Blowin' in Birdland: Improvisation and the Australian Pied Butcherbird

Hollis Taylor

ABSTRACT

This paper challenges the assumption that improvisation is a process unique to humans. Despite the general reluctance of biologists to consider birdsong "music," they routinely comment on improvisation found in the signals of songbirds. The Australian pied butcherbird (*Cracticus nigrogularis*) is such a species. Analysis (including transcriptions and sonograms) of solo song, duets and mimicry illustrates their remarkable preoccupation with novelty and variety, and traces improvisation's role in the creation of their complex song culture. The author suggests further zoömusicological case studies for the relevance this research could have to other human (musical) capacities.

Efforts to single out distinctly human capacities have rarely held up to scientific scrutiny for more than a decade, such as claims about culture, imitation, planning and the ability to adopt another's point of view.

—Frans B.M. de Waal [1]

Score-based performance inevitably embraces nuances (including the unprescribed and the unprescribable), but *improvisation* suggests a more substantial commitment to real-time decision-making that sets it apart from written music. Likewise, an oral culture is not necessarily an improvising one. Instantaneous choices, the hallmark of improvisation, nevertheless often encompass previously considered material [2]. While this prior planning maintains a degree of invisibility in improvisation, constraints do pertain.

A *constraint* is not the antonym to freedom but the path to it, whether the improvisation affirms an acknowledged tradition or proposes a more individual aesthetic. Improvisation's point of departure consists of musical materials and acoustics, to be sure, but also understands a set of cognitive, perceptual and motor abilities that guide music production [3]. Constraints place limits on the number of sound objects, timbral properties, operations, and so on. From convention to invention, the emphasis is on expeditious information processing and decision-making. Memory (in matters of storage, capacity and recall) is crucial.

Despite the cliché, a bird's brain is a complex structure that shares many similarities with ours, and birds are known to have cognitive capacities once thought to be the preserve of primates [4]. Indeed, in the *terra incognita* of animal intelligence [5], it is not unreasonable to consider that birds' cognitive abilities might exceed ours in some areas. Songbirds must learn their song, which allows for variety and complexity not possible in innate vocalizations. Learning is achieved through cultural transmission and occurs vertically (from parents), horizontally (from members of the same generation) and obliquely (from unrelated birds of different generations) [6]. As with their human counterparts, expertise in the art of memory, fluency and flexibility are essential to birds that would manipulate song elements. However, improvisation exceeds matters of efficiency and economy. The spontaneous arrangement of sound objects can be considered a rich but extravagant act [7].

Pied butcherbird songs display an astonishing degree of complexity, inventiveness and dynamicism, as evidenced by almost complete inter-individual differences in the repertoires of mature birds; thus, the point of departure in pied butcherbird song varies with each singer [8]. Birds must match, invent, maintain, recall and alter acoustic constructs. The dawn chorus could structurally be considered a large-group free improvisation, where avian songsters work

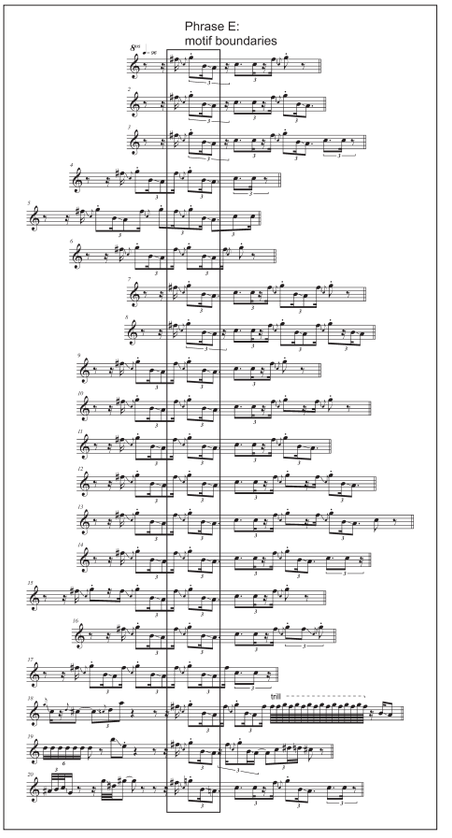

Fig. 1. A pied butcherbird solo song. This partial catalogue of Phrase E variants is presented in order of increased complexity to facilitate a search for potential "chunking" boundaries for motifs. A box outlines at least one area of commonality among all phrase variants. Double bars mark the end of a phrase, which is followed by silence (the mean inter-phrase interval is 7.9 sec). (© Hollis Taylor)

