The Birds World of Song

By Hudson and Sandra Ansley

SCHOLASTIC RECORDS SX 6115

Listening through a Sound Microscope
to Birds around a Maryland Farmhouse

The Birds World of Song

Two Days of Spring in Maryland
March
June
Songs Known only to the Birds
TOHEE
WRENS
FIELD SPARROW
MOCKINGBIRD

DESCRIPTIVE NOTES ARE INSIDE POCKET

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The Bird's World of Song

by Hudson and Sandra Ansley

SIDE I FX 6115 A

Listening through a Sound Microscope to Birds around a Maryland Farmhouse

Band 1: Two Days of Spring in Maryland
March

Band 2: June

Band 3: Songs Known only to the Birds
TOHEE

SIDE 2 FX 6115 B

Band 1: WRENS

Band 2: FIELD SPARROW

Band 3: MOCKINGBIRD

THE BIRDS' WORLD

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Program Notes

The Sound Microscope

A two speed tape recorder is a sound microscope. By recording at high speed and playing back at half speed, the effect is to magnify the song, or extend it over twice the length of tape. For birds that sing at a rate of ten notes per second it is sufficient to perform the process once, and for those that sing faster the process can be repeated until all the detail is discovered. The House Wren must be played at 1/16th speed if we are to hear all its song! Fortunately the bird sings three octaves above middle C; otherwise the song might disappear under such treatment. In general the faster a bird sings, the higher its voice; and most songs end up on the G clef. Once there it is not difficult to score by ear. At times it is not easy, as in the case of Meadowlarks, but that is the fault of the bird.

We are often asked why we do not use an "accurate" method, for then we would never have the trouble. The truth is that there is no more accurate method for our purpose. Let me explain. You do not have to match the pitch by ear if you photograph an oscilloscope or examine a "movie" sound track under a microscope. But once you have compiled the necessary data and keyed it to tables of frequency, amplitude and tempo, you are still in a position of having to make an independent judgment if you enter the results on the musical staff. Birds never sing pure tones, but regulate their voice by ear, just as we do. When it overshoots, they overcompensate, and so on. This is what gives timber and beauty to their voice, and enables us to recognize the species in the field regardless of what song they are singing.

In the case of the Meadowlark, which does not "regulate", it would be impossible to tell just where to put the note. So you are in no happier position than you were before. As a matter of fact, scientists who study birdsong by these methods never do attempt to write the songs on the musical scale, but content themselves with studies of the fine points of vocal technique, and that is what those methods are best suited for. Some of them go so far as to say that it is wrong to put birdsong on music paper.

By the same token it would be wrong to transcribe the songs of human vocalists. We who are interested in birdsong cannot afford such methods. Follow our scores for the Meadowlark as you listen to the phonograph and you will see what we mean. The scores help you to understand what the bird is doing. By whistling off key you can reproduce the sounds by reading our scores. They achieve what we are after -- to advance the understanding of birdsong.

Many of the songs presented in this album have two sides, like coins, or rather like the moon. The obverse side is always before us and we know it well; the reverse is always turned away from us and is only currently being explored. Those who listen to this record (in particular to its reverse side) will hear the songs of the birds as only the birds have known them heretofore. We have presented this work from the original tapes by the original discoverer of this new world of music, and we are happy to refer our listeners to the original paper in which the discovery was announced -- 1951 Proceeding of the Linnaean Society of New York, Number 63, pages 39-40. But we are even happier to reproduce in this pamphlet four short articles by Dr. Ansley which fully answer such questions as his commentary on the songs provokes. Have the songs been heard before? What do they mean? What is the physical basis of the "effect" he calls the Whippoorwill Effect?

The Hidden Songs

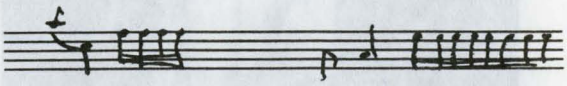
Many birdsongs are plain and clear while others are much too rapid for human ears to follow. In between are songs at the threshold of the human auditory response. In other words, some of the songs presented in our study are well known, others known only vaguely, whereas some have never been heard before. Naturally a claim so sweeping must be backed up by evidence stronger than subjective impressions. Such evidence is amply provided by the numerous efforts made in the past to write musical transcriptions of the songs of birds. There is an extensive catalogue of such efforts, going back to the 17th Century. Far and away the best authorities on North American birdsongs are F. Schuyler Mathews and Aretas A. Saunders, both of whom have

published books on the subject. Mathews (Wild Birds and their Music, Putnam 1904) shows as uncanny ability to judge how well he was hearing, and when he says that he is right, we have been able to prove that he usually was right. Saunders (Bird Song, Doubleday 1935) displays evidence of an ear so keen that we sometimes suspect him of having been born with a straight cochlea.

It is upon the best efforts of these two men that we rely in order to judge whether a song is new or has been heard before.

Red Eyed Towhee

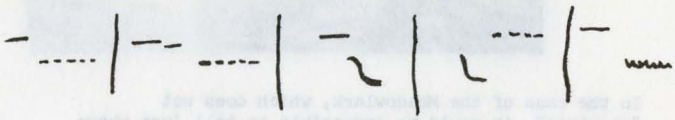
Mathews:



almost right

off by an octave on first note

Saunders:



Neither Mathews nor Saunders discerned the Towhee's 4-note song. From this alone we conclude that the Towhee cannot be properly heard without electronic aid. The fact that both men assign incorrect values to the notes of the songs they do report points to the same conclusion, as does the confusion over the intervals between notes. Hence we classify the songs of this bird as hidden or cryptic, at least in part.

Woodthrush

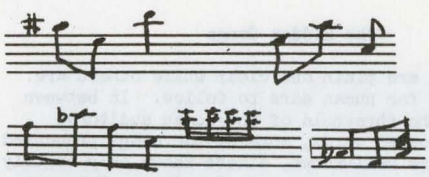
Enthusiasm for the songs of this bird is always unrestrained. Mathews uses such terms as bell-like, solemn beauty, divine. Saunders is no different: rich, flutelike, beautiful. But see how differently they describe the Towhee:

Mathews: "As a musician the Chewink is not remarkable ...In this he differs widely from Woodthrush...There is an attempt at melody and a failure to realize it."

Saunders: "Sometimes the first note are exceedingly rich and thrust-like, but they are often squeaky...scratchy, buzzy or rattly."

The contrast in reaction to these two species illustrates the limitations of human hearing very well, for anyone who has listened to our demonstration of the Woodthrust knows that it is impossible to judge how the songs differ from those of the Towhee. Hence we arrive at Ansley's law, that praise of birdsong is an inverse function of the rate at which birds sing.

Some of the notations made by Mathews are identical to ours:



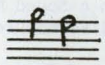
We conclude that the woodthrush can be heard quite well by the unaided ear, but not easily. We are the first to perceive the pattern of the songs. Had it been noted before, it would have been reported, since it is quite interesting; the pattern varies from one part of the country to the other.

We also believe that both our experts give an exaggerated impression of the number of different songs for this species.

The woodthrush sings just below, or at, the human threshold.

Chickadee

The song is almost as plain as that of the European cuckoo. When the song is slowed down, the second note (sometimes repeated) usually breaks up into the distinct notes in a rather unexpected way, but the break is audible to the naked ear, and is mentioned by Saunders. Mathews ignored it. A non-cryptic singer. Mathews:



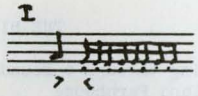
Phoebe

But the Phoebe is another matter. "It is almost useless to place this tuneless song on the musical staff," writes Mathews. Both he and Saunders correctly indicate two songs, but they get both wrong.

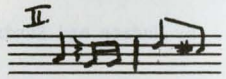
Mathews: Saunders:

Both songs are represented as being essentially alike, except that the one goes up and the other down, whereas in reality it is hard to imagine two songs which differ more strikingly.

