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

DESCRIPTION NOTES ARE INSIDE POCKET

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The Bird's World of Song

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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

SIDE 2  FX 6115 B

Band 1: Wrens

Band 2: Field Sparrow

Band 3: Mockingbird

THE BIRDS' WORLD
Listening through a Sound Microscope to Birds around a Maryland Farmhouse

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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 these 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 reverse 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. Anley 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 an 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:

\[\text{\textbf{\textit{f}}} \]

Almost right.

Off by an octave on first note.

Saunders:

\[\text{\textbf{\textit{f}}} \]

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 is 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 Woodthrush knows that it is impossible to judge how the songs differ from those of the Towhee. Hence we arrive at Asley'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:

\[\text{\textbf{\textit{f}}} \]

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:

\[\text{\textbf{\textit{f}}} \]

**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:

\[\text{\textbf{\textit{f}}} \]

Saunders:

\[\text{\textbf{\textit{f}}} \]

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,

\[\text{\textbf{\textit{f}}} \]

the other like the Towhee's.

\[\text{\textbf{\textit{f}}} \]

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, Woodthrush, 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

\[\text{\textbf{\textit{f}}} \]

In song II the interval of II a second is followed by another note five tones 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 folk. 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 phylogeny 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 Pewee 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 vocal repertoire besides was discovered. Many new and bizarre departures attended the intensity of avian speculation 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:

\[
\begin{align*}
&\text{\textbf{Mathews}}: \\
&\text{\textbf{Saunders}}: \\
&\text{\textbf{Maryland Yellowthroat}}: \\
&\text{\textbf{House Wren}}: \\
&\text{\textbf{Carolina Wren}}: \\
&\text{\textbf{Wood Peewee}}: \\
&\text{\textbf{Yellowthroat}}: \\
&\text{\textbf{Sparrow}}: \\
&\text{\textbf{Cardinal}}: \\
&\text{\textbf{Mockingbird}}: \\
&\text{\textbf{Mockingbird}}: \\
&\text{\textbf{Wood Thrush}}: \\
&\text{\textbf{Robin}}: \\
&\text{\textbf{Savannah Sparrow}}: \\
&\text{\textbf{Savannah Sparrow}}: \\
&\text{\textbf{Wood Thrush}}: \\
&\text{\textbf{House Wren}}:
\end{align*}
\]

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 songs 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 spontaneous or local imitatin. 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 Meadowlark. 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 indecisive by comparison. (Saunders' more elaborate-looking figures actually parallel the meager stations fixed by Mathews.)

Mathews:

\[
\begin{align*}
&\text{\textbf{Mathews}}: \\
&\text{\textbf{Saunders}}: \\
&\text{\textbf{Maryland Yellowthroat}}: \\
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&\text{\textbf{Carolina Wren}}: \\
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&\text{\textbf{Cardinal}}: \\
&\text{\textbf{Mockingbird}}: \\
&\text{\textbf{Mockingbird}}: \\
&\text{\textbf{Wood Thrush}}: \\
&\text{\textbf{House Wren}}:
\end{align*}
\]

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' 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: 

[Music notation]

Saunders: 

[Music notation]

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 to find that variation in the phrases used, chiefly different songs, and Saunders also observed different 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 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.

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 tembered; 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.

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.”

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Neither Mathews nor Saunders was acquainted with the Mockingbird, which by its insistence on inhabiting the Southern States has effectively isolated itself from the birds 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 last 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 in the Phoebe's song could not be so well controlled as to range from the cuckoo-like "phoebe" of the Chickadee, to the lisping of the Wood Peewee, to the cryptic song of the Phoebe, through the rough 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 sufficient precision, 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 the singer is harrassed on the second interval--while a Phoebe never does. Nothing could demonstrate better than this that a bird does not "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. Specialization is evident in the rapidity of birdsong, and physical limitation is evident in the human inability to hear it accurately. Compared to this interpretation, it is absurd to suppose instead that the bird's throat contains some special 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 aware of 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 hear out an entire song with the same mechanical toy. 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 some natural mistake? Certainly the answer cannot be absurdly simple.

