

THE PHONETICS OF BIRD-SOUND

By RICHARD HUNT

THE following plan for a more standardized method of hearing and recording bird utterances is submitted in the belief that it is needed. In at least four fields—ecology, evolution, heredity, and animal behavior—bird vocalization has figured, and must in the future figure, as pertinent and important material. Investigators in these fields, however, are handicapped because there is no agreed-upon terminology for handling the facts of bird sound.

The common belief seems to be that bird sounds are essentially indescribable, and that therefore one man's attempt at description is as useful (or as useless) as another's. It should be remembered, however, that no science or branch of a science, has ever developed ahead of its terminology. A terminology and technique is built up by use, as new facts and concepts come to light. In so far as bird vocalization is concerned, our chief need is for ornithologists to start in talking about the facts of bird sound in an agreed-upon language. So far it has been "each man for himself."

Various systems have been offered,—musical, graphic, and literary. I can not take space here to discuss the relative merits of these systems. The plan herewith offered is based on phonetics. It is believed to be the natural and logical system for three chief reasons: (1) it is perfectly flexible, providing for the recognition of all factors in bird sound (pitch, intensity, rate of speed, form, expression, timbre, and phonetic quality); (2) the working symbols are those of the English language, and are therefore common property and do not require special knowledge or technique; (3) these symbols are essentially suited to the expression of bird sounds, since bird sounds are essentially human speech-like. As some exception has been taken to my claim that bird sounds are human speech-like, I feel that I should devote a little space to explanation, especially since I may previously have failed to make clear just what I mean by human speech-like.

I do *not* mean that birds talk or converse, impelled by motives or needs homologous to those governing human talk and conversation. I mean merely to say that the typical outward *effect* or *structure of a bird utterance*, aside from whatever inner meaning or function it may have, is *like* human talk, and *not* like human singing. I agree that birds *sing* (as well as utter notes of alarm, warning, etc.). Their singing may even have behind it emotional urges and needs similar to those behind human singing, but the physical sound-result is certainly different. Now, it is possible to say or pronounce words after a fashion by whistling them. For example try to whistle the word "doggie." In doing this you produce a bird-like sound effect—an effect which is typical of bird utterance. The quaint Barrington, author of perhaps the oldest treatise on bird-song in our language, remarked: "Thus also the linnnet, which I heard repeat the words *pretty boy*, did not articulate like a *parrot* or a *mino*, though, at the same time the words might be clearly distinguished." In Hudson I find the following quotation from Sir George Grove regarding the English blackbird: "He selects a spot . . . and begins quite at leisure . . . a regular conversation. 'And how are you? Isn't this a fine day? Let us have a nice talk', etc.,

etc. . . ." "Strange as it may seem," says W. Ward Fowler, "the songs of birds may perhaps be more justly compared with the human voice when *speaking*, than with a musical instrument, or with the human voice when *singing*; and we can no more represent a bird's song in musical notation, than the inflections of Mr. Gladstone's voice when delivering one of his great speeches."

Sweeping statements are of course dangerous. Very occasionally a bird utterance is heard which can be accommodated without contortion on the musical staff. Even then, however, the phonetic or speech-like essence of the utterance itself remains unchanged: "pretty boy," for example, is to be *spelt* the same whether "sung like music" by the bird or "spoken." It is not as if syllabification and musical notation were mutually exclusive.

Bird utterances, whether songs or one-syllabled calls, have inflections, cadences, "tunes," or general fluctuations of pitch and emphasis, closely resembling these same phenomena in the speaking (and rarely the singing) human voice. Let the reader call to mind, for example, the Olive-sided Flycatcher's note, *Pui-pee-veur!* If I were hunting for an adjective to describe the *expression* of this call I would decide on the word 'dauntless,' for it suggests the tone of voice in which a human being would say a three-syllabled word dauntlessly. There are times when, by accident, as in the case of Barrington's linnet, the 'words' that a bird whistles, chirps, or twitters, resembles human words, but what is more important, whether they resemble human words or not, they almost invariably resemble the *tone of voice* in which human words are or might be uttered.

It would logically follow from the fact that bird utterances are human speech-like that in making records of bird utterances the same symbols should be used as are used in the written human language. But one does not need to prove the thing by logic. Direct listening to bird sounds has proved to my entire satisfaction that a large number of more or less distinct phonetic effects are contained in the utterances of birds. These phonetic elements fall very nicely into four classes, which we may call: (1) *the vowel sounds*, (2) *the explosives*, (3) *the fricatives*, and (4) *the musicals*.