One is like the Chickadee's, I

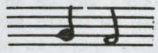


the other like the Towhee's. II

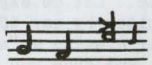


No better illustration can be found of the aural confusion created by birdsong (the psychologist should apply his yardstick here) or the revelations which follow the removal of this confusion. Let us apply a little detective work to this apparent plagiarism of songs. First of all, eight of the twelve species in our study are implicated -- Phoebe, Chickadee, Towhee, Woodthrust, Meadowlark, Carolina Wren, Yellowthroat and Whippoorwill. No two of them belong to the same family, and one is not even a songbird. This is not to mention the Mockingbird, which sings the songs in the style and manner of them all. In fact only the House Wren and Field Sparrow can be cleared of all suspicion, and we have no case against the Cardinal.

Here is one of those amazing coincidences that aches for the proper insight. We think it may be a clue to the origin of birdsong. Suppose that the Phoebe's songs recapitulate the evolutionary steps. To further our detection let us reduce the songs to their basic skeletons. I



In song II the interval of II a second is followed by another note five tunes higher (the last note may be ignored or regarded as an embellishment.) From this it is clear that the second Phoebe song can be derived from the first simply by adding one note, and assigning it the main accent. Having accomplish-

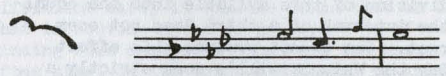


ed this much of our analysis it is only necessary to reflect on the importance of a pure second interval in birdsong in general. It may be used by fully half of the birds of the world. We have already seen how common it is for birds to enlarge upon this simple phrase by repeating it four or five tones higher (or lower.) From this line of reasoning it may be seen that it does not place any excessive weight upon the little Phoebe to discover phyllogeny in the ontogeny of its song. Many birds do exactly the same thing. The simplest call of the Meadowlark -- a downward slur -- if combined with its four-note theme, recapitulates the Phoebe. The Wood Peewee builds on just such a simple phrase. The Towhee has a common two-note song, and so on. A tempting course of speculation, then, it to imagine that the basic call is one which resounded through the Cretaceous swamps and groves when the birds first adopted it and added their accented trill, thus producing the first melody. From this simple beginning the rest of the scale and more besides was discovered. Many new and bizarre departures attended the intensity of avian speciation because of the selective value for close relatives to sound unmistakably different during courtship. But through it all, certain conservative members of each family adhered to the ancient formula to a quite recognizable extent, recognizably at least when the songs are brought within our own best hearing range.

We conclude that the Phoebe is a classic case of a cryptic singer, and the stereotyped nature of its song makes it the best "control" in our study. We can be confident, for instance, that the songs we have analyzed are exactly the same ones which Mathews and Saunders heard.

Meadowlark

Mathews depicts the song we hit upon as the Meadowlark theme this: -



He uses a line drawing as well as the musical staff because "only a series of curves can describe the indecisive attempts at hitting a tone." Mathews did not venture as far as we have in deriving all Meadowlark music from this one theme; he contents himself by saying it is the "one thing we can rely upon as unchanging." Mathews also remarked upon the frequent expansion of song into two-bar melodies; several melodies are compared to "the first two bars" of operatic arias. Mathews considered the variations to be "provincial", in which view he ambiguously supports either racial differences or local imitation. Saunders alerts us to another possibility -- not so much geograph and more spontaneity. He reports "53 different songs from one bird in less than an hour" and estimates that "every normal male bird is capable of singing at least one hundred different songs."

It is not known what the true situation is. If enough people with tape recorders, living near Meadowlarks, would record and study the songs of their birds, an extraordinary story seems bound to unfold, whether they are "normal males" or not. For such a study one person, however free to travel, is not enough. The student must inhabit the same ground as the bird and hundreds of well-marked birds must receive individual attention.

Hardly a cryptic singer, yet we do not advise attempting the work by ear. Our invariable experience has been to imagine that we had a dozen different songs where there were only four or five.

House Wren

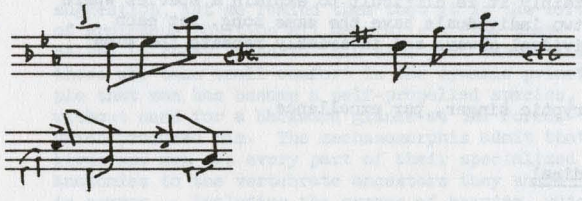
Here the unaided ear, no matter how excellent, is helpless. Both Mathews and Saunders denote a song of three sections, but neither man senses any melodic detail. This demonstrates the highest degree of cryptic song. Again the same questions plague us as with the Meadow lark. Should the House Wren be classed with the Cardinal and Carolina Wren as a bird of fixed repertory (for the individual), or with the Meadowlark and Mockingbird, as a bird of spontaneous (if not altogether free) invention? It is noteworthy that neither Mathews nor Saunders attach the importance we do to the fact that House Wren songs vary in length from one to four sections, and that there is a method in the build-up.

Carolina Wren

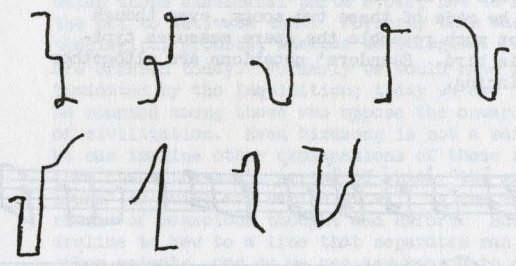
To our astonishment we find that both Mathews and Saunders repeat our own comparison to "the song of the Maryland Yellowthroat" -- despite the fact that the greater speed of the Yellowthroat song caused Mathews to note "a vagueness of tonality, or rather what might be called musical indecision... which after study and some hesitation I considered not a monotone," whereas "in the song of the Carolina Wren there is a definite and emphatic swing from one note to another." Needless to say, Mathews did not suspect that the "musical indecision" of the Yellowthroat lay not in the bird's song but within his own hearing center, nor did he suspect that his ear could be deceived by the decisiveness of the Carolina Wren.

At first Mathews' nicely spaced triads are impressive, and so are Saunders' drawings of the songs. But when we look back at our own records, these begin to look pale and indehiscent by comparison. (Saunders' more elaborate-looking figures actually parallel the meager stations fixed by Mathews.)

Mathews:



Saunders:

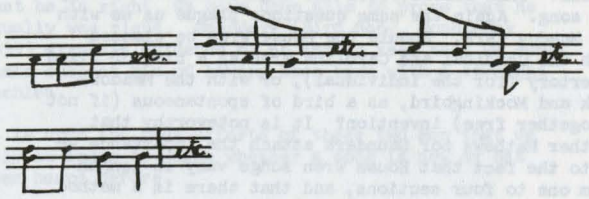


The Carolina Wren is a cryptic singer, but one with an attractive and convincing song at normal speed.

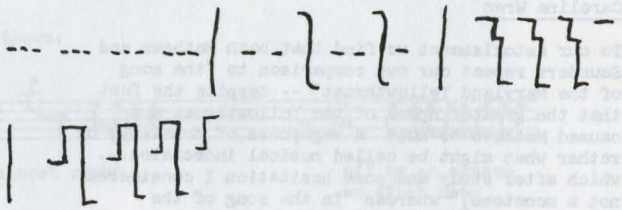
Maryland Yellowthroat

We do not find either Mathews's scores or Saunders' drawings adequate representations of what they must have heard. No Yellowthroat song is adequately represented by three notes, and we take the intervals assigned to be mere guesswork. Mathews concedes as much. "I cannot say that the intervals as I render them represent true pitch. All I can promise is that the swing of the Yellowthroat's voice is accurately reported....I do not consider the musical interval of any consequence."

Mathews:



Saunders:



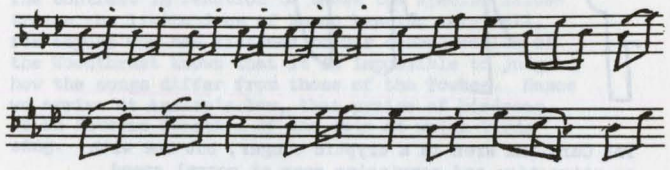
Mathews asserts that different individuals have different songs, and Saunders also observed "great variation in the phrases used, chiefly between individuals." But unlike Mathews, Saunders purports to find that "the same individual can vary its song considerably." This is altogether contrary to our own observations, though it would make the bird easier to comprehend if it is true. Perhaps the fact that the song is cryptic makes it sound different at different times to the same person. We at any rate have frequently had to correct such illusory impressions in ourselves. It would not be difficult to prove which of us is right, and we cannot think of any other simple study which would so greatly advance the understanding of birdsong. Certainly it is difficult to explain a species where no two individuals have the same song, yet each individual always and invariably repeats the same one.