5) The mechanical explanation is not necessarily a good biological explanation. It almost follows that songs be inherited. The anatomical features which would produce a pattern of sound automatically must be extraordinarily subtle on any other ground. 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 anthropomorphistic error? But the matter is not quite so simple. There is an equal and opposite error -- the mechanomorphistic error -- which is the 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 sort wander all the sages in the history of science, who have the feeling that those anatomical parts evoke, not to mention the vit 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 how 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 the same reason as being 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 not think, or enjoy free will, whereas birds do. 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 line 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 coochlear 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 1/60th 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 Whipoorwill sings its song at exactly the rate of 10 notes per second. What we call the Whipoorwill effect is merely the old telegrapher's effect. It is a limitation of the mammalian avian ear - as the Mockingbird proves by "receiving and transmitting" the Whipoorwill 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.

<table>
<thead>
<tr>
<th>Number of notes per second*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Towhee</td>
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<tr>
<td>Woodthrust</td>
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<tr>
<td>Chickadee</td>
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<tr>
<td>Phoebe</td>
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<tr>
<td>Meadowlark</td>
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<tr>
<td>House Wren</td>
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<td>Carolina Wren</td>
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<td>Yellowthroat</td>
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<tr>
<td>Cardinal</td>
</tr>
<tr>
<td>Field Sparrow</td>
</tr>
<tr>
<td>Whipoorwill</td>
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</tbody>
</table>

*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.
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 Woodthrush carols.

A choir of Robins chants from the lawns of a near-by estate (followed here by the Retreat 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, TRACK 3: THE BIRD'S WORLD: PROGRAM OF SONGS KNOWN ONLY TO THE BIRD

TOWHEE

1. 

2. 

3. 

4. 

5. 

6. (a) 

7. 

Exchange between two Towhees

SONG SPARROW

SONG SPARROW'S INTERMITTENT MEASURE occurring 6 times above.

CHICKADEE

PHOEBE

Towhee

WOODTHRUSH

Response

Odd Song
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.)
SCIENCE ON RECORDS

Folkways' series of science recordings provides a unique documentary of the world-a remarkable, 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


FX6000 Sounds of Frequency

The purpose of this record is to provide the user with a variety of frequency measuring equipment that can be checked for frequency response and distortion. 10 kHz, 10 kHz, 20 kilohertz, and 100 kilohertz, and various vibrations of music to show how much frequency response measurements provide us with signals which are always the same musical distance apart. Accompanying descriptive notes.

FX6011 Science in Our Lives

First in a series of Folkways records. Science begins, Science ends, Science is everywhere. Food from the jungle, Millions of men without seasports, Van Vistas come to town.

FX6005 The Sounds of Camp

The picture of a children's camp in the summer winds of its children. Recorded at Kamp Kildoon, Hancock, Vermont, 1938 by Ed Bruce, including, Singing, camping, baseball, before lunch music, Filling into tables, Dancing, Shopping, Tug of war, Girls and Boys, and other sounds. Recorded by Karl White and Kay White. Includes Sound of buildings and animals that benefit the world due to this program. In part... Also includes Music and Sounds of Camp.

FX6012 Sounds of a Tropical Rain Forest in America

A description of the sounds and animal sounds made by birds and mammals of the Amazon region. Sounds of the banana, the hummingbird, the toucan, the parrot, the howler monkey, and many other animals. Distributed by FOLKWAYS RECORDS & SERVICE CORP., 24-47 34th Street, New York 1, 90.

FX6020 Sounds of the Sea from the South

Actual Sounds of fish species recorded in 200 fathoms or 200 miles. Distributed by FOLKWAYS RECORDS & SERVICE CORP., 24-47 34th Street, New York 1, 90.

FX6021 Sounds of the Sea from the South

Actual Sounds of fish species recorded in 200 fathoms or 200 miles. Distributed by FOLKWAYS RECORDS & SERVICE CORP., 24-47 34th Street, New York 1, 90.

FX6022 Sounds of the Sea from the South

Actual Sounds of fish species recorded in 200 fathoms or 200 miles. Distributed by FOLKWAYS RECORDS & SERVICE CORP., 24-47 34th Street, New York 1, 90.

