rempli d'eau; mais ce radiateur a un petit rendement à cause des pertes de chaleur provenant du rayonnement et de la convection.

Pour combiner la simplicité avec un rendement important, nous avons construit un radiateur métallique, clos et plat, couvert extérieurement d'une couche de noir de fumée, analogue au radiateur Romagnoli. Pour réduire au minimum les pertes par rayonnement et par convection, nous avons donné à ce radiateur une profondeur plus petite afin de diminuer la surface non attaquée par les rayons solaires, et nous avons en même temps placé celui-ci entre deux vitres, encadrées dans un châssis et distantes de quelques centimètres seulement.

De cette disposition, il résulte une augmentation considérable de la chaleur absorbée. Ainsi les expériences ont démontré qu'à une température supérieure à 50°, la chaleur concentrée est au moins double de celle qui est absorbée par un radiateur Romagnoli de même surface. A une température plus élevée la différence est encore bien plus accusée; enfin, au moyen de notre radiateur, il a été possible de distiller de l'eau à la pression atmosphérique normale.

ΜΟΥΣΙΚΗ.—**Some results of the study of American indian Music,** *by* ***Frances Densmore.*** Presented by Const. Maltezos.

First of all, let me express my high appreciation of the honor of the invitation from M. Const. Maltezos, asking that I send him a note upon my study of Indian music, for transmission to the Academy of Athens. I am aware of M. Maltezos' deep and extended research in the music of ancient peoples, in both the old and new worlds. To that research he has brought the scholarly attainments of the physicist. My own work is done from the standpoint of a musician and an observer of human nature. Music is essentially a vital and human expression, especially in a primitive race like the American Indians. It has been said that «the North American Indians give us a fuller knowledge than any other existing race affords of the manner of working of the primitive creative mind». The study of Indian music has, therefore, a relation to the subject of primitive music in all races.

The Indians living in North America did not share the high development of those living in Central America and in certain parts of South America. There are no records in stone to tell us of their early art. The minds of the old men were the repositories of the wisdom and

experience of the tribe, and it was the duty of the old men to transmit this orally to the next generation, each man instructing his oldest son. In development of memory the Indian excelled but in logic and in deductions from facts he did not excel. His culture and mental habit were not such as to produce a musical system, comparable, for example, to that of the Hindu or the Chinese. The Indians are not a homogeneous people or nation, but consist of many tribes which differ in language and important customs.

The following incident shows the manner of reasoning of a Sioux Indian who was highly respected among his people. He found a globular stone on top of a hill, similar to stones that were abundant in a river not far distant. On being asked how he explained the peculiar shape of the stone he said it had become globular by looking at the sun, since «things that look at each other for a long time will come to have a resemblance». He carried this stone on his person and attributed the good health of himself and his family to its presence. In order to stimulate the supposedly magic power of the stone he sang a song, according to an Indian custom which will be described in this paper.

Agassiz, the great naturalist, said that «the function of science is to strive to interpret facts». In the study of Indian music the facts are the vocal sounds produced by the Indians and recorded by means of a phonograph. The interpretation must concern itself with the life and customs of the Indian and withe his mental attitude. If we were to try to understand Indian songs without taking this into consideration we would become involved in a maze of speculation. Although we admit the kinship of all humanity, the Indian belongs to a different race than our own. His habit of thought and his standard of beauty are not like ours, and even more different is his idea of the function of music in his daily life. Music, to the American Indian, was not primarily an art to be cultivated for pleasure. It was one of the means by which he exercised magic and it lay, in part, in the field of religion.

In the oldest times of which we have any knowledge, the Indians believed that songs were received in dreams, and this belief continues to the present time among many old Indians. The «dream» of the Indians is a trance-like condition induced by abstinence from food and intense concentration of the mind. While in this condition the Indian imagines

himself visited by a supernatural being which promises its aid in any difficulties that may befall him. The mysterious visitant usually sings a song which the dreamer learns and is told to sing when asking for the promised aid. On awaking, he remembers the song and it becomes his most valued possession. It can hardly be supposed that such songs are based upon an intelligent musical system. The profound students and thinkers among the Indians were concerned with means of obtaining supernatural help, not with calculations nor material facts. They were mystics and their old songs cannot be separated from their mysticism.

A type of song which is probably as old as the dream song is that connected with myths and folk-tales, many of which were of cosmic significance and intended for the instruction of the people. Melodies were introduced at intervals during a long story and were sung by the narrator. In the most primitive tribe under observation the melody was sung only once, after which the narrator resumed the story. It appears that the song broke the monotony of the narrative in an agreable, rhythmic manner, and it usually represented the expression of some character in the story, either human or otherwise. For example, one story recorded by the writer was concerning a contest between a beaver and a plant called «fox-tail» to determine which could bring rain. Each sang his own magic song and the beaver produced the heavier downpour of rain. In explanation it was said that the beaver had a stronger supernatural helper than the flower. Should we expect to find, in such material, a consciously evolved musical system?