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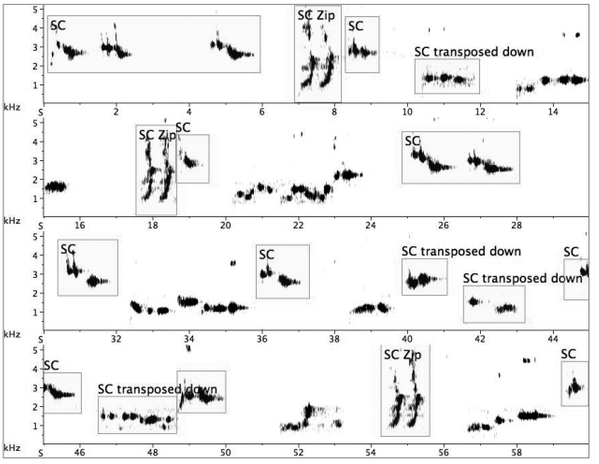

Fig. 2. An immature pied butcherbird practicing. The species call (SC) is delivered on the conventional pitch and at a number of lower transpositions. The ascending zip often associated with the beginning of the call is delivered without the call notes. No mimicry is noted. (© Hollis Taylor)

across species to create a consensus of impromptu patterns and relationships. However, my focus here will be on matters more easily documented in the song culture of specific pied butcherbirds.

SOLO SONG

By reducing complexity, the human brain builds shortcuts and makes life bearable. For example, we combine bits of information in order to recall them as groups in long-term memory [9]. I examined motif boundaries to determine how "chunking" might be relevant in the brain of "Two Tree" during his delivery of a three-and-a-quarter-hour diurnal song [10]. The bird executes 110 diverse solutions to Phrase E; 20 are presented in Fig. 1 in approximate order of increased complexity. This assists a visual inspection of how strings of motifs (and sub-motifs or "figures") function as organizational or mnemonic tools. A box outlines at least one area of commonality among all phrase variants.

Variation is found at all levels of organization. One of 12 major phrases, Phrase E is of unstable length, and variants include rhythmic variations and hybrids formed by recombinations of material. A search for the minimal units of production (groups of notes that always occur together) is frustrated by the constant paring down of the functional recall units. Phrase E conventions permit repetition or elision of most motifs and figures, which are energized by leaps and sharp switchbacks and which accommodate a multitude of entry and stopping points. Initial and terminal decorations are common in this additive process, which is reminiscent of the modularity of snap-together beads.

The song as a whole displays a remarkable balance between predictability and surprise in the 1,123 phrases delivered. On visual inspection, no obvious phrase ordering can be detected. Perhaps phrase "order" is determined by the desire to create passages of diverse timbre, rhythm, direction, duration and melody that will command, hold and recommand attention. Transition versatility (the likelihood of successive phrases being different) is extremely high. A host of timbral effects are brought to bear, including a trill, quasi-rattle, standard rattle, hollow-sounding rattle, *wow* sound, *chip* sound, bubbly sound and whistle reminiscent of a telephone ring. Material is drawn from other phrases, with a typical hybrid recombination consisting of two fused phrases, either in part or in full; sometimes three phrases are mixed together. At times, one is hard pressed to determine a hybrid from an altogether new phrase type.

We cannot avoid "the vexed problem of inventiveness in song" [11]. Within Two Tree's repertoire, phrases are subjected to operations such as repetition, contrast, reduction, expansion, interruption, fusion, division and substitution. The signal at minimum declares, "I am a pied butcherbird." Birdsong is a biomarker, and the listener may also be able to infer the vocalist's identity, health, gender, distance and acoustic environment. Biologists regularly remark on the improvisatory abilities of certain songbirds [12], and Two Tree's invention, acceptance, rejection and transformation of ideas in real time are consistent with the capacity to improvise.

