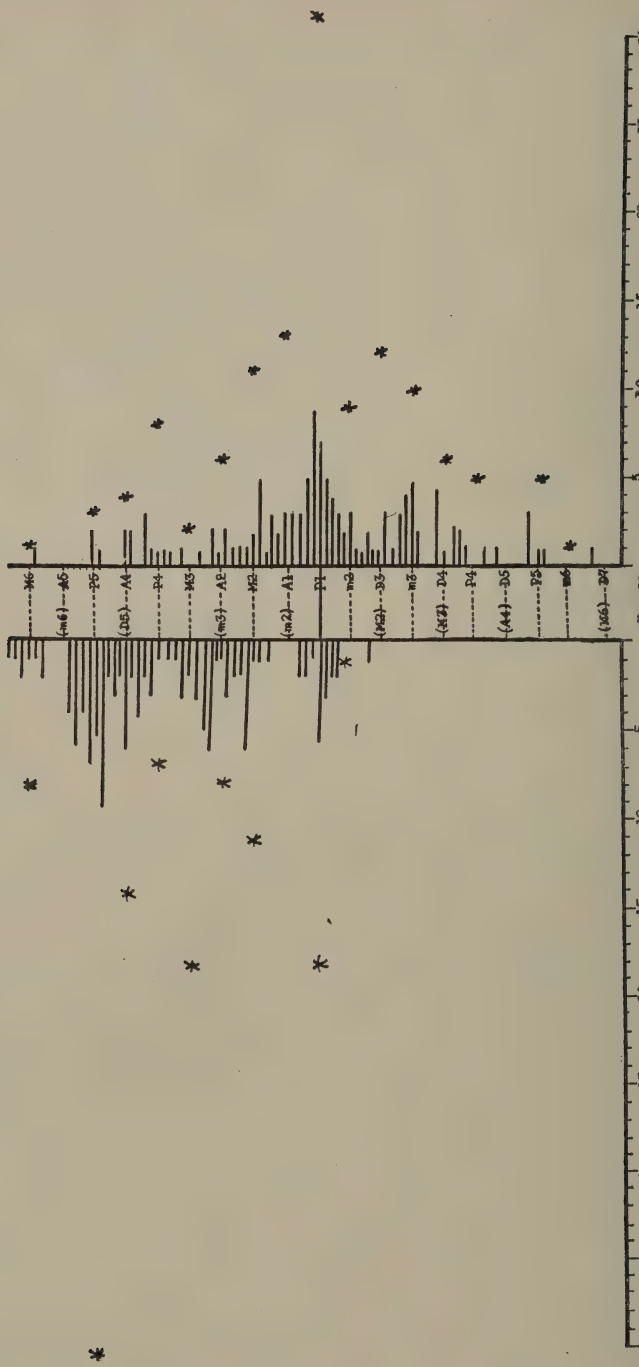
L. Intervals. *Continued.*



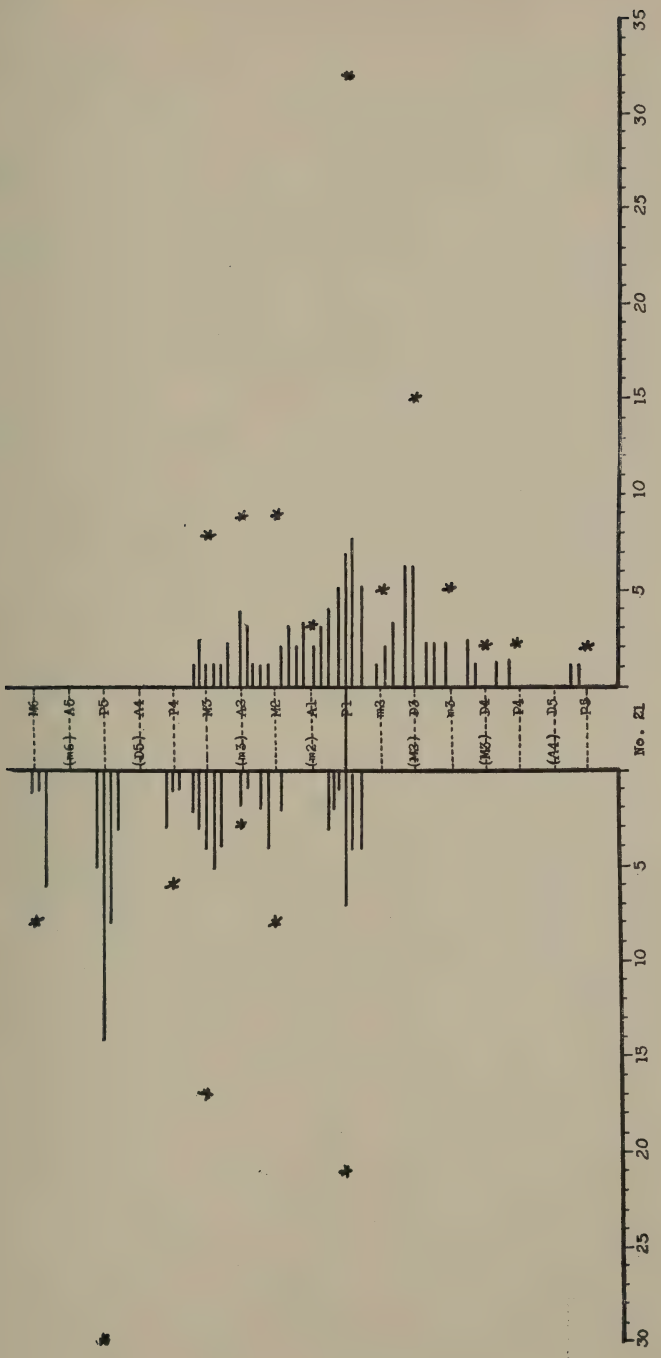
M. Intervals. *Continued.*



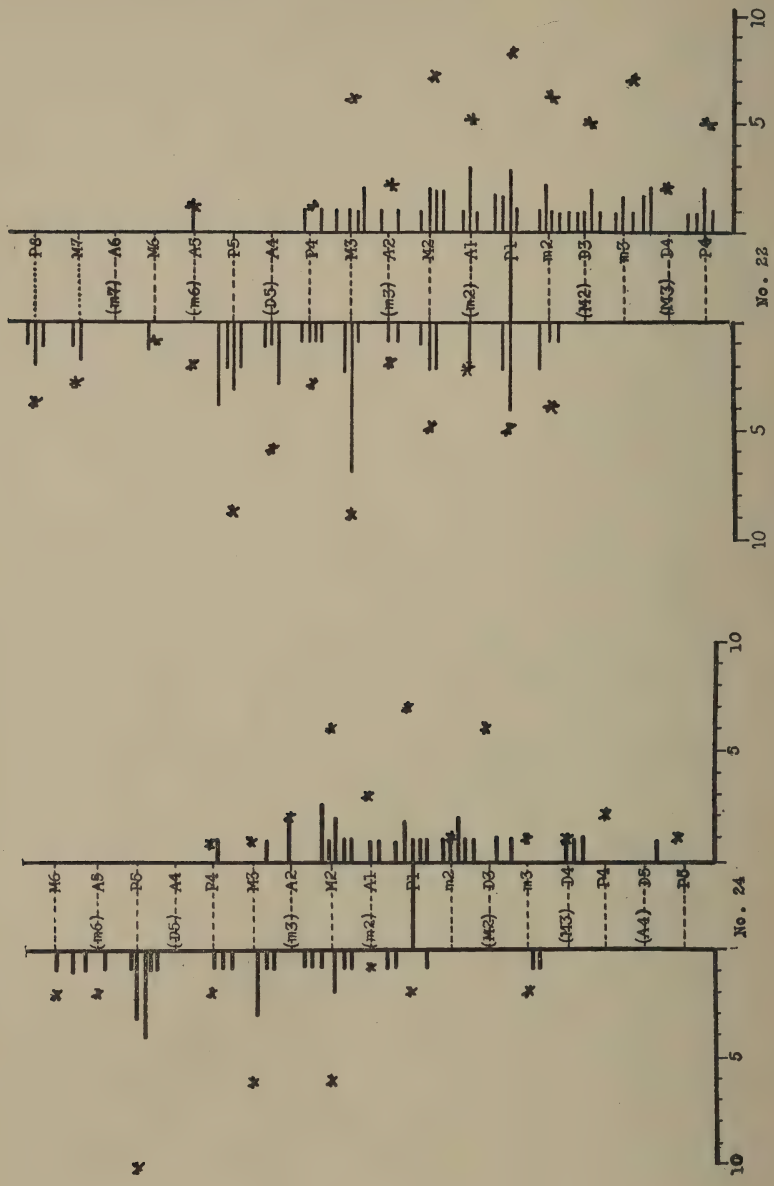
N. Intervals. *Continued.*



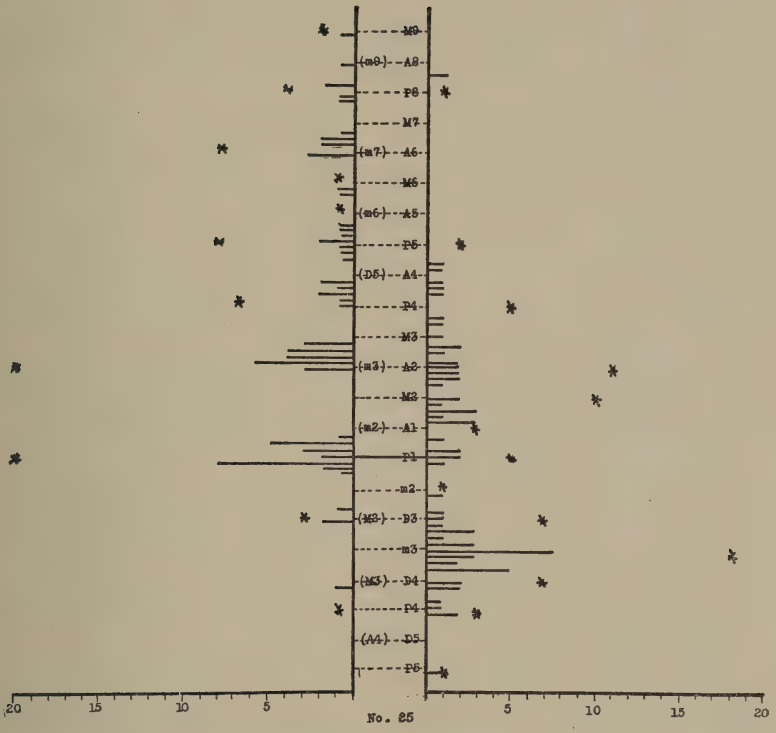
O. Intervals. *Continued.*



P. Intervals. *Continued.*



Q. Intervals. *Continued.*



R. Intervals. *Continued.*

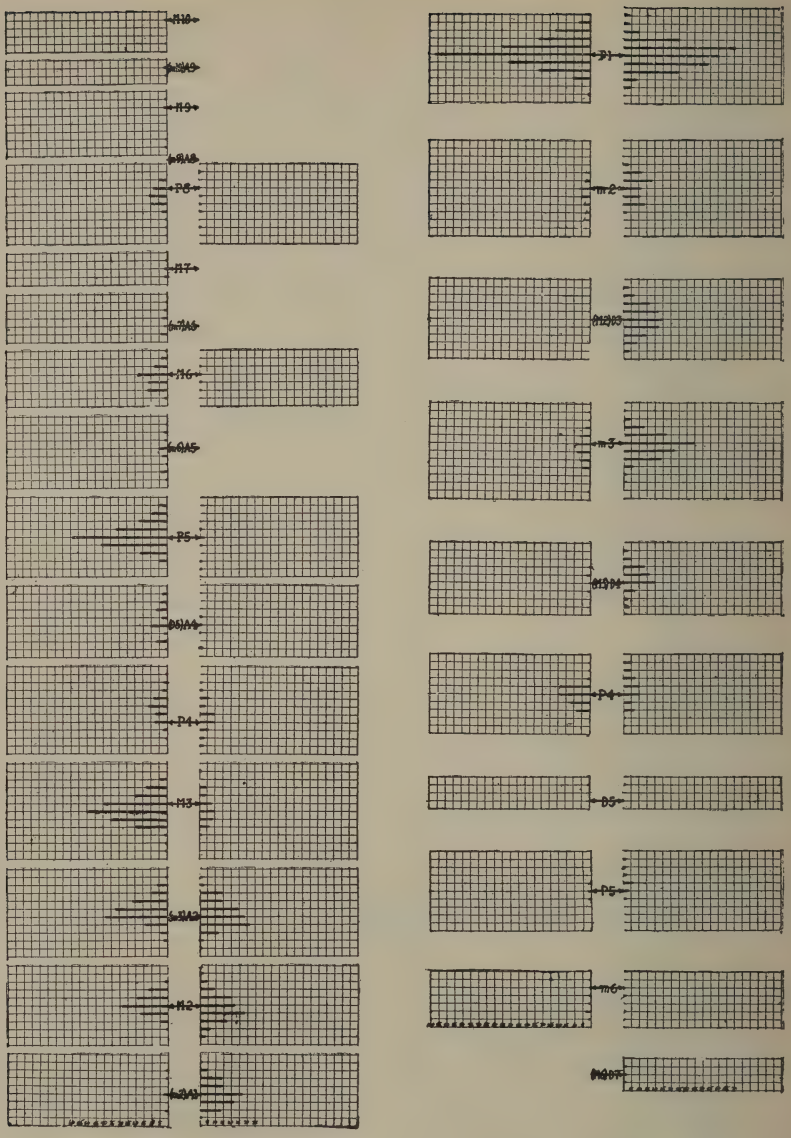


Fig. 68. Composite graph of intervals. Left half of graph, ascending intervals, which are from bottom to top, (m2) A1, M2, (m3) A2, M3, P4, (D5) A4, P5, m6 (A5), M6, (m7) A6, M7, P8, m9 (A8), M9, m10 (A9) and M10. Right half, descending intervals, from top to bottom, P1, m2, M2 (D3), m3, M3 (D4), P4, D5, P5, m6 (D7). Left of pillars in center of each half, key-note intervals. Right of pillars, previous note intervals.

Each vertical space— .1 step. Horizontal space—5 cases. The lines on the pillar represent the position of intervals named based on the even-tempered scale. Cf. Table II.

The key-note, the M3 and P5 ascending combined are used for 655 tones, while all the rest are sung on 569 tones.

To put the data of the two interval types together: among the key-note intervals more than half of the tones are in the major triad, these figures including both major and minor mode, and the minor third is the most frequent previous-note interval.

Much of the discussion of Negro intervals has centered about the minor seventh, and the "neutral" third, which is between the m3 and M3. There are examples of a key-note ascending minor seventh found in No. 4, "Roll, Jerdon, Roll"; No. 14, "You Ketch Dis Train"; and No. 25, "Shot Ma Pistol." The most evident cases of the neutral third are found in the first two versions of the work song, "I Got a Muly," Nos. 17 and 18. Each singer changed the key by shifting major and minor thirds, but the majority of tones were sung leaning toward an interval half way between.

The tones of nine of the songs are grouped for the most part above the key-notes, Nos. 3, 5, 8, 11, 15, 18, 20, 22, 24, and 25. Five have no tones below the key-note: Nos. 4, 9, 14, 17, and 21. Those evenly balanced are Nos. 1, 2, 7, 10, and 19, while two, Nos. 6 and 16, are sung mostly below the key-note.

No. 15, "John Henry," has the greatest range of key-note intervals, and No. 17, first version, "I Got a Muly," is the most confined. No. 8, "By and By," has the farthest extent of previous-note intervals, and No. 17 again has the least range.

All the conventionally notated songs have balanced directional trends of melody. The number of ascending previous-note intervals is almost the same as the number of descending. In No. 26, Obscene Song, there is a definite downward melody progression. The song begins high and gradually drops. Then it jumps quickly upward and works back down again.