Permit me, at this point, to state that I began my study of Indian music in 1893 and have conducted that research for the Bureau of American Ethnology of the Smithsonian Institution since 1907. In pursuit of this study I have visited many Indian reservations and recorded songs on the phonograph and the dictaphone, transcribing and analysing more than 1600 of these records. For transcriptions I use the ordinary musical notation with only a few additional sings. If a tone is sung less than a quarter-tone higher than the indicated pitch I place a plus sign above the note, and if a tone is sung less than a quarter-tone below the indicated pitch a minus sign is placed above the note. A slight extension or diminution of the length of the tone is indicated by the sign for a «hold» placed vertically above the note, the opening of the curve being toward the left if the tone is shortened and toward the right if the tone is

prolonged. By this simple and familiar notation it is possible to present a large amount of material in a form that is convenient for observation. A more elaborate graphic representation would make it necessary for students to master a new medium of expression and, if it were accurate and adequate, it would require the services of a large staff of workers. The writer has no assistants and the opportunity to secure genuine Indian songs is rapidly passing away. These are among the circumstances which seem to justify the use of ordinary musical notation in the transcription of Indian songs. It is not claimed that Indians sing all the tones of the diatonic scale with accuracy but it will be shown that the upper partials (overtones) of a fundamental tone constitute the framework of many Indian songs. These tones are usually sung with a degree of accuracy that would be considered acceptable in a cultured singer.

To those not familiar with the manner in which Indians sing, it may be said that the Indian produces his tone in the back of his throat, holding the lips and teeth motionless and separating the tones by a peculiar action of the throat muscles. This tone is unfocussed and frequently resembles the vocal sound produced by an animal. There is a multiplicity of by-tones which suggests that the song is progressing by minute intervals of pitch, and one of the first decisions that must be made by a student of Indian music is concerning the degree of importance to be attached to these small gradations of pitch.

It may safely be assumed that if exceedingly small intervals or gradations of pitch are consciously produced, the Indian must have an ability to discriminate such intervals when hearing them. In order to test the pitch-discrimination of Indians the writer took with her, to Indian reservations, a set of 11 standardized tuning forks, one of which gave the fundamental tone of the series (a′, 435 vibrations, international pitch) while the other forks produced tones respectively $^1/_2$, 2, 3, 4, 5, 8, 12, 17, 23 and 30 vibrations above the fundamental. These forks were lent by Dr. C. E. Seashore, Dean of the Graduate College, State University of Iowa, who kindly examined the tabulated report of the result of the test. He expressed the opinion that «the abilities here shown are about as good as one would find among the average American whites under similar conditions». The ear of the Indian is trained to hear sounds which we do not notice but this test does not indicate that he has a superior perception

of differences in the pitch of tones. A practical experience with Indians has convinced me that, among uncultured people, small variations in the pitch of vocal sounds are not directed by an intelligence which would entitle them to serious consideration. I do not think that a voluminous study of them would reveal any underlying system or laws. Lacking that definite purpose, the undertaking does not seem to be justified.

During the first year of my work with the recording phonograph I made an experiment which has an important bearing on this subject. Two phonographs were placed opposite each other in such a position that the ends of the recording horns were together. Selecting a typical record of an Indian song, I played it on one phonograph and recorded it on the other. A duplicate was made from this record and so on until I had the sixth duplication of the original record. This was much softer than the original but the tones were those of the diatonic scale, sung with reasonable accuracy. The duplicating had eliminated the by-tones, leaving a kernel of tone which had been obscured by the Indian's manner of rendition. As so much depended upon the accuracy of my hearing I underwent a test by Dr. C. E. Seashore in his laboratory, the result being entirely satisfactory. This may be regarded as a standardizing of the human ear in order that it may safely be used as an instrument of measurement.

An Indian seldom strikes the drum or shakes his rattle precisely with the corresponding tone of his song. Through the courtesy of Dr. Dayton C. Miller, head of the department of physics, Case School of Applied Science, Cleveland, Ohio, this peculiarity of Indian music was given a graphic proof. The writer's phonograph was installed in Dr. Miller's laboratory, portions of two records were played on the phonograph and the sound recorded graphically by the phonodeik, an instrument of Dr. Miller's invention. In one of the songs thus studied, the portion phonographed by the phonodeik was of about 23 seconds' duration, as reproduced by the phonograph, and made a film record about 38 feet in length. In a detailed report on this test Dr. Miller stated that «the first beat of the pair of drumbeats follows the beginning of an accented voice-tone with great regularity. Of 25 such instances identified on the phonograph the drumbeat follows the voice by 0.12 second in 12 cases and in no instance does the interval differ from this by more than 0.02 second». Other interesting results of this test are apart from our present conside-

ration. The cooperation of Dr. Seashore and Dr. Miller is here acknowledged with appreciation.