Two Tree manages a discrete body of acoustic constructs, much in the same way as a human improviser has his box of licks and tricks, but a good improviser does more than just show them off. The constraint of a toolkit is broken open via inventing, copying, rearranging and reshaping—and Two Tree's delivery never falters. No waning of energy or inventiveness in the third hour (such as a less powerful signal or a drop in transition versatility) is noted. Such fluent cut-and-paste dexterity would test the skills of the best of human improvisers, with the exception of a sampling DJ, whose memory demands differ. In a way, the results of improvisation employing samplers, discs and other forms of sonic retrieval devices are more akin to the grouping and retrieval abilities of the best improvising birds than to that of traditional human improvisers. This complexity [13] is the product of unique and open-ended avian spontaneity, but improvisation is not limited to accomplished vocalists like Two Tree. In Fig. 2, an immature bird [14] relies heavily on the species call [15] in its practice session. The rambling "subsong" resembles the babbling of human infants and has a strong improvisational element.

The species call is subjected to various treatments to build a singing performance. For example, the call is delivered both on the conventional pitch and at a number of lower transpositions, and the tempo is greatly reduced. It is intriguing to see that the featured sound

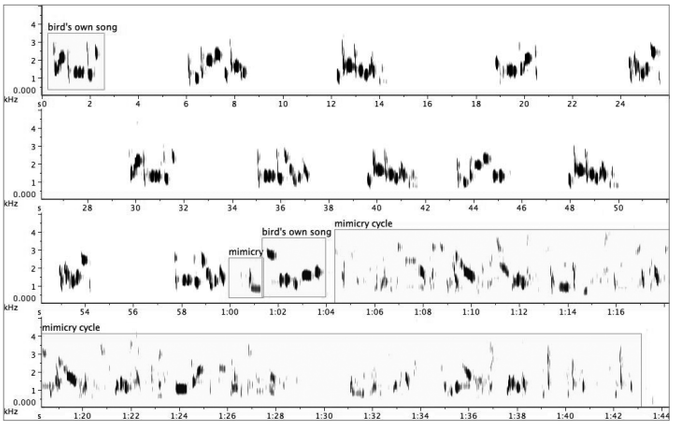

Fig. 3. Pied butcherbird pre-dawn solo song by "Wordsworth," with a regular pattern of sound and silence, morphs into a mimicry cycle. (© Hollis Taylor)

object in the beginner's toolkit is the presumably innate species call and gives rise to questions of reference and totemism, to be taken up next.

MIMICRY

In this section I draw on aspects of mimicry that are particularly relevant to the sound world of both pied butcherbirds and humans. Composers are prolific borrowers, from one another and from their past works; jazz improvisers are fond of quoting themes from both within their idiom and without. Like most of its human counterparts, a songbird seeks out fresh material to combat aesthetic fatigue and thus build a large, acoustically rich repertoire. Mimicry, or imitation, is the ability to reproduce, to a varying degree, sounds other than those of the species in question [16], including environmental sounds. Its function in birds is poorly understood, and no single explanation appears to suffice [17]. Musicians know mimicry by a myriad of names: imitation, borrowing, quotation, appropriation, bricolage, allusion, simulation, modeling, pastiche, parody, montage and even plagiarism—I believe it is the quotidian basis of music-making, while originality is rare or even illusory.

Whatever the label, the mimetic powers of pied butcherbirds betray their oral absorption of the exterior world. With a capacity for high-fidelity duplication, they eclectically copy techniques and materials developed by other species. Mimicry cycles consisting of a non-stop montage of alien species, occasionally mixed with bits from their own song, are often delivered quietly around mid-day in the shade of a tree, as if part of a practice session or an internal dialogue, or perhaps even a meditation or an audiophonic rendering of their surroundings [18].

Pied butcherbird pre-dawn songs occur in the spring and typically last several hours. A regular pattern of sound and silence is in evidence, with phrases of 1–2 sec interspersed with inter-phrase intervals of at least twice that length. Silence seems an integral part of the phrase. "Wordsworth"'s [19] delivery style is typical, although his palette is remarkably wide ranging, with strong contrast, including alternating pure notes and noisy ones. The term *Klangfarbenmelodie,* coined by Arnold Schoenberg in 1911, implies a melody formed and perceived through timbral transformation. A host of qualities fall under the rubric "timbre," even pitch and loudness, although they can also be discussed separately.