I. THE BIRD VOWEL SOUNDS

<i>ee</i>	as in meet	<i>a</i>	as in hat
<i>i</i>	as in hit	<i>ä</i>	as in father
<i>ë</i>	as in pet	<i>aw</i>	as in saw
<i>ö</i>	as in hot		
<i>ë</i>	as in whirl		
<i>ü</i> (or uh)	as in hut		
<i>öö</i>	as in stood		
<i>oo</i>	as in who		

The vowels in the first column are arranged in descending scale; each falls within a definite and characteristic "region of maximum resonance" which determines its relative *pitch* value in the utterance. It is thus obvious that if we correctly determine the vowel sounds in a bird utterance and spell the utterance accordingly, we thereby automatically convey an idea of the relative pitch. The vowels from *ee* to *oo* are intrinsically clear, pure-toned, or tonal, and hence may be called *tonals* to distinguish them from the sounds in column two, which are intrinsically harsh, raucous, or nasal sound-

ing, and which we may call the *fricative vowel sounds*. All the above sounds are *continuables*—they may be indefinitely prolonged without change of character.

From these same vowels, however, are derived certain *non-continuable* effects, representing rapid transitions from one continuable vowel to another. They are thus virtually brief upward or downward glides of sound and may be called *the inflectives*. They are:

<i>ay</i>	(=a+ee)	<i>eü</i>	(=ee+uh)	<i>ow</i>	(=a+oo)
<i>oy</i>	(=ö+ee)	<i>eu</i>	(=ee+oo)		
<i>ooee</i>	(=oo+ee)				

It should here be explained that *w* and *y* are, in bird utterance as in human, not actual sounds at all, but mere points of change or inflection. To secure life-like effects it is often necessary to use *w* and *y* in recording bird utterances, but it should be remembered that *w* represents the low sound *oo*, and *y* represents the high sound *ee*; thus:

Twee is in actuality t + oo + ee

Tyou is in actuality t + ee + oo

II. THE BIRD EXPLOSIVES

<i>wh</i>	<i>p</i> (b)
<i>t</i> (d)	<i>k</i> (g)
<i>ch</i> (j)	(th)

We are very much in need of some adjectives or descriptive words answering to the explosives. One service that interested ornithologists may render is to correlate phonetic bird sounds with descriptive words, thus gradually contributing to a basis for a more standardized terminology. If by comparing the field notes of say a dozen men it should be found that seven or eight had described notes as 'chipping' in which a *ch* element was discovered, we would have some reason for standardizing the word 'chipping' as signifying a note to be spelt with a *ch*. As a matter of fact, however, 'chipping' could not apply to all *ch*-notes since many such notes take low-frequency vowels and might more properly be called 'chupping' or 'chocking' notes, etc. The trouble here is that an explosive is not so apt to determine the whole utterance as is a vowel or a fricative, for the explosive is ordinarily merely a more or less obscure *initial* effect. The initial, however, can be very marked, and have a decided character of its own. There is no doubt that we shall have to 'coin' a certain number of descriptive words, whether on a phonetic basis or otherwise.

The bird explosives are (with the exception of *th*) strictly *non-continuable*. They may be thought of as brief flashes of sound in the whole utterance; each has its peculiar 'brilliancy' and 'color.' To use another figure, each lends a special 'flavor' to the sound of which it is a part. Much space could be given to a qualitative analysis of the properties of the explosive sounds. Briefly, *wh* is *breath-like*; *t* is *hard* and *sharp* and *tight* and *incisive*; *ch* is hard, yet comparatively *slow* and *loose-sounding*; *p* is *weaker* than *t*, is often the initial in continued sounds of a *peeping* or *piping* character, and shows a marked tendency to combine with musical *l* in the formation of *musical* explosives; *k* is hard like *t* but *not incisive*; it is *deader* (except when livened by the admixture of a musical *l* sound); it is always found in cracking, creaking, and croaking sounds in combination with non-musical *r*;

th is really a fricative, but often plays the rôle of an explosive, lending to those sounds of which it is the initial element a certain impact-like *thippiness* or even a *lisp*ing quality. The sounds *d*, *j*, and *b* are obscure phases of *t*, *ch*, and *p*. The *guttural* sound *g* is not uncommon in bird utterance, and is often associated with musical *l*, as in the song of the Brewer Blackbird and the cowbird.

III. THE BIRD FRICATIVES

wheezy	<i>hw</i>	—————?	<i>zh</i>
sputtery	? <i>f</i> (<i>v</i>)	German	<i>ch</i>
sibilant	<i>s</i>	nasal	<i>m</i>
shuffly	<i>sh</i>	nasal	<i>n</i>
buzzy	<i>z</i>		

When a fricative exists at all it usually dominates and runs throughout the utterance as a more or less specific sort of effect. It is therefore not hard to give most of the fricative sounds specific names. Nominations are in order for *zh*, however; and I am not convinced that 'sputtery' is the final designation for sounds containing *f*.