A cryptic singer, par excellence.

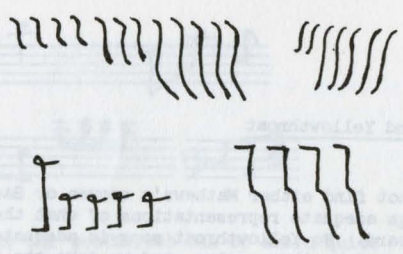
Cardinal

The Cardinal did not reach New England in Mathews' lifetime, and he knew only two songs from a caged bird. We are in no position to reject the transcriptions he made of these two songs, even though they do not much resemble the spare measures typical of this bird. Saunders' notations are altogether more convincing.

Mathews:



Saunders:



The Cardinal cannot be included with the cryptic singers, and it would be surprising if it were, since it does not seem to sing at all fast. Yet we consider it a borderline case. Much unexpected detail emerges when certain songs are slowed down -- enough to suggest that the first two songs taken from Saunders' notes, above, may have had more shape than he was able to discern.

Field Sparrow

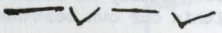
Obviously no Sound Microscope is needed for this species, since both our experts give songs which recall those on our farm. Mathews quotes Chapman to the effect that "the same individuals sing several different songs." But Saunders corrects this: "Each individual Field Sparrow usually sings but one song and varies it very little, so that individuals are easily marked and their singing habits followed."

Another instance where confirmatory studies are needed. Not a cryptic singer. The work could be done by ear, if that ear is a good one.

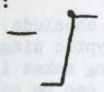
Whippoorwill

Both men give similar sketches of song. They indicate but three notes. But their commentaries tender a cautionary warning before we certify this bird as a cryptic singer.

Mathews:

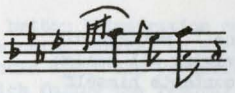


Saunders:

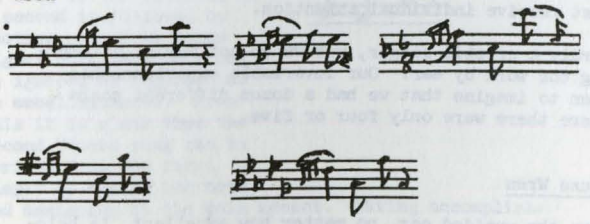


1) Saunders writes, "Sometimes the last note is slurred downward."

2) Mathews writes, "One will also notice a very perceptible quaver on the syllable poor, so I have indicated that by a grace note in one song. Mr. Cheney's division of this syllable into the equal notes on the interval of a third does not seem to me correct. One cannot produce this effect by imitating the Whippoorwill's song strictly a tempo; it is impossible to do anything else than bounce on that middle syllable."



Put these two observations together and you have the true Whippoorwill song, and by the criteria we have adopted that would make the Whippoorwill non-cryptic. On the other hand, consider that each of our experts contribute but one cryptic note a piece. Mathews himself confesses that he is working beyond the limit of human certainty on a point where we can expect no agreement even among experts. And in all fairness it should be pointed out that Mathews thought there was an extra note, or slur, at the beginning, (not to be confused with the "tuck".) On this point he was quite positive, mentioning it specifically in the text and always giving it in his scores. But it is not there. We present all of his songs for the bird because they suggest that individual Whippoorwills, despite their habit of monotonous repetition, have more than one song. In fact, if Mathews is right, all of the variations used by the Woodthrust and Towhee are possessed by Whippoorwills, though seldom used.



Mockingbird

Neither Mathews nor Saunders was acquainted with the Mockingbird, which by its insistence on inhabiting the Southern States has effectively isolated itself from the breed of men who dare to do nothing else but listen to birds. But an interesting criticism of our own work with the Mockingbird has been published by Dr. Peter Paul Kellogg, Director of the Biological Acoustics Laboratory of Cornell University.

"I am inclined to believe," writes Dr. Kellogg, "that birds do hear and distinguish the very last notes, but the possibility that these fast notes may be explained in some other way should not be overlooked...It might be that the avian imitator because of physical limitations or because of specialized sound producing equipment, just naturally falls into the normal pattern whenever he tries to reproduce a birdlike note. Presumably...'the Mockingbird hears the rapid notes' but might it not also be that the only way a bird has of producing the over-all effect which we hear and which the bird may also hear, is to build the gross sound out of a number of small parts?"

This is an important objection -- one, I think, that will have occurred to most of our listeners, as it has to ourselves. We think the evidence is overwhelmingly against it, for the following reasons:

1) If the Whippoorwill's apparent 3-note song cannot be reproduced by a bird without the production of 5 actual notes, then it would follow that the variations on the Phoebe's song could not be so well controlled as to range from the cuckoo-like "phoebe" of the Chickadee, to the glissando of the Wood Peewee, to the cryptic song of the Phoebe, through the rough coarse cries of Jays when they also use that phrase. From this it is clear that there is no "normal pattern" and the bird uses different "small parts" to build the "gross sound". No other difficulty to the objection need be mentioned, but other difficulties remain.

2) If the songs of the Mockingbird are studied with sifficient care, it will be found that an imitation that is convincing at normal speed is often unconvincing when analyzed. That is, the Mockingbird will often sing, in the voice and manner of another bird, a phrase which the bird in question would never use. For example, Mockingbird imitations of the Phoebe's primary song are not always a second interval; the Mockingbird may use the interval of a third or a fourth--if he was harping on that interval -- while a Phoebe never does. Nothing could demonstrate better than this that a bird does <u>not</u> "naturally fall into the normal pattern." He sometimes "falls into" the wrong one.

3) "Physical limitations" of "specialized sound producing equipment" are of course what all animals have, and what it has been our object to explore, though we would not exclude the associated brain centers from consideration. <u>Specialization</u> is evident in the rapidity of birdsong, and <u>physical limitation</u> is evident in the human inability to hear it accurately. Compared to this interpretation, it is awkward to suppose instead that the birds' throat contains sound producing equipment that produces extra small sounds which the bird cannot hear. What is so special about the song in question that would justify such a peculiar way of producing it? Why is the function of these unheard parts not gradually lost? Why would not certain individuals appear which counterfeit the song by omitting the inaudible notes? Is it reasonable for all birds to have the same specialized sound producing equipment -- especially where both songbirds and non-songbirds are involved, as in this case? Where is this special equipment when we dissect a bird? I am raising some very broad objections, but none that would not occur to our audience had we adopted the mechanical explanation of our finding.

4) If every species was like the Phoebe, then the mechanical view might be very strong -- still wrong but a very natural mistake to make. For the Phoebe does bring to mind a mechanical bird on a Swiss clock in the faithful way it repeats its song. But actually the Phoebe is atypical. Outside of the family to which it belongs it is hard to find other examples like it. In real life songbirds rarely bear out an analogy to mechanical toys. For example, the wealth of musical invention displayed by a song sparrow surpasses all but the most gifted human composers. Without this -- the most important single fact of birdsong -- the subject would never have intrigued such gifted men as Chapman, Saunders, Mathews, White, Brand and for that matter, Kellogg. The intriguing thing is how to explain it. Might it offer us a clue to the human gift of music? Certainly the answer cannot be absurdly simple.

5) The mechanical explanation is not necessarily a good biological explanation. It almost demands that songs be inherited. The anatomical features which would produce a pattern of sound automatically must be extraordinarily subtle on any other grounds. The only thing that would make the theory attractive to me would be positive grounds for thinking birdsong is strictly inherited, so that birds can produce their songs automatically, without learning. But much of Dr. Kellogg's fame rests upon his part in the famous Cornell experiments which proved that birds must learn their songs.