Vocal Customs of the Negro. The Negro's freedom in singing is evidenced in a number of ways. In general, the limits

of this freedom are not those set by any aesthetic standard, but are merely physiological. At times he will sing as loudly or as softly as he can, his pitch swoops often may be as extended and fast as he can make them, his falsetto-twists as high and quick as possible, or he will sing as long as he can before taking a breath. Then he may go to the other extreme and offset speed with a slow pattern.

With all the repetition of words, melody, and rhythm, monotony is strangely absent. This is due in part to the variations of rhythmical patterns, and to the wide range of emotions expressed in the songs, as James Weldon Johnson[23] observes. Just as important is the Negro's wide repertoire of fast patterns, many of which are put in or left out at will. They are free lances, with no set position in a song, but are always present at some place or other. Within the patterns, the Negro invents many variations, or they may come as a consequence of his care-free attitude. It is these variations, as much as the flexibility of the patterns themselves, that keep his songs in a fluid state. He can jump from one exciting trick to another, and "nebber tire," filling his songs with a generous amount of ornamentation.

The same freedom is found in accompanying bodily movements. The voice plays against the hands and feet, the syncopations of the former being based on those of the latter. These effects are susceptible of endless change.

Singing is a pleasure and not a business to him. He uses his songs primarily to stir emotional experience within himself, and not in others. The fact that the latter is accomplished is only incidental. That he is concerned with his inner experiences, mostly emotional, is verified by the words of his songs, with the many *ah's* and *mah's*.

Another indication of the wide singing interests of the Negro, the "try anything once" spirit, is apparent from his range of songs, both in content and musical characteristics.

[23] *The Second Book of Negro Spirituals.*

PART V

EVALUATION OF PHONOPHOTOGRAPHY

The opening section was devoted to an explanation of photographic technique and graphic methods in phonophotography, and a definition of terms. In Part III, the folk songs were treated separately, the discussion of each case aiming to start an analysis of the pattern notation. In Part IV, a cross-section of Part III was ventured, in which the various voice-patterns, dialect, tempo, and intervals of the songs as a whole were described. Now some of the future possibilities of phonophotography and the pattern notation will be presented theoretically.

Distinctiveness of Negro Folk Music. In order to indicate the part phonophotography might play in some of the more involved problems of folk music, such a troublesome consideration as distinctiveness of Negro folk music will be outlined.

Discussion as to the distinctiveness of Negro songs has been obscured by confusing a number of problems. After reading the literature on the subject, one might distinguish the following points of controversy:

1. Are the songs of the American Negro his own composition?
2. Are they American?
3. Are they a part of the European musical system or are they a part of the African musical system?
4. Is American Negro music distinct from European and African music?

Unfortunately, these questions can at the present time be answered only by the opinions of various students.

The purpose of this section is to point out (1) the conflicting results that appear when the data on such problems consist of opinions, (2) the difficulties in the formation of opinions which cause the conflicting results, and (3) the value of phono-

photography in helping to arrive at a solution without personal bias.

Wallaschek opened a fiery discussion about American Negro songs when he said: "I cannot think that these and the rest of the songs deserve the praise given by the editors, for they are unmistakably 'arranged'—not to say ignorantly borrowed—from the national songs of all nations, from military signals, well-known marches, German student-songs, etc.; unless it is pure accident which has caused me to light upon traces of so many of them."[1] This challenge to the Negro as an original composer was answered by Krehbiel. The latter cited instances of the birth of folk songs among the Negroes, and upheld the position that if the majority of Negro folk songs were their own composition, plagiarism of European melodies in a lesser number of instances could not detract from the originality of the majority.[2] The African elements of Negro songs, which Wallaschek did not find in the limited number he observed, should have been given some consideration.

Wallaschek, in tracing the songs to European origin, disputed the right to call the Negro songs "American."[3] However, Krehbiel, Work, and von Hornbostel, are in agreement with Johnson's words: "This music . . . is America's only folk music and, up to this time, the finest distinctive artistic contribution she has to offer the world."[4]

The reasons advanced for the right of Negro music to be called "American" are environmental, and, neglecting other factors, refer for the most part to the poetic content of the songs. They hold that the Negroes were thrown from primitive surroundings into the middle of a civilized community, and that as a group their experience with musical interests has not been duplicated. Krehbiel sums up the environmental influences:

[1] *Primitive Music,* p. 61.
[2] *Afro-American Folk-Songs,* Chap. II.
[3] *Op. cit.,* p. 60.
[4] *The Book of American Negro Spirituals,* p. 13.