In order to determine whether Indian music resembles that of a European people, a comparison was made between the structure of Indian and Slovak songs, the latter being analysed by the same method employed in analysing Indian songs. The material used in this comparison consisted of 710 Indian songs from widely separated tribes and 10 typical Slovak songs selected for the purpose by Mr. Ivan Daxner, secretary of the Slovanian League of America, whose cooperation is gratefully acknowledged. The Slovak songs included the Slovak national anthem, a song concerning Janovik, a very ancient melody entitled «In praise of song», a «dialogue on melody», several love songs, and folk songs concerning the plowboy and the girl who watched the geese. On comparing the structural analyses it was found that the resemblances were fewer than the differences. The Indian and Slovak songs under analysis differed in trend and in the principal interval of progression, it also appeared that the Slovak songs had more directness in beginning and more simplicity of rhythm.

In order to obtain representative material among the Indians it is necessary to exercise great care in the selection of singers and interpreters. To this phase of the work on must bring a knowledge of Indians which can be gained only by experience. The Indians have their standards of good singing and recognise only one correct version of a song. This version must be obtained if the work is to be reliable. One of the requirements of a good singer among Indians is that he shall repeat a song with absolute accuracy. To the credit of the Indians it may be said that repetitions after a period of weeks, months or (in one instance) after the expiration of two years have been found identical in tempo, pitch and note-values. Similarly, it is not unusual for as many as ten renditions of a song to be recorded on one phonograph cylinder without the slightest differences in the renditions. This accuracy appears in ceremonial songs and in records made by the best singers. There are other instances in which we find slight and unimportant variations in the renditions. The first is usually the best rendition in such cases but the transcription is made from the clearest, wherever it occurs on the cylinder.

Mention has been made of the system of analysis devised and used by the writer. This consists at present of eighteen tables of classification.

Four additional tables were used in the analysis of 710 songs and the results were so similar in the tribes under analysis that these bases of classification were discontinued as being no longer necessary. The discontinued tables concerned the metronome tempo of voice and drum, a comparison of these tempi, and the pitch of the keynote of the song. The tables now in use are as follows:

1. Tonality (determined by the interval between the keynote and its third and sixth)
2. First note of song--its relation to keynote
3. Last note of song--its relation to keynote
4. Last note of song--its relation to compass of song
5. Number of tones comprising compass of song
6. Tone material
7. Accidentals
8. Structure (melodic or harmonic)
9. First progression--downward and upward
10. Total number of progressions--downward and upward
11. Intervals in downward progression
12. Intervals in upward progression
13. Average number of semitones in an interval
14. Part of measure on which song begins
15. Rhythm (meter) of first measure
16. Change of time (measure-length)
17. Rhythmic unit
18. Rhythm of drum or rattle

Each song is analysed according to these tables as soon as it is transcribed. These analyses are combined into a tribal group, and the tribal groups are, in turn, combined in a large total which shows the characteristics of all the songs under consideration. More than 1600 songs have been transcribed and analysed but only 1073 have been combined in the large total. The data to be here presented are based upon this group of 1073 songs, comprising songs of the Chippewa, Sioux, Ute, Mandan, Hidatsa, Papago and Pawnee tribes. The songs analysed singly but not included in this total are those of the Yuma, Cocopa, Yaqui, Makah, Menominee, Winnebago, and the Tule Indians of Panama, as well as Salish and Tsimshian songs recorded in British Columbia, Canada. A large

number of Indian songs have been heard at tribal gatherings and not recorded phonographically. In all the tribes an effort has been made to obtain the oldest songs, recorded by the most reliable singers. Special attention has been given to songs connected with magic or with the treatment of the sick. A limited number of comparatively modern songs have been recorded for purposes of comparison.

The tables of analysis which chiefly interest us at present are Nos. 2, 3 and 6 from which the problem of the scale in Indian music may be discussed. The term «keynote» is applied to the tone which, by the test of the ear, appears to be the fundamental tone in the series of tones comprising the song. This does not present a claim that the Indian regards it in this manner. The term is used for convenience, like the ordinary notation in which the songs are transcribed. Having decided upon the tone to be designated as the keynote, the analysis of the song proceeds upon that basis. In a limited number of songs there is no apparent feeling for a keynote, such songs being pure melody without tonality. These occur chiefly in the songs which are not included in the large total. They are classified as irregular in tonality and await further study.

On examining Table 2 we find that 216 songs (20%) begin on the octave above the keynote, 150 songs (14%) begin on the twelfth, and 285 songs (27%) begin on the fifth above the keynote. The ratios of these intervals are respectively $^{2}/_{1}$, $^{3}/_{1}$ and $^{3}/_{2}$. On examining Table 3 we find that the keynote is the final tone in 597 songs (56%), and the fifth is the final tone in 342 songs (32%) of this group. The data in these two tables indicate a feeling for tones having simple vibration-ratios, such tones forming what may be termed the boundaries of the songs under observation.