6) Anyone who has cared to follow this discussion is aware of what is at stake. Will I avoid the anthropomorphic error? But the matter is not quite so simple. There is an equal and opposite error -- the mechanomorphic error -- which can result from too much leaning over backwards. My wife and I are content to say that Song is Music, and let it go at that, comforting ourselves with the knowledge that if we had brought back music from the Moon, it could not be any stranger or more marvelous than what we have found. If to some less oppressed souls I seem to be driven to excessive lengths by a modest and not-too-well-thought out suggestion, let me remind them that it is the sort of grotesque position all naturalists find themselves in today. And to this same port wander all those who take small comfort in the dynamic principle that man has become a self-propelled species, without need for a backward glance at the forces which produced him. The mechanomorphis admit that birds and men owe every part of their specialized anatomies to the vertebrate ancestors they share in common -- including the organs of hearing, voice and song. Yet the same spokesmen will ask us to reserve for our own species the feelings and emotions which those anatomical parts evoke, not to mention the wit to activate them. Formerly this was done on theological grounds, whereas sociological reasons are offered today. Formerly we would have been intimidated by the Inquisition; today we are liable to be counted among those who oppose the onward flight of civilization. Even birdsong is not a safe harbor. We can imagine other explanations of these songs than that "the small parts" of which "the gross sound" is built are varied at will by the bird, as a result of conscious thought and effort. But we decline to hew to a line that separates man from other animals, nor do we see any reason to draw a qualitative distinction between birdsong and man-made music. The evidence forbids it. We do not regard birdsong for that reason as being any less subject to a mechanistic interpretation. We say this knowing that in many quarters it will be received as a cryptic song of our own signifying that we think man does <u>not</u> think, or enjoy free will, whereas birds <u>do</u>. Let the bias be theirs, not ours.

The Whippoorwill Effect*

The base of the cochlea is sensitive to low sounds and the tip is sensitive to high sounds. In between the arrangement is linear. A given region of the cochlea corresponds to a parallel region of the frequency diagram for hearing. If the cochlea were drawn out into a straight tube it could be laid on the musical staves so that the appropriate parts of the cochlea would fall approximately on the notes

they would respond to. It is not surprising, therefore, that the human cochlea is longer than the avian cochlea. But as the length increases, the organ threatens to crowd the jaw. This problem is solved by packing the unwieldy tube in a tight coil. In this way mammals have achieved an incomparable set of ears without much change in the shape of the inner ear.

Inside the cochlea is a complex system of membranes and nerve endings stretched between two channels, one of which opens at a diaphragm toward the outside of the head and the other to a diaphragm to the inside. When sound waves impinge on the outer diaphragm, via the ossicles of the middle ear, the wave is transmitted by the fluid to the membranes and thence to the nerves.

Whether for reasons of hydraulics in a curved channel or from the greater tension in a bowed membrane, it appears likely that the mammalian ear has sacrificed some of its original ability to recover from one stimulus in time to receive the next. Just for the sake of argument, let us suppose that the tectorial membrane is still engaged if it receives a second impulse too soon after the first. In this case it would be unable to record the sound. By contrast, the corresponding membrane in the cochlear duct of a bird would have recovered in plenty of time and would transmit the second impulse without confusion.

Back in the days of the telegraph key, it was discovered that a telegrapher could transmit faster than he could receive. The hand is quicker than the ear. Mistakes begin when more than three short taps are delivered faster than 1/10th of a second apart. This is not to mention interesting but disturbing side effects, such as the sensation that the sound is coming from another part of the room.

It so happens that the Whippoorwill sings its song at exactly the rate of 10 notes per second. What we call the Whippoorwill Effect is merely the old telegrapher's effect. It is a limitation of the mammalian ear, but not of the avian ear -- as the Mockingbird proves by "receiving and transmitting" the Whippoorwill message. Below is a table of the speed at which the birds in our study sing their songs.

*Demonstrated in the Mockingbird section, Side II, Birds' World

	Number of notes per second*
Towhee	11
Woodthrust	8
Chickadee	4
Phoebe	24
Meadowlark	8
House Wren	50
Carolina Wren	18
Yellowthroat	26
Cardinal	6 to 20
Field Sparrow	7 to 9
Whippoorwill	10

*If the fastest notes in a song are eighth notes, then quarter notes, if present, are counted twice. Grace notes and trills are not counted, however. The Woodthrust trill, for instance, has 32 beats per second, whereas the song has 8. The Cardinal has both slow and fast songs. The Field Sparrow changes speed during a song.

SIDE I, BAND 1:

Two Days of Spring in Maryland

March

Everything in bud, nothing in bloom; streams full; windy day. Dawn. A Winter Wren sings a farewell song by a cascading forest brook.

Spring Peepers call from the pons and are joined by American Toads singing in different pitches.

Redwings call Okaree, Okaray.

Migrant Whitethroated Sparrows have a way out when they can push their song no higher.

Black-capped Chickadees call to one another; the answerer usually a half-step lower. (A few cros pass overhead.)

Jays begin to orchestrate in flocks.

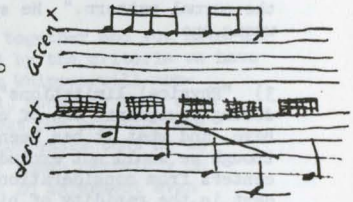
Flickers call from the swaying treetops.

Where the Kingfisher rattles along the bank, an Osprey keeps watch for fish in the river. The Osprey's voice is as gentle as his look is fierce.

The Woodcock, though it cannot sing, has whistles in its wings, and after sunset by dint of extraordinary aerial acrobatics manages to produce a tinkling song in the air. Taking off in a low spiral to about 200 feet, it gives excited rolls near the apex of its flight, then produces its "song" as it zigs and zags from horizon to horizon, barely visible in the failing light. Silently it flutters back to the spot where it took off (a point in our record punctuated by a whispered comment) and once again buzzes with its own true voice as it treads and struts in the undergrowth.

We have all heard of birds which use tools. But here is the only recorded instance of a bird which plays a musical instrument. It uses its wings like a reed instrument, except that instead of using its mouth as we do, it sweeps the reeds (or feathers) through the air at different speeds and angles. During the ascent the wings emit clusters of seven notes, ending on a long note pitched half a step lower. During the descent the same clusters, accelerated five or six times, produce the aerial song--the melody being plucked out on the long final notes.

We ought, perhaps, to add here that it was vouchsafed to us to discover this remarkable fact.



SIDE I, BAND 2:

June

The yard is fully occupied and the pattern of song from dawn to dusk is a world in itself -- two worlds in fact -- one familiar to us and another known only to the birds. First a day of the familiar world:

At 4 a.m. the Yellowbreasted Chat begins the day. It is still dark, the stars are out; there are fireflies blinking in the treetops. The Chat uses a set of six calls -- three percussive and three singing calls -- and with a dramatic sense of time lends a wild note to the familiar grounds.

Forty minutes later the Cardinal joins the Chat with a sleepy exercise. By now other species may also be discerned, among them the Phoebe and Mourning Dove.

The Carolina Wren awakes, as have also vireos and warblers.

A few minutes before sun-up just about everybody in the yard begins to sing -- Carolina Wren, Cardinal and Dove effectually drowning out at least twenty other voices.

Several species make up for their lack of prominence at daybreak by singing throughout the morning, even while they eat.

The Red-Eyed Towhee. Interrupted by a Jay, the Towhee stops singing and later resumes where it broke off -- a trivial event except to those who imagine that birdsong is an automatic process over which the bird has little or no control. (The chip, chip of a Hairy Woodpecker marks the passage of time.)

The Maryland Yellowthroat's Witchery-Witchery.

The House Wren. We have selected a moment when a Robin adds its song, as we think, judiciously.

An American Goldfinch flits above the heads of men working in the fields. One call breaks forth like a diamond flashing in the sunlight.

A Meadowlark is audible above the midday traffic.

In the heat of the sultry 90° afternoon everything comes to rest. Only a far off Cicada sings.

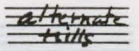
As the shadows lengthen, the Woodthrust carols.

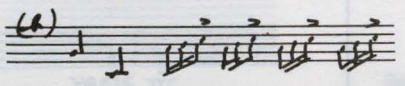
A choir of Robins chants from the lawns of a near-by estate (followed here by the retreating calls of a Jay as it flies off to roost.)

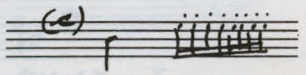
A Whippoorwill calls as darkness falls (and a Common Tree Toad begins.)

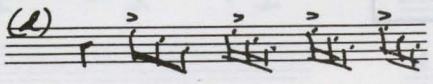
In the dead of night a Mockingbird wakes up and sings.