"As songs they are the product of American institutions; of the social, political and geographical environment within which their creators were placed in America; of the influences to which they were subjected in America; of the joys, sorrows, and experiences which fell to their lot in America."[5] Work's point of view is stated in his own words: "The American History and Encyclopaedia of Music, under the heading 'Negro Music and Negro Minstrelsy', contains the following statement: 'While not of a strictly American origin, they have undoubtedly gone to form the foundation of such Folk Song literature as this country possesses'. . . . It is true that the Negro Folk Song is not wholly American. . . . The literary and spiritual forces, however, are wholly American. The subject-matter and sentiment express American life."[6]

Von Hornbostel takes the following point of view: "I readily agree with what J. W. Johnson says in his excellent preface to *The Book of American Negro Spirituals.* . . . [Quoted above] But I cannot agree with these other words of his: 'The statement that the spirituals are imitations made by the Negro of other music that he heard is an absurdity.' Of course, they are not mere imitations, nor are they African songs influenced by the white man, but they are songs made by the Negro in European style."[7]

Allen concurs with von Hornbostel that Negro songs are a part of the European musical system: "There are very few [Negro songs] which are of an intrinsically barbaric character, and where this character does appear, it is chiefly in short passages, intermingled with others of a different character."[8]

On the other hand, Krehbiel, Work, Murphy, and Ballanta contend that American Negro music is a part of the African

[5] *Op. cit.,* p. 22.
[6] *Op. cit.,* p. 33.
[7] "Review of American Negro Songs," *International Review of Missions,* XV, 748 ff.
[8] Allen, W. F., Ware, C. P., and McKim-Garrison, L., *Slave Songs of the United States,* pp. vi and vii.

musical system. Krehbiel: "While their combination into songs took place in this country, the essential elements came from Africa."[9] Work: "The songs of the Negro can be unmistakably and plainly traced to African tribal songs. In scale, intervallic relations, rhythm, construction of melody, picturesqueness; in short, in vehicle, in frame work, there is very little difference between African tribal songs and the songs of the American Negro."[10] Murphy: "The greater part of their music, their methods, their scale, . . . came straight from Africa."[11] Ballanta: "No one who has been in Africa and has heard the music of the Africans would doubt the sincerity of the statement that the characteristics of the music of the American Negro could be traced to an African stem."[12]

This literature gives the impression that some of the authors who have formed opinions are thinking in terms of conventional notation. Thus, American Negro songs are judged by their appearance on the five-line staff, in comparison with the way European and African music looks on that notation.

From the standpoint of one studying the basic nature of music, and interested in the comparison of the different kinds of music formed by different groups, the nature of the music should not be considered as adequately represented on conventional notation. This is not to imply that conventional notation is of no value scientifically, since there are some features of music for which it is sufficiently accurate. The point is that *any evaluation of the distinctiveness of American Negro music based on conventional notation is only partial,* and is bound to lead to a neglect of characteristic features of that music.

The assigning of American Negro music to either or both the European and African systems evidently has been accomplished by a mental analysis, by each author, of the songs he

[9] *Op. cit.,* Preface, p. iv.
[10] *Op. cit.,* p. 29.
[11] *The Survival of African Music in America.*
[12] *Saint Helena Island Spirituals.* Foreword, p. vi.

knew. The judgment was based on the number of analyzed elements which were found in common with African or European music. This analytical procedure is probably satisfactory for the answer to a question of this kind, provided that more than a mental analysis be made.