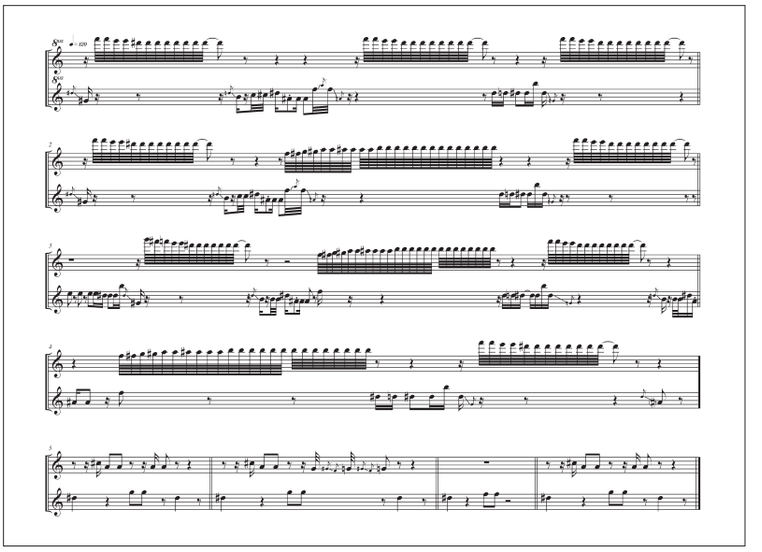

Fig. 4. A pied butcherbird duet involving an ascending and descending rattle (top staff) and large leaps and portamenti (bottom staff), followed in bar five by a simpler duet from the same pair. Double bars mark the end of a phrase, which is followed by silence (inter-phrase intervals were shortened by the recordist and thus unknown). (© Hollis Taylor)

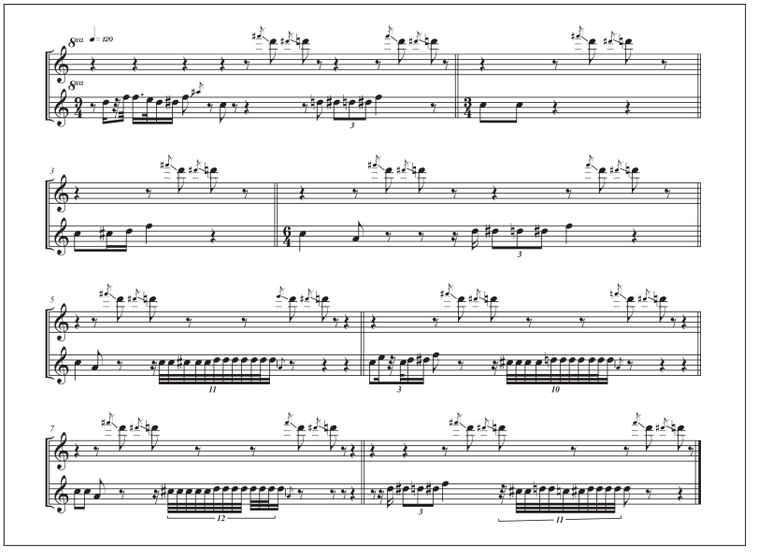

Fig. 5. A pied butcherbird duet. The bird on the lower staff initiates a number of variable motifs, while the upper-staff bird provides an unflinching refrain based on the species call. Double bars mark the end of a phrase, which is followed by silence (the mean inter-phrase interval is 8.3 sec). (© Hollis Taylor)

Klangfarbenmelodie is an apt description of the "sound" of many improvisers, such as Derek Bailey, Paul Lovens, John Butcher and Jim Denley, and also seems an appropriate description of Wordsworth's typical vocal approach.

However, in Fig. 3, Wordsworth abandons his formal song with a cut-and-paste coda of *sotto voce* mimicry, breaking species-specific tendencies such as phrase and inter-phrase duration, vocal range and timbre. With a memory bank of ready-mades as building blocks, he creates a sonic tangle that is difficult to unravel. In my several hundred hours of recorded pied butcherbird vocalizations, no bird except Wordsworth has included mimicry in pre-dawn solo song.

It is unknown whether the signal of an alien species, when pasted into formal song, retains a totemic function, suggests narrativity [20] or merely represents an appreciation of other sounds; Cutler suggests a similar cloudiness concerning referents for the human improviser [21]. Pied butcherbirds—they take each other's stuff, customize stuff, chop stuff up, add stuff, re-stuff and re-cycle.