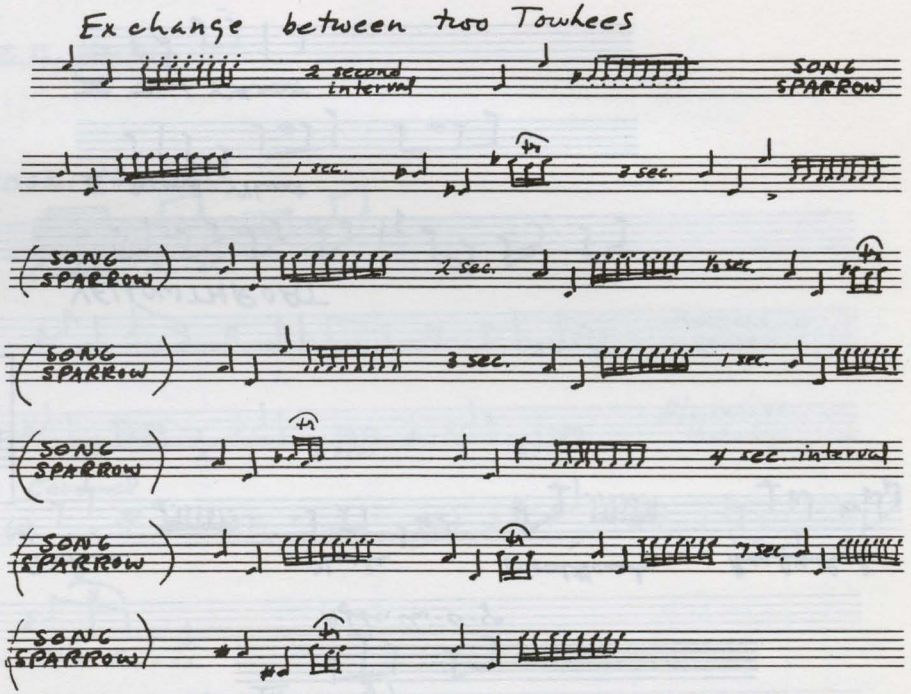
SIDE I, BAND 3: THE BIRD'S WORLD: PROGRAM OF SONGS KNOWN ONLY TO THE BIRDS

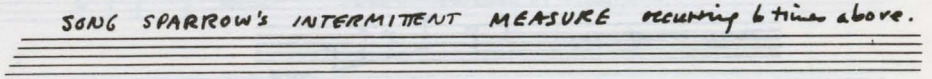


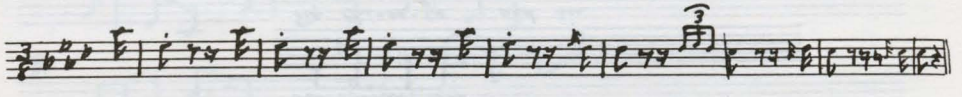


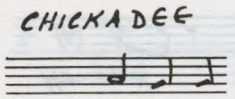


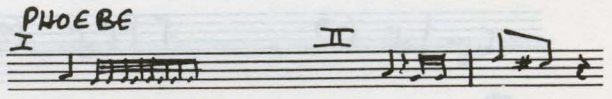


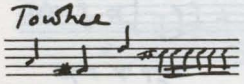


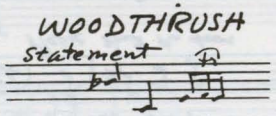


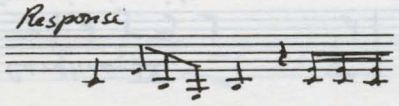


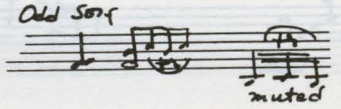


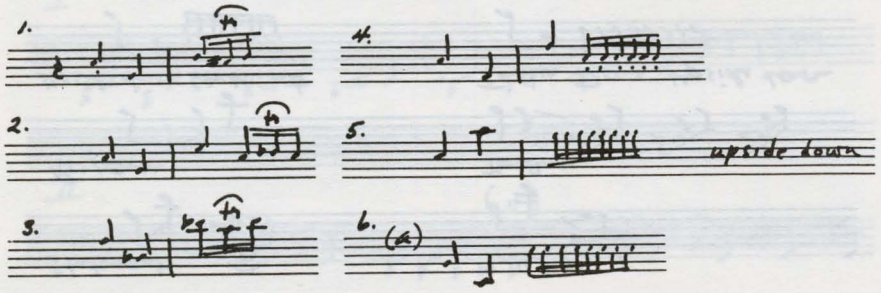


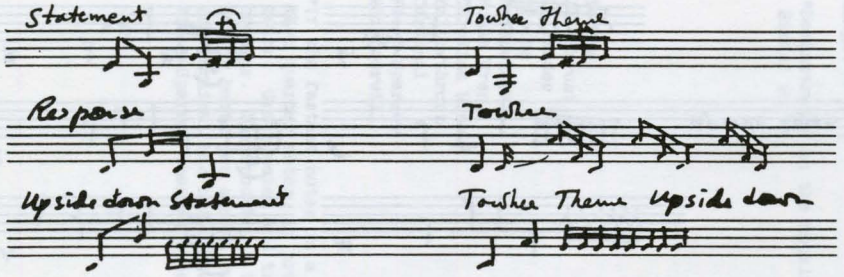