FX6023 Sounds of the Sea from the South

Actual Sounds of fish species recorded in 200 fathoms or 200 miles. Distributed by FOLKWAYS RECORDS & SERVICE CORP., 24-47 34th Street, New York 1, 90.

FX6024 Sounds of the Sea from the South

Actual Sounds of fish species recorded in 200 fathoms or 200 miles. Distributed by FOLKWAYS RECORDS & SERVICE CORP., 24-47 34th Street, New York 1, 90.

FX6025 Sounds of the Sea from the South

Actual Sounds of fish species recorded in 200 fathoms or 200 miles. Distributed by FOLKWAYS RECORDS & SERVICE CORP., 24-47 34th Street, New York 1, 90.

FX6026 Sounds of the Sea from the South

Actual Sounds of fish species recorded in 200 fathoms or 200 miles. Distributed by FOLKWAYS RECORDS & SERVICE CORP., 24-47 34th Street, New York 1, 90.

FX6027 Sounds of Medicine

Recorded on location, Contains Operation, Vascular, surgical operation, small boy with a can in his nose, Teardrop sounds, Heart murmurs and bombs, Organ transplant, Heart sounds, Blood sounds, surgical operation, Breath sounds, Sounds of the bowel - A medical history, Man shaving, Man shaving a signature before dinner, Heart sounds - A man with inflammation of the heart due to active rheumatic fever.

FX6028 Sounds of Music

Recorded on location, Contains Music, Melodies, and Musician. Distributed by FOLKWAYS RECORDS & SERVICE CORP., 24-47 34th Street, New York 1, 90.

FX6029 Sounds of Music

Recorded on location, Contains Music, Melodies, and Musician. Distributed by FOLKWAYS RECORDS & SERVICE CORP., 24-47 34th Street, New York 1, 90.

FX6030 Sounds of Music

Recorded on location, Contains Music, Melodies, and Musician. Distributed by FOLKWAYS RECORDS & SERVICE CORP., 24-47 34th Street, New York 1, 90.

FX6031 Sounds of Music

Recorded on location, Contains Music, Melodies, and Musician. Distributed by FOLKWAYS RECORDS & SERVICE CORP., 24-47 34th Street, New York 1, 90.

FX6032 Sounds of Music

Recorded on location, Contains Music, Melodies, and Musician. Distributed by FOLKWAYS RECORDS & SERVICE CORP., 24-47 34th Street, New York 1, 90.

FX6033 Sounds of Music

Recorded on location, Contains Music, Melodies, and Musician. Distributed by FOLKWAYS RECORDS & SERVICE CORP., 24-47 34th Street, New York 1, 90.

FX6034 Sounds of Music

Recorded on location, Contains Music, Melodies, and Musician. Distributed by FOLKWAYS RECORDS & SERVICE CORP., 24-47 34th Street, New York 1, 90.

FX6035 Sounds of Music

Recorded on location, Contains Music, Melodies, and Musician. Distributed by FOLKWAYS RECORDS & SERVICE CORP., 24-47 34th Street, New York 1, 90.

FX6036 Sounds of Music

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FX6037 Sounds of Music

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FX6038 Sounds of Music

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FX6039 Sounds of Music

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FX6040 Sounds of Music

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FX6041 Sounds of Music

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FX6042 Sounds of Music

Recorded on location, Contains Music, Melodies, and Musician. Distributed by FOLKWAYS RECORDS & SERVICE CORP., 24-47 34th Street, New York 1, 90.

FX6043 Sounds of Music

Recorded on location, Contains Music, Melodies, and Musician. Distributed by FOLKWAYS RECORDS & SERVICE CORP., 24-47 34th Street, New York 1, 90.

FX6044 Sounds of Music

Recorded on location, Contains Music, Melodies, and Musician. Distributed by FOLKWAYS RECORDS & SERVICE CORP., 24-47 34th Street, New York 1, 90.

FX6045 Sounds of Music

Recorded on location, Contains Music, Melodies, and Musician. Distributed by FOLKWAYS RECORDS & SERVICE CORP., 24-47 34th Street, New York 1, 90.