At this point it should be stated that the writer uses the term «scale» for convenience. It is applied only to the series of tones commonly known as the major and minor diatonic scales, appearing in complete or incomplete form, and to the five pentatonic scales which are designated by Helmholtz, appearing in complete form. The vibration-ratios in the first named are as follows:

Major diatonic scale

$^{9}/_{8}$, $^{10}/_{9}$, $^{16}/_{15}$, $^{9}/_{8}$, $^{10}/_{9}$, $^{9}/_{8}$, $^{16}/_{15}$

Minor diatonic scale

$^{9}/_{8}$, $^{16}/_{15}$, $^{9}/_{8}$, $^{10}/_{9}$, $^{16}/_{15}$, $^{9}/_{8}$, $^{10}/_{9}$

The tone material of the songs is presented in Table 6 and, before considering the principal groups, mention should be made of a group of 71 songs (6%) which contains a large variety of songs not otherwise classified. In this group are 42 songs which, in the first year of the writer's work, were transcribed in outline, no keynote being designated. There are 12 songs classified as irregular in tonality, and other series of tones which appear only twice in the 1073 songs. The largest division of this group consists of 10 songs containing the first, second, fifth and sixth tones of the diatonic octav (vibration-ratios $^{9}/_{8}$, $^{4}/_{3}$, $^{9}/_{8}$, $^{6}/_{5}$). This group may contain material of value but our present concern is with the larger groups.

The seven tone, or degrees, of the diatonic octave (major or minor) occur in only 62 songs (5.3%). Six tones occur in 204 songs (19%), and four tones in 319 songs (29%). The number of tones preferred by the Indian singer is five, since 499 songs (46.4%) contain five tones, or degrees, of the diatonic octave.

Within the group of songs with five tones we find that 236 (47.1%) contain the series of tones designated by Helmholtz as the fourth five-toned scale and commonly known as the major pentatonic scale, having the following vibration-ratios:

$$^{9}/_{8},\ ^{10}/_{9},\ ^{6}/_{5},\ ^{10}/_{9},\ ^{6}/_{5}$$

Next in number are 106 songs (20%) which contain the series designated by Helmholtz as the second five-toned scale and commonly known as the minor pentatonic scale, having the following vibration-ratios:

$$^{6}/_{5},\ ^{9}/_{8},\ ^{10}/_{9},\ ^{6}/_{5},\ ^{10}/_{9}$$

A small group, 18 in number, contains the first five-toned scale according to Helmholtz which has the following vibration-ratios:

$$^{10}/_{9},\ ^{6}/_{5},\ ^{9}/_{8},\ ^{10}/_{9},\ ^{6}/_{5}$$

Only two songs are based on the fifth five-toned scale which has the following vibration-ratios:

$$^{6}/_{5},\ ^{10}/_{9},\ ^{6}/_{5},\ ^{9}/_{8},\ ^{10}/_{9}$$

The other songs containing five degrees of the diatonic scale are in many combinations of tone and are not regarded as on any scale. In 107 of these five-toned songs (not on the pentatonic scales designated by Helmholtz) the seventh and one other degree of the octave are absent.

The total of 1073 songs does not show this group in detail but in a previous total of 820 songs we may examine the number of songs in which two degrees of the diatonic octave are absent. In this we find the largest group to be 29 songs which lack the seventh and sixth degrees, the series having the vibration-ratios $^{9}/_{8}$, $^{10}/_{9}$, $^{16}/_{15}$, $^{9}/_{8}$, $^{4}/_{3}$. Next to the largest group comprises 26 songs which lack the seventh and second degrees, the series having the vibration-ratios $^{5}/_{4}$, $^{16}/_{15}$, $^{9}/_{8}$, $^{10}/_{9}$, $^{6}/_{5}$. The general proportions would be the same if this detailed observation were extended to the analysis of 1073 songs. In the five-toned songs we find that 19 omit the sixth and one other tone, while in 10 songs the fourth and one other tone do not occur. It is, therefore, apparent that the octave is omitted in a larger number of these Indian songs than any other degree of the octave.

Table 7 is devoted to a consideration of accidentals, or tones chromatically altered. In 923 songs (86%) there are no accidentals. In 25 songs (minor in tonality) the seventh is raised a semitone, and in 22 songs the fourth is similarly raised. These are the largest groups containing only one accidental. Songs containing two accidentals number 89 and are of so many sorts that a detailed consideration of the group is not practical at this time.

From the foregoing it appears that tones with simple vibration-ratios are preferred by the Indians under observation as the boundary and tone material of their songs, also that the seventh is the scale degree most frequently omitted, and that the seventh and fourth are the tones most often altered chromatically in the songs.