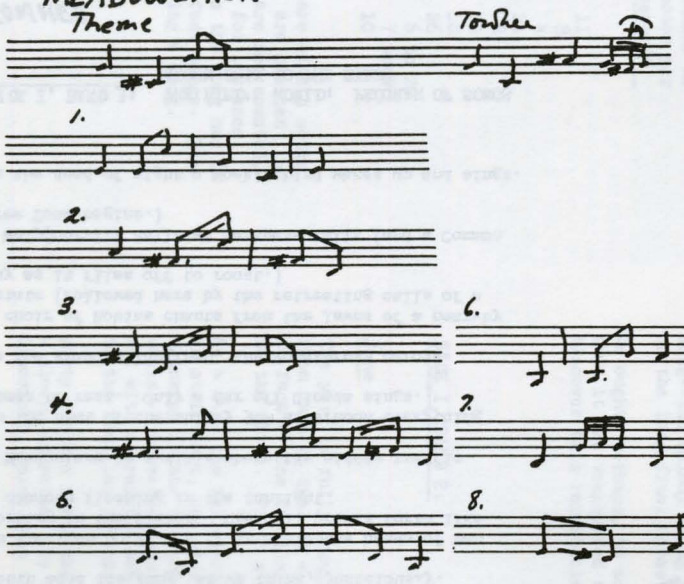


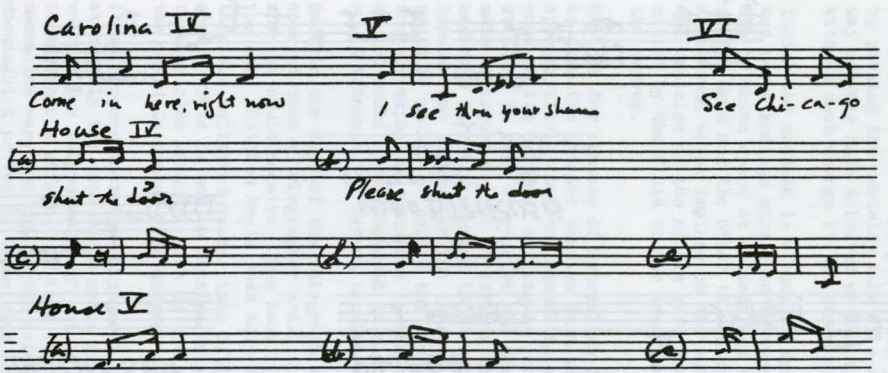


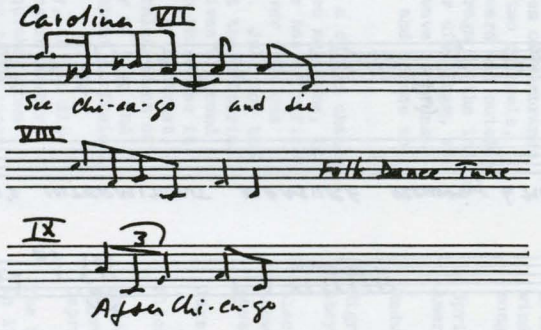


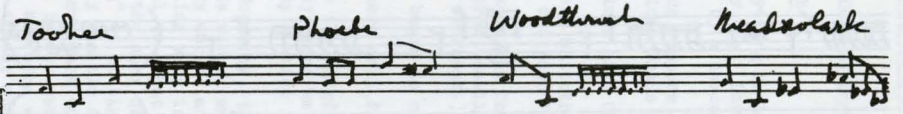


MEADOWLARK

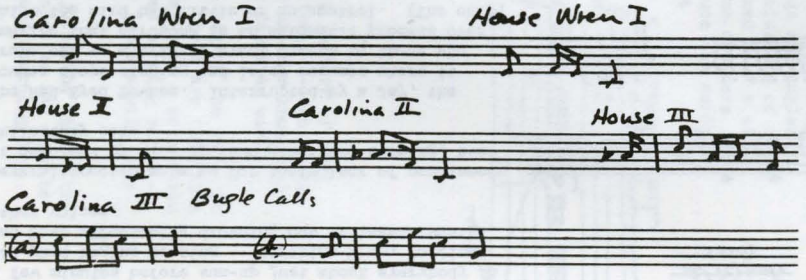




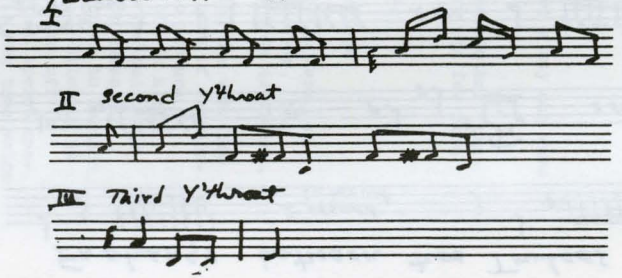




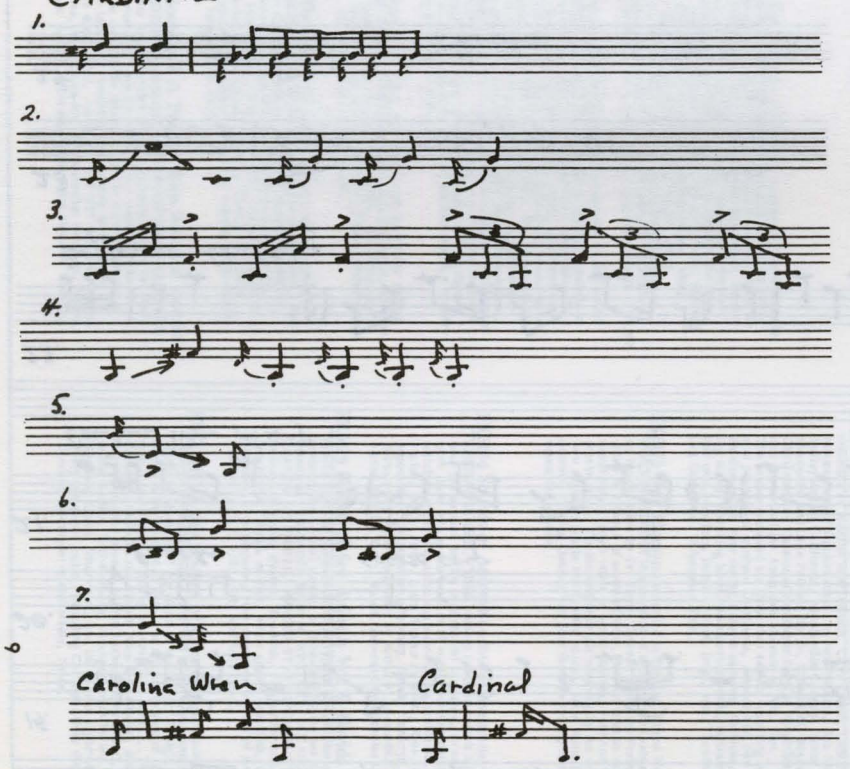
SIDE II, BAND 1: WRENS



YELLOWTHROAT

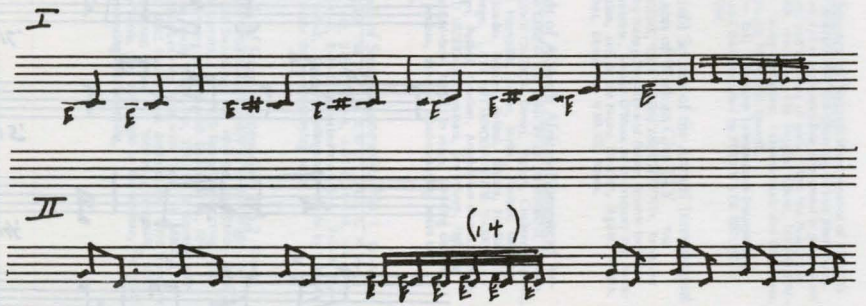


CARDINAL



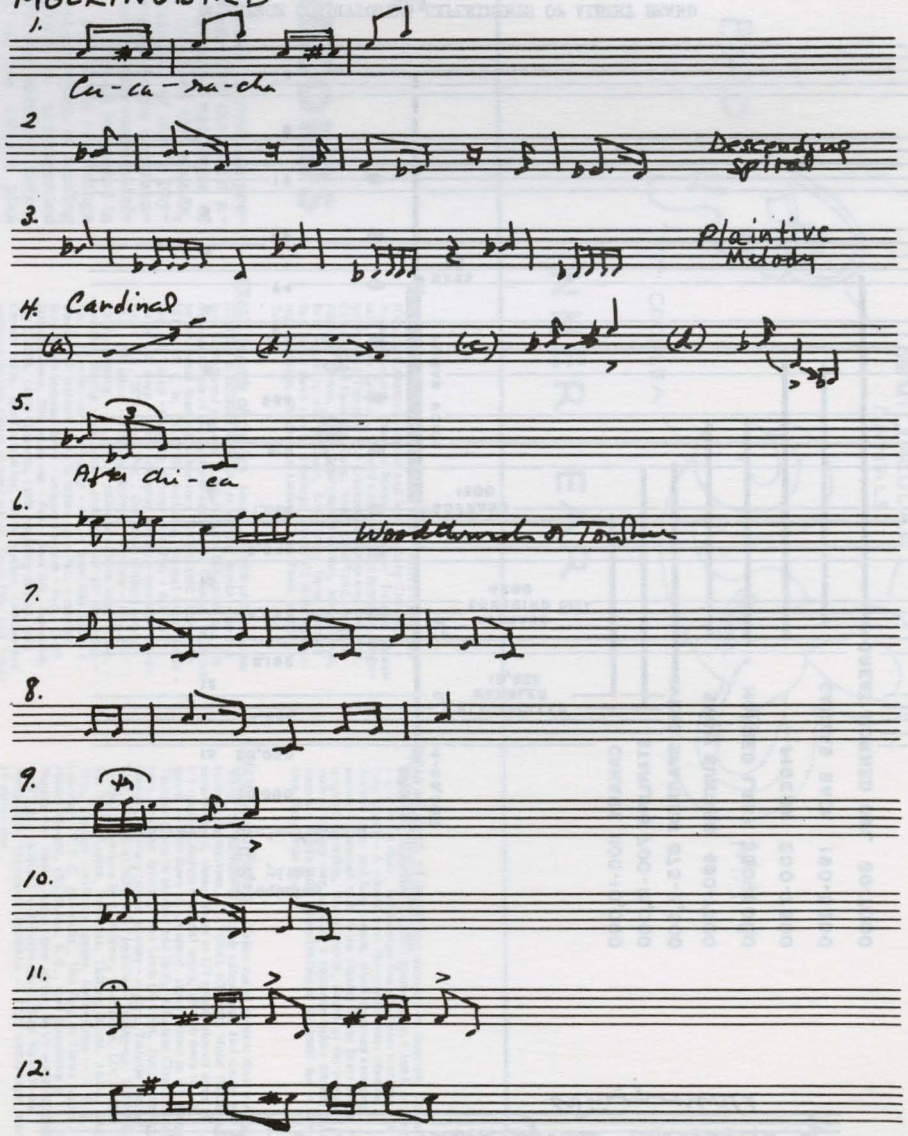
SIDE II, BAND 2:

FIELD SPARROW



SIDE II, BAND 3:

MOCKINGBIRD



13.