One difficulty with a mental analysis lies in the fact that a student of music is deaf to many of those elements which are foreign to his music. The African, for the most part, hears the elements of his music in the singing of the American Negro, and very few of the European features. Another difficulty is that the entire range of songs in a given folk group may not be considered. Unless Negro folk songs are viewed as a whole, there is danger of a false estimation of the music. In bridging the gap between civilized and primitive music, the Negro sings some songs in which the analyzed elements are probably more often European than African, others in which the two are equally present, and others still in which the African elements predominate. In our present group, the work songs seem to have more of the latter elements, the blues and workaday religious songs partake of both, while the formal spirituals appear to lean toward Europe. A third subjective difficulty is the sifting of the songs because of aesthetic appeal to the collector, rather than to the folk singer.

It is possible, on the basis of present opinion, to view American Negro music as distinctive within the sphere of either African or European music. The greater problem lies in deciding whether Negro music is distinctive within the sphere of music in general. No one has ventured further on this problem than Curtis-Burlin who uses the term "new art form—African, though European."[13] There are others, like James Weldon Johnson, who maintain that the Negro has "produced fine and distinctive folk-art," but who do not place that distinctiveness, whether standing alone, or whether a part of another system.[14]

[13] *Songs and Tales from the Dark Continent,* p. xxi.
[14] *The Second Book of Negro Spirituals.*

Phonophotography will go a long way toward answering this question as to real distinction. With the basic knowledge of the nature of music which it gives, it will be possible to define terms as progress is made and set up standards of comparison and criteria of originality as such, coming to every conclusion only after rigid experimental and statistical treatment. All the factual problems of music may be solved without guesses or opinions.

In order to point out the phonophotographic attack that could be made, a number of criteria will be laid down, though the writer is agnostic as far as any solution is concerned.

Suppose that a criterion of distinctiveness is the proof that a synthesis has taken place, just as in chemistry only the right combination of H and O under the right conditions will produce water. In the case of the American Negro music, it might happen that when the African and European systems were thrown together there took place not an addition of the two, but a synthesis. Thus, Negro music might not be part African plus another part European, any more than water is part of either hydrogen or oxygen.

A synthesis may be said to have taken place when there is present in the result anything not found in the constituent parts, but which has a relationship to those parts. For example, in the speech of an African attempting to pronounce English words, such words as *i-r'uluneli* for *governor*[15] could be made the basis for a new language, both written and oral. *I-r'uluneli* is a combination of African and English, but it is a part of neither. It can be explained only in terms of what happens when the two language habits come together.

For purposes of illustration, with the realization that it is fragmentary, let us form a few standards of comparison for such musical elements as rhythmical patterns, the "neutral" third, the interpolated tone, the attack, the release, the vibrato,

[15] Cf. section on "Negro Dialect."

etc. To select such elements by analysis from pattern notation of different musics is to compare the different *kinds* of elements. Some may be found only in African music, and others only in European. Suppose that one of them, the interpolated tone,[16] for example, occurs in neither, and that such a new element may be explained as a result of the two systems coming together.

A second standard of comparison could be a difference in *degree*. For example, the attacks used in Negro music on the whole may be more extended than in any other type of folk music.

A third is *frequency*. Certain elements, such as the falsetto-twist, may occur in Negro music more often than in either European or African.

If about 75% of the elements of all classes of Negro folk songs, from the standpoint of *kind, degree, frequency,* etc., are in common with those of European music, it may be said that American Negro music is a part of the European system. If the same percentage can be found which relates to the African elements, Negro music belongs to the latter system. If the weight of the elements in common does not lean conclusively toward either European or African, and there are a large number of unique elements (the result of a synthesis, for example), then American Negro music may be considered distinctive.

It is possible to view this problem from another angle than that of the synthesis of elements. There is a synthesis on a different level which could be utilized in dealing with distinctiveness. In a Negro blues, there is a certain *group* of elements brought together, and it may be that the particular combination is not found in any other type of music.

Assuming that ultimately it will be proven that a synthesis of musics took place, it can be said that the difference of opinion as to whether Negro music is a part of the African or the

[16] Cf. section on "Interpolated Tone Patterns."

European system is due to the fact that students have mentally analyzed the elements, but have not recognized the synthesis from which they made the analysis. The reference of the elements of all classes of Negro songs to either European or African music has been partial to one side or the other, or else there could be no difference of opinion.