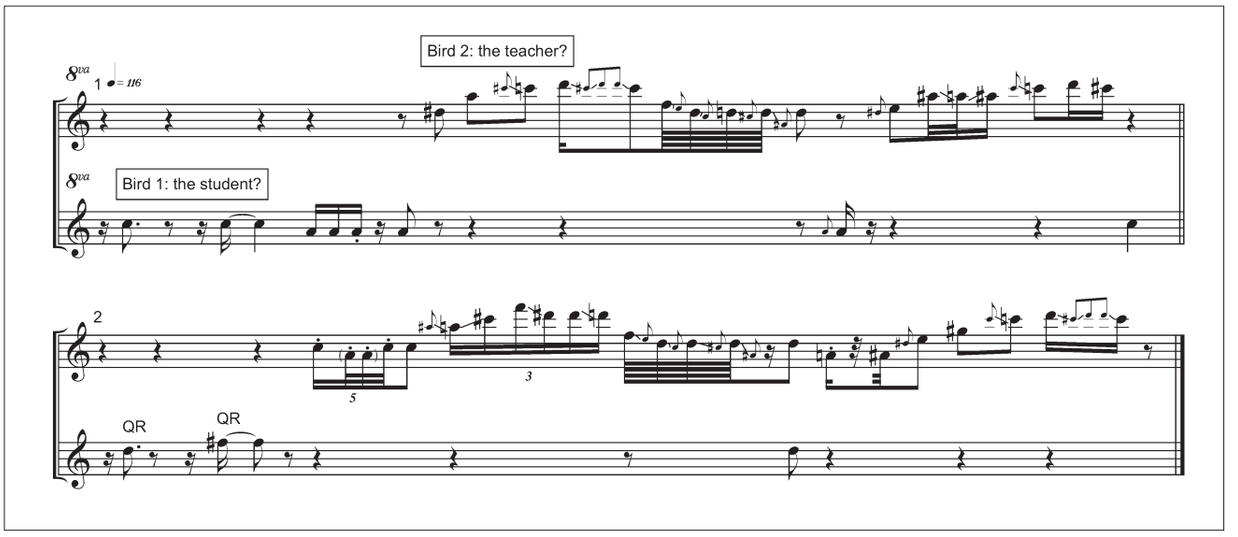

Fig. 6. "The Singing Lesson," where bird #1 puts forth a few basic notes (lower staff) while bird #2 unravels a melismatic cadenza (upper staff). "QR" denotes a quasi-rattle, and double bars mark the end of a phrase, which is followed by silence (the mean inter-phrase interval is 7.9 sec). (© Hollis Taylor)

Multimodality in Duets and Antiphonal Song

Sound is rooted in the physicality of the body, making the two-way flow of haptic feedback crucial to the language of improvisation in avian and human music. The body's inherent intelligence supports and yields a number of musical properties [22]. Prolonged and intimate contact with this species via extensive fieldwork (and not merely deskwork) provided ear- and eye-witness accounts of the multimodal aspects of pied butcherbird communication. When singing, they engage the entire body in complex patterns of motor activity. Movement alternates a standard upright posture with raising the beak high and then sinking it on the breast. These visual correlates plus changes in beak gape and throat feathers allow part identification to be parsed out in the field (or on film) when more than one bird is singing.

In the autumn, duets are common, as is antiphonal song, which implies song parts delivered by three or more "chorus" members. Females take part in both, but since the sexes are indistinguishable in the field, the female contribution is unknown. Some pied butcherbird duets hark back to the precision of medieval motets, where the technique of sharing a melody to create the effect of a single melodic line was termed "hocket." More pertinent to the subject at hand are not these "tight" hockets but looser ones found in antiphonal trios, quartets and quintets. These antiphons impart a strong sense of collective improvisation, evoking the contrapuntal multi-soloing of Dixieland jazz. As for duets, after working one via variations in timing, pitch, emphasis and timbre for some minutes, pied butcherbirds typically move to another. Such is the case in Fig. 4, where both birds deliver dynamic motifs (an ascending and descending rattle in the top staff, and in the bottom large leaps, both ascending and descending, often with portamenti) and then abruptly move on to simpler thematic material in bar 5 [23].

Duets and antiphonal song have elements of ritual and dialogue [24]. In Fig. 5, a "call and response" finds the bird on the lower staff initiating a number of variable motifs, while the upper-staff bird provides an unflinching refrain—the species call injected like an "Amen" in a Southern Baptist church.