14.

15.

16.

17.

18. Jaye Pumphandle Call

19. Strange Musical

20. Phoebe coarse cry

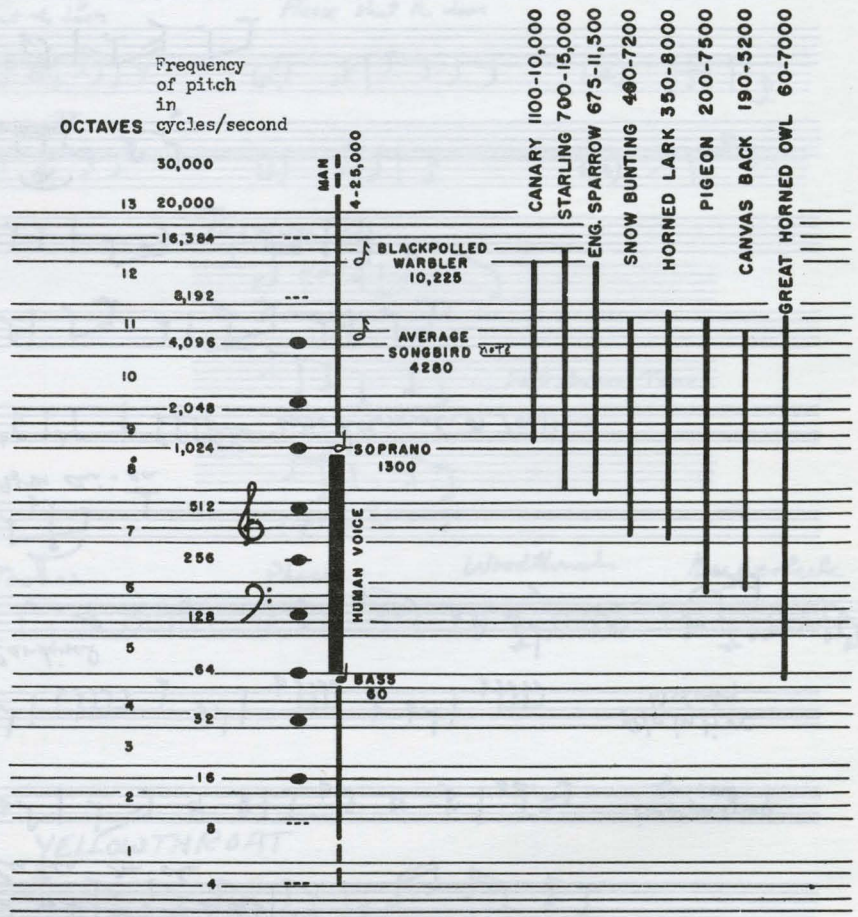
21. Carolina Wren passage

22. Different handling

23. Whippoorwill

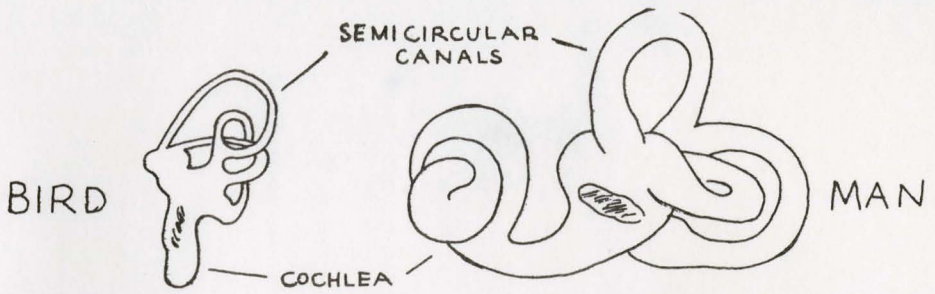
24. Phoebe

25. Mockingbird imitation of Whippoorwill



DATA FROM CONDITIONING EXPERIMENTS OF ALBERT BRAND

The hearing range of man and birds is drawn on the musical staves. Region of best hearing for every species (including man) corresponds to range of voice. Birds with low voices can hear low sounds. (Range of musical instruments is also indicated.)



INNER EAR

SCIENCE

ON RECORDS

Folkways' series of science recordings provides a unique documentary of the world around us. This ever-growing catalogue of long-playing records, captures the sounds, both natural and mechanical, of man's physical world. These sounds -- the documentation of animals, insects, man-made satellites, railroads, etc. -- are all recorded in geographical context. All of the recordings are edited under the supervision of leading scientists. Each record is accompanied with a set of extensive documentary notes, providing background on the subject plus additional information on the circumstances of recording and the significance of the sounds recorded.

FX6007 The Science of Sound Demonstrations of acoustic phenomena with an explanatory narration written by scientists and engineers of Bell Telephone Laboratories, How We Hear, Frequency, Pitch, Vibration and Resonance, Intensity, Loudness, Noise Measurement, Masking, Echo and Reverberation, Delay Distortion, Fundamentals and Overtones, Quality, Subjective Tones, Music or Noise, Filtered Music and Speech, Dissonance and Consonance, Music Scales, Vibrato and Tremolo, The Doppler Effect.
Produced by Bell Telephone Laboratories Incorporated
Distributed and manufactured by FOLKWAYS RECORDS & SERVICE CORP. 2-12" 33-1/3 rpm long play records . . $11.90

FX6100 Sounds of Frequency The purpose of this record is to provide a standard by which record playing equipment can be checked for frequency response and distortion. 78 RPM:. . . Frequency test run; square waves; and three variations of music to check longplay phonograph record characteristics. NOTES BY PETER BARTOK The purpose of this record is to provide a standard by the use of which record playing equipment can be checked for frequency response, and distortion, without equipment other than an oscilloscope and volume indicator. The portion of the record intended for frequency-response measurement provides test signals which are always the same musical distance apart. Accompanying descriptive notes.

FX6101 Science in Our Lives narrated by Ritchie Calder, from the Signet Key Book. Includes Science began, Science terms, Edison effect, Atoms, Agriculture, Food from the desert, Food from the jungle, Millions of men without teaspoons, Rip Van Winkle comes to town.

FX6105 The Sounds of Camp the picture of a children's camp painted in the voices and sounds of its children. Recorded at Camp Killooleer, Hancock, Vermont, 1958 by Ed Badeaux. Includes Riding, Shop Swimming, Jingle, Before lunch music, Filing into tables, Eating, Happy Birthday, Jacks, Dance Class, Baseball, Theatre Backstage, Front porch before hikes leave, Hike reports, Girls after a dance, Riflery, Last campfire.

FX6120 Sounds of A Tropical Rain Forest in America As a dramatic presentation, and because enough sounds were available it was decided that the approach would be. . for every hour of the day from one to two minutes of sound would be used on the record. Thus in sixteen minutes of play an idealized condition was possible in depicting a dawn to dusk period. Includes, THE DRY SEASON Cricket and Dove, Violaceous Jay, Black Howler Monkeys, Parrott, Swainson Toucan, Cicadas, Great Rufus Motmot, Cicada, Spotted Chachalaca, Great Tinamou, Wattled Guan, Red Wattled Curassow, Toucan and Jay, Monkey Chatter, Toucan Barbetes, Flock of Parrots, Waglers' Toucan, Macaw talk, With Crickets, Crested Guans In Thunderstorm, Chestnut Headed Tinamou and Crickets, Crickets and Parakeet, Crickets and Mourning Dove, Small Tree Toad, Peepers, Flight of Parrots, Giant Toad (Bufo Marinus), Many Toads, Rain Sequence with Crickets, And Toads, Three Wattled Bell Bird, Black Howler Monkeys, Tree Fall With Screaming, Monkeys, Parrots and Macaw, Tree Toad, and Big Toad.