The fricatives are, like the vowels, *continuable* (though they may be abbreviated so as to serve as initial or final effects). A fricative, like an explosive, always *accompanies* or emanates from a vowel sound, of which it may be said to be the *irradiation*. In this phenomenon is contained a valuable hint for the field recorder of bird utterances, who so often finds a note 'unspellable.' It will often be found, on careful listening, that the difficulty arises from the fact that two sound elements (i. e., a vowel and a fricative) are synchronous. The elements should be separated out by ear one by one, and the spelling built up on the page of the note book. The vowel-sound or sounds of an utterance can almost always be picked out before anything else can. If a fricative is next discovered, it should be *superposed* over the vowel sound in the finished spelling. Thus the song of the Western Wood Pewee should be spelt:

zzzzzzzzzz
Bccccccccc

The peculiar character of each bird fricative may be realized by an experimental use of the human mouth. *Hw* and *f* are the weakest and most obscure of the fricatives; *z* and *ch* are the strongest and the most readily recognized. A rough sound emanating from a vowel effect may always be recognized as a fricative, even though its specific character is not immediately apparent. Even as a foreign bird skin sent to one for identification might be placed in its proper genus, but not immediately in its specific niche, so can one usually recognize a *general* fricative element in a bird utterance, though one may not be able immediately to identify it as a buzz or a wheeze. If it cannot be written *ch ch ch ch* it can at least be written *fricative* *whaaaaaaaaa*. It may be that there are some important undiscovered bird fricatives. Theoretically *th* is a fricative, but I have never discerned it as such in bird sound.

IV. THE BIRD MUSICALS

musical *l*

musical *r*

L is the most musical of the bird sound elements. It occurs in sounds of both whistle-like and impact-like character. It shows a marked affinity

for *p* and *k*, with which it combines to form some of the most pleasing bird sounds.

Strictly speaking, we must recognize two *r*-sounds: (1) *musical r*, which is, like *l*, a *fluent, gliding* or perhaps briefly rolled or looped *inflection* or connective; and (2) *rolling r*, which is not necessarily musical, and which is the *apparent* sound effect emanating from certain rapidly-repeated impact-like sounds—as a regularly repeated series of ‘metallic’ *t*-sounds seems to become *trrrrrrrrrr*. *R* is often one of the chief determining factors in *rich-harsh* or *rich-croaky* sounds, such as *kraa* and *kruh*.

The main purpose of this paper is to enlist the coöperation of interested ornithologists in standardizing the terminology and technique of the science of bird sound. It seemed to me that a good way to begin was to offer the above suggestions as a possible working basis. Needless to say the writer will be glad of criticism and suggestion. One much needed thing is the fixation of more definite word meanings through the common specific use of descriptive words referring to facts of bird sound. A Dictionary of Bird Sounds can be built up by cooperative action, and the words should eventually be classified not only in accordance with their reference to the four classes of phonetic bird sound, but also with reference to the factors of pitch, intensity, speed, form, expression, and timbre. For example, ‘shrill’ refers to *pitch*; ‘loud,’ to *intensity*; ‘rapid,’ to *speed*; ‘staccato,’ to *form*; ‘querulous’ to *expression*; and ‘rich’ to *timbre*. As a working basis of possible value to others in their bird utterance work, I submit the following alphabetically arranged, incomplete list of

BIRD SOUND DESIGNATIONS

abrupt	blare	crunching	chug	clump
alarm	belling	crowing	clear	crumple
alto	blast	crow-like	clarity	clarinet
attenuated	bursting	cicada-like	choppy	crake
asthmatic	bombinate	cuckoo-like	croupy	
aspirate	bark	canary-like	crack-voiced	drum
	brawl	chitter	coarse	drone
base	bay	chatter	cooing	dead-sounding
blown	blatter	chutter	cackle	dripping
beaten	babel	clatter	chink	dry
bounding	blab	clap	chat	discordant
banjo-like	babble	clip	call	drawl
blackbird-like	brassy	crackle	clamor	detonate
bellow	blurting	clang	caterwaul	ding-dong
buzz	bumping	clank	cat-like	dulcet
bantam-like	baa	clink	crashing	devil's tattoo
bell-like	blithe	click	crepitate	dove-like
bow-wow		cough	clutter	dog-like
breathless	chant	chip	charivari	ditty
breathy	castanet-like	chipper	clack	double-toned
bang	crinkling	chirp	chime	
blubber	crick	chirrup	contralto	effervescing
burred	creak	cheep	cry	explosive
bleat	crack	chuck	chuckle	echoing
bray	croak	chack	chickadee-like	
bawl	cricket-like	cluck	carol	flowing
bugle	crink	churr	chortle	fizzy
boom	crisp	clash	chiff	fluent