It is not enough for our purpose, however, to consider the tones used by the Indians in their songs. Equally important is the sequence in which these tones are used. For example, Indian songs containing the tones of the «major pentatonic scale» do not resemble the Gaelic songs based on that scale, and the tone material frequently is not discerned until the song is analysed. The sequence of tones is shown in Tables 11 and 12 in which the number and sort of the intervals are considered. These tables show that the interval occurring most frequently is the whole tone or major second ($^{9}/_{8}$). The entire number of intervals in the 1073 songs under analysis is 28,956, and the whole tones comprise 11,741 (40%) of that number. Next in frequency is the minor third ($^{6}/_{5}$) which comprises 8,029 (29%). The interval of a fourth (4/3) constitutes 3,717 (13%), and the

semitone, or minor second ($^{16}/_{15}$) constitutes 1,117 (4%). Attention is directed to the relatively small number of semitone progressions which does not encourage the hypothesis that the Indian possesses a musical system consisting of small intervals or gradations of pitch. It is interesting to note that the major third ($^{5}/_{4}$) comprises only 2,932 (10%) as that interval is part of the harmonic series already shown to be prominent in the framework of the melodies.

The intonation on the semitone is more variable than that on any other interval. The tone transcribed as a minor third is more frequently a non-major third than a correct minor third. This general observation on a large uumber of intervals is, in the writer's opinion, more important than an intensive study of a limited number of intervals. The Indian does not «think» the intervals with large vibration-ratios as clearly as those with simpler ratios and the multitude of his deviations involved a personal element. To follow such deviations is apart from our present purpose.

The interval of a fourth has been found, by the writer, to occur most frequently in songs concerning birds, animals and motion. Indeed, it may be said to characterise such songs. For example, it is a prominent interval in songs with the following titles which are derived from the words of the songs: «The ravens are singing». «The big bear, to his lodge I often go». «I am raising my pipe», and «A bubbling spring comes from the hard ground». The fourth may be called a progressive interval, implying action that is to be completed.

We will now proceed to a peculiarity of Indian songs which can hardly be tabulated but which is observed when the songs are studied. This mey be termed an «interval formation» and has no counterpart in the music of civilization. It occurs most frequentzy in songs which lack a keynote and are classified as irregular in tonality. Perhaps, at some future time, the basis of classification may be changed and the songs divided into those which have a keynote and those which are formed upon successive intervals. In many of the latter songs a few measures are within a small compass, the next few measures are within a different compass, and so on to the end of the song with no binding intervals that would unite these small groups in relation to a common keynote. For example, a song for the healing of the sick, recorded by Pigeon-hawk, begins with a few measures on the descending fourth A to E, these are

followed by a few measures on the descending fourth G to D, and the song closes with measures on the tones D to A. Each phrase is complete in itself, like a separate melody. In the songs of the Northwest Coast, not included in the collective analysis, this peculiarity appears as a whole-tone formation, many songs having a compass of three or four tones with phrases based on whole tones, repeated within that compass. In such songs the feeling for a keynote is less prominent than the stepping from one tone to another. The melody vacillates from one tone to another which is adjacent, or desirable for some other reason. This indicates the complexity of Indian music and the danger which lies in the making of generalizations.

It is difficult to trace the history of an Indian song more than 150 years and, with the utmost care in selection, we cannot be certain that every recorded melody is of purely Indian derivation. The Indians are imitative and when visiting other localities they are particularly eager to hear and learn new songs. In this manner there may have been alien influences in their music which they do not recognise. The Yaqui Indians, living on the Mexican border, said they had two sorts of songs, one of which was their own and the other was «like Mexican music». Examples of both were recorded, the former being ceremonial songs and the latter being modern songs accompanied by the guitar. One song was recorded on Cape Flattery, on the northwestern boundary of the United States, which closely resembles the Cocopa dancing songs recorded in southern Arizona by members of a tribe which lives partly in the United States and partly in Mexico. It is said that long ago the Spanish visited Cape Flattery and this coincidence is interesting. Other songs recorded on Cape Flattery resemble chants and yet are not like the chanting in the Roman Church. There is no mission of the Roman Church in this locality and we are reminded that the Russian Church is widely established in the north. Possibly this may have influenced the Indians from Cape Flattery, on some of their journeyings. Songs recorded by Indians living on the west coast of British Columbia are characterised by a fluency and easy tunefulness that bears no resemblance to typical Indian songs but is like the easy, pleasing melodies used in missions of the Roman Catholic Church. The writer was not surprised to learn that the Roman Church has missionaries in that region and that certain of the recorded songs were

used in Christmas festivities. The presence of such songs demonstrates the necessity for collecting a large amount of material, on which to base conclusions.