FX6121 Sounds of the Sea Actual SOUNDS of fish species recorded in isolated tanks and at varying depths - from 5 feet in sheltered areas to 2,000 fathoms 200 miles out - in tropical waters of the Atlantic and Pacific Oceans, Recorded by the Naval Research Laboratory. INTRODUCTION AND NOTES BY C. W. COATES. Includes, Normal water noises - Pac., 10' deep - snapping shrimp - toadfish - Atl., 11' water - 5' deep - Atl. - snapping shrimp - croakers - toadfish - Atl., 20' water - Pac., One mile offshore (crabs) Pac., 45' water - snapping shrimp; Afternoon - Atl., 45' water; Evening - Atl., 1 1/2 miles out above water - Pac. - snapping shrimp - sea robin - croakers, 50' 60' 70' water - Pac., 12 miles out - 48' deep - Atl. - drum fish (bastard trout), 600 fathoms down 18 miles out - Pac. - croaker family 600 fathoms down - unknown sounds - Pac., 2000 fathoms down, 200 miles out - Pac., Spot fish, Sea robin, (5) Catfish, (400) Croakers, (150) Snapping shrimp, (40) Cancer crabs, Spotfin croaker, Black croaker, Croaker and snapping shrimp chorus in open water, Drum fish, and Toadfish.

FX6122(FPX6122) Sounds of the American Southwest recorded in Arizona near Tucson, Cave Creek, Chiricahua Mountains and Rustlers Park, In New Mexico, San Simeon Valley and in California, Mandevilla Canyon, Santa Monica Mountains and Lake Fulmar, by Dr. Charles M. Bogert, Chairman and Curator of the Department of Amphibians and Reptiles of the American Museum of Nat. Hist., N. Y. The sounds recorded are those that anyone traveling in the arid portions of southern California, Arizona and New Mexico might hear during a single summer. Includes, Morning doves, mocking birds, woodpecker, owls, rattlesnakes, bob cats, crickets, beetles toads, frogs, etc. Thunder storm and flashflood. Illustrated Text.

FX6123 Vox Humana recorded in England, Alfred Wolfsohn's experiments in extension of human vocal range with an introduction by Dr. Henry Cowell. Includes Female voice in a range of seven octaves, Female duet in ne vocal sound range, Boy's voice in seven octaves, Four and five octave leaps, Double and multiple stopping by the voice, New registers (male and female voice), Male voice in nine octaves, "String Quartet" for four female voices, and Voice versus Instrument.

FX6124 Sounds of Animals audible communication of zoo and farm animals. These various recorded sounds suggest that just as man has his own special language, so animals have their own special means of vocal communication which help them to solve their own living problems. Includes, ZOO: Puma, Lion, Indian Elephant, Rhea, Hippopotamus, Chimpanzee, Peccary, Rhesus Monkeys, Rhinoceros, Tiger, recorded by Arthur M. Greenhall. FARM: Chicks, Goat, Sheep. recorded by Nicholas Collias.

FX6125 Sounds of Sea Animals Vol. II Florida This record contains representative or typical underwater sounds produced by several species of fishes and by the sea cow or manatee. RECORDED BY W. N. KELLOGG.. OCEANOGRAPHIC INSTITUTE. . FLORIDA STATE UNIVERSITY. . . Includes Snapping shrimp, Toadfish, Trigger Parrotfish, Sea catfish, Single catfish, White grunt, Drumfish, Cowfish, Manatee, One porpoise, Four porpoises, School of porpoises, "School" at 1/2, 1/8, 1/32, and 1/64 speed.

FX6126(FPX126) Sounds of Carnival The Midway and Merry-Go-Round Music. Recorded at The Royal American Shows by students of the Chicago Institute of Design. This record is for young and old. It is a documentary of typical sounds nostalgic and true of an American scene. . . The Carnival. Includes the Crowd, Merry-Go-Round, Barker, Outside the fun house, Animal barker, Ferris Wheel, Motordrome barker, Roll-O-Plane, Strange people barker, Laughing clown, Interviews, and the famous repertoire of merry-go-round music, including Calliope; Over the Waves, Ta-ra-ra-boom-der-e and others. Notes.

FX6127 Sounds of Medicine recorded on location. Contains Operation: Supervised surgical operation on a small boy with a cyst in his neck, Stethoscope Sounds; Heart murmurs and lung sounds - A woman with Rheumatic Heart Disease, Normal heart and lung sounds, Heart murmurs and lung sounds - A woman with Valve Disease of the heart before surgical operation, Breath sounds, Sounds of the bowels - A normal hungry man smoking a cigarette before dinner, Heart sounds - A man with inflammation of the heart due to active Rheumatic Fever.

FX6130 Sound Patters. Taken out of content these sounds 'stand' by themselves in their uniqueness, and create new auditory dimensions. NATURAL SOUNDS: Wood Thrush--natural speed, slowed down to 1/2 speed, slowed down to 1/4 speed, Crickets--natural speed, slowed down to 1/2 speed, slowed down to 1/4 speed, slowed down to 1/8 speed, Thunder Storm (with toad and bird), Alligator Chorus (American, and one Asiatic), Two Lions (Atlanta, Zoo), Monkey (happy), Monkey (same monkey - angry), Tortoise Mating Call, MUSICAL SOUNDS: Musicians Tuning-up, SOUNDS: Animal imitations by an Eskimo, Heartbeats, LOCATION SOUNDS: Chorcha, Honduras, Talking Drums, Africa, Taxi Trip, Through Traffic to Airport, Street Cries -- N. Y. C. Lineman, N. Y. C. gardenias!, Hot Dogs in Times Square, Flower Vendor, Charleston, S. C., Cow Ceremony in Yugoslavia, Dawn Chorus, East Africa, MAN MADE SOUNDS: Jet Flight, Railroad to Atlantic City, Short Wave Radio, Pump Drill, Electronic Feedback -- 7 1/2 inches tape, and 15 inches tape.

FX6136 The Science of Sound (Short versions of FX6007) This record describes and demonstrates various phenomena of sound as an aid to understanding how sound is put ot work for the benefit and pleasure of man. How We Hear, Frequency, Pitch, Intensity, The Doppler Effect, Echo and Reverberation, Delay Distortion, Fundamentals and Overtones, Quality, Filtered Music and Speech.
Produced by Bell Telephone Laboratories Incorporated
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FX6140(FPX140) Sounds of the Annual International Sports Car Races of Watkins Glen N.Y. The Schuyler, Carrera, Glen Trophy and Grand Prix. Recorded on location by Henry Mandler and Robert Strome Includes: lining up, practice, winner O'Shea in the victory lap, technical inspection, cars in the races: Maserat, Jaguar, Austin, MG's, Porsches, Mercedes. With ill. notes.

FX6151 Sounds of A South African Homestead Recorded in the Land of the Zulus by Dr. Raymond B. Cowles Containes DAWN CHORUS: Doves, Thrush, Cuckoo, Weaver. BUSH BIRDS: Hornbills, Doves, Barbet, Shrikes, Monkey, Warblers, Cicadas, Orioles, Bulbul, Robbin, Starling, Ibis, Trogon, Drongo. LATE AFTERNOON UNTIL DARK: Partridge, Drongo, Bulbul, Cricket, Amphibian chorus, Toads, Frogs. ZULU MUSIC: with guitars, jew's harp, fighting sticks, gourd-and-bow, horns, in songs, wedding chants, beer-drink, praises, dances. Accompanying notes and illustrations.

FX6152 Sounds of Steam Locomoties No. 1 Stack Music Sampler; The U. P., C. B. & Q., I. C., C. N. W., D. R. G. W. . etc. 2-8-2, 4-8-4, 4-12-2, 4-6-0, 4-6-6-4, 4-8-8-4, 4-8-2, 2-10-2 and switchers 0-6-0, 2-8-0, narrow gauge 2-8-2. These recordings were made by Vinton Wight who wrote the accompanying notes.

FX6163 Sounds of Steam Locomotives No.2 Stack music sampler edited and recorded by Vinton Wight. Includes No. 510 Switching, No. 4958 Leaving Yards, No. 5116 Climbing to Elevator, No. 5112 Struggling spotting Cars, No. 4958 Returning to Yards with Empties, No. 5344 Simmering on Ready Track, No. 5351 Up to Crossing and Back, No. 5504 Leaving Yards with Train, No. 5355 Passing, No. 5505 Switching at Ashland, No. 5504 Woodlawn Run, No. 5347 and Helper No. 7000 near Firth, No. 5335 Pulling into Yards, No. 5504 Light to Roundhouse, No. 5351 from RH Simmering and Switching.