flutey	hard	melodious	quawk	snore
feeping	hiccup	masculine		short
frog-like	high	murmur	rumble	smooth
forced	halloo	moan	roll	sonant
fluffy	hoop	mewl	roar	sizzle
flutter	hen-like	mouse-like	ripple	snap
fricative	hammering	mutter	rustle	sneeze
falsestto	horn-like	muffled	rattle	snarl
flapping			rip	shattering
flopping	instrumental	nasal	rickety	sputter
flipping	impact-like	noisy	rich	spatter
flaring	insect-like	neigh	rich-harsh	spit
fife-like	incisive	near-whistle	rending	spat
filing	iterated	nipping	rubbing	smack
fizzling	inflected		rasping	striking
fulminate	intoned	outright	ringing	strained
flump		oozy	resonant	synchronous
feminine	jingle	oboe-like	round	squawk
finchy	jangle	out-of-breath	rough	stir
	jabber	owl-like	reedy	sharp
grinding	jibber	open-mouthed	rushing	squeal
grating	jar	oriole-like	raucous	stacatto
growl			reverberant	sonorous
gasp	kissing	pop	rapping	snuff
glassy	knocking	pip	report	sing
grasshopper-like	kitten-like	peep	rataplan	shake
gliding	katydid-like	pipe	ratatat	song
gurgle		puff	repetition	sing-song
glug	lapping	patter	rooster-like	squall
gulp	loose	pat	reeling	stage-whisper
gargle	lispy	plop	rollicking	swish
guttural	lippy	purr		shrill
gritty	lispering	prattle	say	stentorian
gabble	light	planning	speak	slam
gobble	laughing	protracted	shout	soprano
grunt	long-drawn	plash		scream
giggle	lowing	pebble-tapping	scrape	squeak
gibber	little-voiced	pealing	strident	silvery
gruff	liquid	piercing	split	strain
grum	licking	pitapat	squash	stone-tapping
groan	lusty	pule	squeeze	sound
gaggle	latration	pig-like	sip	strum
gushing	locust-like	parrot-like	snicker	snip
gong-like	leathery	puppy-like	sigh	splash
	lay	played	sough	stutter
honk	lyric	purling	snuffle	sawing
hoot	lilt	pulsating	sniff	sparrowy
howl	lively	palpitating	screech	sotto voce
harsh	legato	ponderous	scream	slur
hoarse	loud	puttering	shiver	
hawking		pitch-pipe	shimmer	tap
hiss	maniacal	plaintive	snort	toot
heavy	moo	penetrating	sibilant	trill
hollow	meow		shuffle	tinkle
human-like	mew	quivering	soft	tear
hum	musical	quavering	stomachy	tremulous
husky	metallic	quick	sweet	thippy
half-human	mellow	quack	shriek	tonal

twang	thumping	undulating	whistle	wierd
throaty	thudding	utterance	whisper	warblery
tinny	thundering	un-musical	warble	
tipping	tattoo	un-ringing	woodeny	xylophone-like
tipper	tantara	un-resonant	wet	
tsipper	tolling	uncanny	wiry	yowl
tseep	tintinnabulation		watery	yawn
thin	treble	voice-like	wrenching	yap
tenuous	tenor	vocal	whinny	yip
tick	tune	vibratory	whimper	yell
thick	thrum	voluble	whizz	yodle
troll	tymbal	ventriloquial	whir	yawp
tight	throb	vociferation	whoop	yelp
trumpet-like	tattle	violent	wrinkle	
twitter	thrushy	velvety	weak	zizzy
tweet	tree-cricket-like		whipping	zip
trickling	talk	whine	whirling	zing
tang		wail	whetting	
tink	ululation	wheeze	wind-bell-like	

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A STUDY OF SOME PLUMAGES OF THE BLACK TERN

(WITH TWO PHOTOS)

By A. J. VAN ROSSEM

AMONG the specimens collected for Donald R. Dickey by the writer during the summers of 1920 and 1921, at Buena Vista Lake, Kern County, California, was a small series of Black Tern (*Chlidonias nigra surinamensis*). These were obtained on various dates ranging from May to September, and were taken more or less in the way of routine collecting, with the object of outlining roughly the post-nuptial molt,—the change from dark summer to light winter dress. When this series was assembled it became evident that there were many misfits,—in other words, plumages which refused to accommodate themselves to an orderly sequence. In 1922 and 1923, therefore, a special effort was made to work out some of the problems for which the small series previously collected offered no solution. In addition to this personally taken material, use has been made of specimens in the Museum of Vertebrate Zoology. My thanks are due also to Dr. L. B. Bishop, for many helpful hints and suggestions.

The nesting and downy young of this species are so well known that any space devoted to them would be a rather useless repetition of other accounts. However, one item about egg laying may well be emphasized because it has an indirect bearing on the subject which this paper is intended to cover, namely certain phases of plumages and molts. The writer is confessedly ignorant of what has been done in recent years in the study of molt-causation, but, as the following observation has been of interest to others to whom it has been men-