The most conservative songs of the Indians are those connected with old ceremonies, the songs hereditary in families, the songs received in fasting dreams, and the songs used in the treatment of the sick. A very large majority of the songs collected and analysed by the writer belongs to these classes, but other songs are also collected in order to secure a complete representation of a region and to afford material for comparison. If modern songs should be found to predominate in a region, the writer would go elsewhere to collect songs. The desirability of a field for research is estimated by the number of medicine men still living and by the extent to which the native religious customs are observed. Distance from towns is also a factor. For example, the village on Cape Flattery where work has been conducted for two seasons is reached only by water and there is only one steamer a week, carrying freight and a few passengers. In winter this boat is often unable to land because of the high waves. The isolation of this village adds value to its musical material. Other songs have been recorded in a mountain village about 130 miles from a regular line of railroad. The Indians came a considerable distance to this village in order that their songs might be recorded by the phonograph. On the southern desert the writer has travelled more than 80 miles from a town or a telephone to record songs from the Indians, once spending Christmas in such a locality and attending a remarkable dance that was held only on Christmas night. This dance was given on the desert sand and was a wonderful sight in the moonlight. Many similar incidents could be related but to not concern our present purpose.

Mention may here be made of the use of a rest in Indian songs. A pause for taking breath is noted only in records made by younger Indians. This occurs rarely and can be distinguished from a musical rest as it does not occur uniformly in all renditions of the song. The taking of breath by older singers is imperceptible. A rest occurred in only 10 Chippewa songs (less than $^1/_2$ of 1%) but was found in 13 (more than 11%) of the Ute songs, being given with care and distinctness. A rest, both short and long, is used to a much larger extent in the songs of southern Arizona and in those recorded on Cape Flattery. If we were to form our

opinion of Indian songs by those of the Chippewa we might imagine a resemblance to the songs of the Hindu concerning which it is said that «rests are seldom written in any of their songs. They appear to take breath when they want to take it, not at the end of words».[1] Further experience shows that such a conclusion would be erroneous as rests are effectively used in the songs of many Indian tribes.

The suggestion that Indian melodies are based on the tones produced by an instrument is untenable as the only instruments used by the Indians that produce tones of different pitch are the flute and whistle. The first named was formerly made according to the physical measurements of the man who was to play it, and the second instrument produces two tones by a peculiar manner of blowing it. Neither produces tones of sufficient accuracy to form the basis for songs.

The rhythm of Indian songs is characterised by accents unevenly spaced, transcribed as measures of different lengths. The tempo of the voice and the accompanying drum or rattle are frequently different yet each is steadily maintained. When the tempo is the same, they frequently do not synchronise, as proven by the test conducted by Dr. Dayton C. Miller and described in this paper.

Summary:—The music of the American Indians is formed and preserved mentally, not visually. The collective analysis of 1073 songs shows a perception of tones with simple ratios of vibration. These tones, however, are frequently used in what may be termed an «interval formation» of melody which does not suggest a keynote and has no counterpart in our musical system. The analysed songs of the North American Indians do not suggest a resemblance to the songs of Asiatic or European countries. Interesting resemblances to less distant music are occasionally noted but are considered less important than the larger data obtained through collective analysis. A group of songs now designated as irregular in tonality is reserved for further study.

The rhythm of Indian songs shows more striking peculiarities than the melodic progressions. In this connection we repeat the statement that Indian music was originally associated with the working of magic and the treatment of the sick, and that its use in the old manner persists, in many localities, until the present day.

[1] Fox Strangways, Music of Hindostan, Oxford, England, 1914. pp. 192-193.

The music of the American Indian is not an art, in our use of that term, but is primarily a means by which the Indian believes that he puts himself in communication with the mysterious forces of the earth, air and sea. These are beneficient forces, though he regards them with awe and reverence, and he looks to their aid for safety in his daily life and for success in his undertakings. The study of Indian music connot be separated from the study of the Indian himself, his traditions and his highest beliefs.

ΠΕΡΙΛΗΨΙΣ

Ἡ Mis ***Frances Densmore,*** μέλος τῆς Ἀκαδημίας τῶν Ἐπιστημῶν τῆς Βάσιγκτων καὶ τοῦ Ἀμερικανικοῦ Ἐθνολογικοῦ Γραφείου, ἀσχολεῖται ἀπὸ τοῦ 1893 εἰς τὴν συλλογὴν καὶ τὴν σπουδὴν τῶν ᾀσμάτων τῶν βορειοαμερικανῶν Ἰνδῶν. Ἔχει δημοσιεύσῃ πλείστας ἀξιολόγους σχετικὰς ἐργασίας.