After the examples taken from phonograph records in the preceding Parts have been compared visually and auditorially, there seems little doubt about the incompleteness of conventional notation for folk music. It is too limited in scope and leaves out much that constitutes singing. In using it one writes folk music in terms of European music. The investigator must constantly refer what is heard to what is known about a different kind of music from the one studied. Conventional notation says nothing about the illusions to which the ear is susceptible, and the multitude of inaccuracies which are not so apparent until one begins to look at them critically. Contrasted to this is the pattern notation, which can be universally applied to any type of music, affording not only an insight into the nature of each but a convenient means for comparison of all types of music without bias.[17]

It is only when folk music is studied as it might exist in the mind of a musician who does his thinking in terms of conventional notation, backed by auditory habits of European music, that conventional notation may describe it fairly accurately. Truth, to a musician, is what he hears, and what he hears is largely accountable for in terms of the way he has been trained in auditory perception. Such individual subjective analysis is anything but a scientific account.

The same sound waves of Negro music affecting an African and a European musician create quite a different impres-

[17] The pattern notation has purposely been limited in its present state. The arguments here presented deal comparatively with the way conventional notation and the pattern notation represent correspondents of pitch and duration on the sound wave.

sion, judging from the differences listed above. In a subjective study of folk music there will never be a uniformity of description unless the musical talent and training of all students is the same. Only when musicians are confronted by an objective analysis of the sound waves in music will differences of opinion cease to exist as far as the factual problems are concerned. It is a disadvantage to be a trained, civilized musician in a solely subjective study of folk music.

Symbols are not the difficult part of the notating of primitive music. One could draw on a pattern notation a song as it was heard, bringing out the various known voice-patterns, by adopting a standard form of pattern. A regular wavy line would indicate the vibrato, the rising, falling, and circumflex intonations could be recognized and placed, the falsetto-twist would have its standard pattern symbol, and so on. But while this would be an improvement over the present system, it is obvious that it would not bring out many of the important facts of variability. Nor would it be possible to discover any new patterns or laws.

The ear notator's difficulty is due to the fact that there is not a perfect correlation between frequency changes of the sound waves and pitch changes in perception. Frequency of vibration results in some kind of pitch perception, but when the frequencies group themselves in definite patterns at a fast rate, there is more than pitch perceived.

One of the new perceptive categories has been called "sonance."[18] Sonance is neither pitch nor timbre, but it resembles the latter somewhat. A good example of the likeness was explained in the section on "Falsetto-twist," where the twist and whine sounded much alike, although the former can be shown as frequency changes in notation and the latter cannot. Timbre is due to a simultaneous fusing of different frequencies. Sonance results from a successive fusing of different frequencies,

[18] Metfessel, "Sonance as a Form of Tonal Fusion," *Psychological Review,* (Nov. 1926), pp. 459-466.

the changes taking place so fast that they pile up in perception. The inability to distinguish auditorially between timbre and sonance, except after it has been pointed out on the sound waves, is a great handicap in analyzing a song other than by phonophotography and measurement.

Phonophotography, by laying the foundation for definition of what a music is, by defining the terms used in music, by substituting objective experiments for opinions, and by the utilization of graphic and statistical methods, will assist in removing the uncertainties and prejudices that have pervaded the study of folk music.

CONCLUSIONS

1. The traditional concepts of music are insufficient to describe folk or primitive music. It has been necessary to lay the foundation for a new set of concepts based on measurement of the sound wave. Examples of these are *sonance* in perceiving successive sound-wave patterns, and *regions* in determining intervals.

2. Anything in speech or music may be measured and notated, including the trick ornaments, and tempo, interval, and rhythmical deviations.

3. By establishing psychophysical laws of relationship between neural action, muscular action, and the sound wave, and likewise the sound wave with action of the ear and auditory experience, the pattern notation will become a more complete record of the entire singing process.

4. Phonophotography lifts folk music out of the subjective and intangible into an objective, measurable physical reality. Many of the involved problems of folk music are now possible of solution.

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INDEX FOR MEANINGS OF TERMS