Ἡ μουσικὴ τῶν Ἰνδῶν τούτων εἶναι ἁπλῶς φωνητική, ἡ τοῦ ᾄσματος· διὰ τοῦτο, μὴ ὑπαρχόντων μνημείων διαλαμβανόντων περὶ τῆς ἀρχαίας των τέχνης, ἔπρεπε νὰ συλλεγῶσιν ἐπὶ τόπου ᾄσματα ᾀδόμενα ὑπὸ ἀοιδῶν, διατηρούμενα ἐκ παραδόσεως. Ἡ μνήμη τῶν γερόντων Ἰνδῶν ὑπῆρξε τὸ μουσεῖον τῶν γνώσεων καὶ τῆς πείρας τῆς φυλῆς, καὶ καθῆκον τῶν γερόντων ἦτο νὰ μεταδίδωσι ταύτας διὰ ζώσης εἰς τὰς μετέπειτα γενεάς. Οἱ Ἰνδοὶ τῆς βορείου Ἀμερικῆς δὲν εἶναι ὁμοιογενὴς λαὸς ἢ ἔθνος, ἀλλὰ ἀποτελοῦσι φυλάς τινας, διαφερούσας κατὰ τὴν γλῶσσαν καὶ κατὰ οὐσιώδη ἔθιμα. Διὰ ταῦτα, ἡ συγγραφεύς, κατὰ τὰς μακρὰς αὐτῆς ἐρεύνας, ἐπεσκέφθη πολλοὺς ἰνδικοὺς σῳζομένους συνοικισμούς, καὶ συνέλεξεν, ἐγγράψασα εἰς τὸν φωνόγραφον καὶ τὸ δεικτάφωνον, μέγα πλῆθος ᾀσμάτων, μετέγραψε δὲ καὶ ἀνέλυσε πλέον τῶν 1600 ἐκ τῶν πλακῶν αὐτῶν. Εἰς τὴν μεταγραφὴν ἐχρησιμοποίησε τὴν κοινὴν (Εὐρωπαϊκὴν) παρασημαντικήν, μετ' ὀλίγων τινῶν προσθέτων σημείων, τὰ ὁποῖα ἀναφέρει.

Ἐν προηγουμέναις αὐτῆς ἐργασίαις ἡ συγγραφεὺς εἶχε συμπεράνῃ ὅτι ἡ Ἰνδικὴ αὕτη μουσικὴ δὲν ἀκολουθεῖ κλίμακά τινα. Λαβοῦσα ὅμως ἀφορμὴν ἐκ τῆς ἱστορικῆς καὶ θεωρητικῆς ἐρεύνης τοῦ κ. Κ. Μαλτέζου περὶ τῆς γενέσεως τῶν κλιμάκων, ἀνεζήτησε μήπως δύνανται νὰ ἀνευρεθῶσιν εἰς τὰ ᾄσματα τῶν βορειοαμερικανῶν Ἰνδῶν σκελετοὶ μουσικῆς κλίμακος. Ὡς δὲ γράφει ἐν τῇ εἰσαγωγῇ, ἐνῷ ὁ κ. Μαλτέζος εἰργάσθη ὡς ***φυσικός,*** τὸ ἔργον τῆς Συγγραφέως ἐδράζεται ἐπὶ τῆς ἀπόψεως Μουσικοῦ καὶ παρατηρητοῦ τῆς ἀνθρωπίνης φύσεως, τουτέστι καθαρῶς ***ἐθνολογικῆς.***

Ἐν τῷ ὑποβαλλομένῳ ἐκτεταμένῳ ἔργῳ ἡ Συγγραφεύς, ἀναπτύσσει τὰς ἐπιστημονικὰς μεθόδους ἃς μετεχειρίσθη, ὧν τινες ἰδίας ἐπινοήσεως, προσθέτει δ' ὅτι: Ἕκα-

στον ᾄσμα ἀνελύετο συμφώνως πρὸς 18 κανόνας, οὓς παραθέτει, αἱ δὲ ἀναλύσεις συνεδυάσθησαν εἰς φυλετικὴν ὁμάδα, μεθ' ὃ αἱ φυλετικαὶ ὁμάδες συνεδυάσθησαν εἰς ἓν εὐρὺ σύνολον, ὅπερ δεικνύει τὰ χαρακτηριστικὰ ὅλων τῶν ὑπὸ ἔρευναν ᾀσμάτων. Ἐκ τῶν 1600 ἐγγραφέντων καὶ ἀναλυθέντων ᾀσμάτων, μόνον τὰ 1073 ὑπῆρξε δυνατὸν νὰ ὑπαχθῶσιν εἰς τὸ εὐρὺ τοῦτο σύνολον.

Ἐκ τῆς μακρᾶς ταύτης ἐρεύνης ἡ Συγγραφεὺς ἀνεῦρεν 62 ᾄσματα περιέχοντα καὶ τοὺς 7 φθόγγους, 204 περιέχοντα 6 φθόγγους καὶ 319 περιέχοντα 4 φθόγγους τῆς ὀκτωήχου διατονικῆς κλίμακος (τῆς κοινῆς Εὐρωπαϊκῆς). Ἀλλ' ἀνεῦρε καὶ 499 ᾄσματα ἐμφανίζοντα πεντατονικὴν διατονικὴν κλίμακα. Ἐπὶ τοῦ σημείου ὅμως τούτου παρατηρεῖ ὅτι μεταχειρίζεται τὸν ὅρον «κλῖμαξ» χάριν εὐκολίας καὶ ὅτι ἡ μουσικὴ τῶν περὶ οὗ ὁ λόγος Ἰνδῶν προτιμᾷ πάντως τοὺς πέντε φθόγγους, τουτέστι χρησιμοποιεῖ συνηθέστερον φθόγγους πεντατονικῆς κλίμακος.

Ἡ Συγγραφεὺς ἄγεται εἰς τὸ συμπέρασμα ὅτι οἱ ἀρχαῖοι βορειοαμερικανοὶ Ἰνδοὶ ἤδον οὐχὶ διὰ τὴν Τέχνην ἢ ἁπλῆν εὐχαρίστησιν, οὐδ' ἦσαν ἱκανοὶ νὰ μορφώσουν μουσικόν τι σύστημα ὡς οἱ Ἰνδοὶ τῆς Κεντρώας Ἀμερικῆς ἢ οἱ Κινέζοι. Καταλήγει δ' ὡς ἕπεται:

«Ἡ μουσικὴ τῶν βορειοαμερικανῶν Ἰνδῶν ἐμορφώθη καὶ διετηρήθη διανοητικῶς καὶ οὐχὶ διὰ τῆς ὁράσεως. Ἡ συλλογικὴ ἀνάλυσις 1073 ᾀσμάτων δεικνύει κατανόησιν φθόγγου μετὰ ἁπλῶν διαστημάτων. Τῶν φθόγγων ὅμως τούτων συχνάκις γίνεται χρῆσις εἰς ὅ,τι δύναται νὰ ὁρισθῇ ὡς διαμόρφωσις διαστημάτων τῆς μελῳδίας, ἥτις δὲν ὑπονοεῖ *τονικὴν* καὶ δὲν ἔχει τὸ ἀντίστοιχόν της εἰς τὸ ἡμέτερον μουσικὸν σύστημα».

«Τὰ ἀναλυθέντα ᾄσματα τῶν Ἰνδῶν τῆς Β. Ἀμερικῆς δὲν ὑποδηλοῦσιν ὁμοιότητά τινα πρὸς τὰ ᾄσματα Ἀσιατικῶν ἢ Εὐρωπαϊκῶν χωρῶν. Ἐνίοτε παρατηρεῖται ἐνδιαφέρουσα ὁμοιότης πρὸς ἐγγυτέραν μουσικήν, ἥτις ὅμως δὲν εἶναι ἐξ ἴσου σπουδαία πρὸς τὰ εὐρύτερα «***δεδομένα***», τὰ ὁποῖα ποριζόμεθα διὰ τῆς συλλογικῆς ἀναλύσεως. Μία ὁμὰς ᾀσμάτων, ἡ ὁποία καθορίζεται ὡς ἀνώμαλος εἰς τονικότητα θὰ ἀποτελέσῃ τὸ ἀντικείμενον ἑτέρας Μελέτης».

«Ὁ ρυθμὸς τῶν ἰνδικῶν ᾀσμάτων παρουσιάζει πλέον ἀσυνήθεις ἰδιορρυθμίας, ἢ τὸ μελῳδικὸν σχέδιον. Ἐν σχέσει δὲ πρὸς τοῦτο παρετηρήσαμεν ὅτι ἡ Ἰνδικὴ Μουσικὴ ἦτο ἀρχικῶς συνδεδεμένη μὲ τὴν τέλεσιν μαγειῶν καὶ τὴν ἴασιν τῶν ἀσθενῶν, καὶ ὅτι ἡ κατὰ τὸν παλαιὸν τρόπον χρῆσις αὐτῆς διατηρεῖται εἰς πολλὰ μέρη μέχρι σήμερον».

«Ἡ μουσικὴ αὕτη δὲν εἶναι ***τέχνη,*** κατὰ τὴν παρ' ἡμῖν χρῆσιν τοῦ ὅρου τούτου, ἀλλὰ εἶναι κυρίως τὸ μέσον διὰ τοῦ ὁποίου πιστεύει ὁ Ἰνδὸς ὅτι ἐπικοινωνεῖ μετὰ τῶν μυστηριωδῶν δυνάμεων τῆς Γῆς, τοῦ ἀέρος καὶ τῆς θαλάσσης. Τῷ εἶναι αὗται

εὐεργετικαὶ δυνάμεις, ἂν καὶ οὗτος φέρεται πρὸς αὐτὰς μετὰ δέους καὶ εὐλαβείας καὶ ἀποβλέπει εἰς τὴν βοήθειάν των διὰ τὴν ἀσφάλειαν ἐν τῷ καθημέραν βίῳ καὶ τὴν ἐπιτυχίαν εἰς τὰς ἐπιχειρήσεις του. Ἡ μελέτη τῆς ἰνδικῆς ταύτης μουσικῆς δὲν δύναται νὰ χωρισθῇ τῆς μελέτης αὐτοῦ τοῦ Ἰνδοῦ, τῶν παραδόσεών του καὶ τῶν ἀνωτέρων του πεποιθήσεων».