Although they can be vocal gymnasts with a flourish here and an arabesque there, pied butcherbirds are not prone to extreme elaboration and appoggiatura. Bird #2 from this pair (Fig. 6) is a notable exception, "a beautiful study of what structure, tuning, and melodic decoration might mean to pied butcherbirds" [25]. The recordist even questions whether this is a duet or rather two poles-apart renditions of the same song. In any case, the exchange is elastic, particularly when listened to.

For pied butcherbirds, music is a family affair; as with the von Trapps and the Bachs, everyone contributes to the choral society, jumping in when and where they can.

Spontaneous Decision-Making and Links to Human Cognition

Art works and plays on the fringes between repetition and innovation. Music tolerates, invites and even exploits reiteration—we desire both to predict and to be surprised. Pied butcherbirds are driven by similar instincts, producing songs that are unique yet suitable to the task; they cleave to some rules and break others. Components from their rich and nuanced repertoire are subjected to recasting, whether subtle or bold, simple or complex, melodic or kinetic. In improvisation's wide range of manifestations, pied butcherbirds keep popping up: from Two Tree's long sustained process of improvisation shaped by recombination to an immature bird's rambling mish-mash; from a sudden montage of alien species in solo song to two extreme versions of the same song, from dynamic duos with both birds displaying fluidity to a call and response where one bird transforms material while the other is unflinchingly stable. Their songs seem to go far beyond what would be necessary for a registration of their continuing occupation of place and a way of passing along genetic code.

Pied butcherbird vocalizations display all the features that have provoked analogies between birdsong and human music. In addition to those items described above, my research finds frequent overlaps with the human experience of music [26], such as fanfare, accelerando and ritardando, crescendo and decrescendo,

anacrusis, augmentation, articulation, melisma, ostinato, warming up, phrase endings à la Schoenberg [27], shape and balance, étude, national anthem and serenade. These mutualisms suggest links in the mental commonalities between our two species.

While the analysis of pied butcherbird sonic constructs and vocal behaviors is an intriguing field in its own right, its study poses significant relevance to any assertions of unique human capacities and the perceptual and cognitive processes behind them. Ultimately, anything we discover about improvisation and its relevance to musical composition, performance and learning must factor in that we are apparently not alone in this capability. Indeed, birds have been singing for much longer than the human animal.

The use of wax cylinders, shellac discs, magnetic tape and eventually sonographic analysis allowed biologists to capture and study birdsong, although now it is more often with a trained *eye* than a trained ear. There is hardly a species whose vocalizations have been researched by a trained musician. Future case studies by zoömusicologists will doubtless yield fascinating results on the capabilities of target species. Birdsong also has the potential to lend insights into human consciousness, intuition, creativity, musicality, language, memory, the learning process and cognition.

References and Notes

1. Frans B.M. de Waal, "Darwin's Last Laugh," *Nature* **460**, 175 (2009).

2. See Derek Bailey, *Improvisation: Its Nature and Practice in Music* (London: The British Library National Sound Archive, 1992) p. 73: "One of the things which quickly becomes apparent in any improvising is that one spends very little time looking for 'new' things to play. The instinctive choice as well as the calculated choice is usually for tried material. Improvisation is hardly ever deliberately experimental. When the 'new' arrives, if it arrives, it appears to come of its own accord."

3. See Jeff Pressing, "Psychological Constraints on Improvisational Expertise and Communication," pp. 47–67, in Bruno Nettl and Melinda Russell, eds., *In the Course of Performance: Studies in the World of Musical Improvisation* (Chicago: Univ. of Chicago Press, 1998).

4. Johan J. Bolhuis and Manfred Gahr, "Neural Mechanisms of Birdsong Memory," *Nature Reviews. Neuroscience* **7**, No. 5, 347–357 (2006) p. 347.

5. See Dominique Lestel, *Les Amis de mes Amis* (Paris: Éditions du Seuil, 2007) p. 9.

6. Luis F. Baptista and Sandra L.L. Gaunt, "Historical Perspectives. Advances in Studies of Avian Sound Communication," *The Condor* **96**, 817–830 (1994) pp. 820–821.

7. See Dario Martinelli, *Of Birds, Whales, and Other Musicians: An Introduction to Zoomusicology* (Scranton, Univ. of Scranton Press, 2009) p. 195: "It is thus very intriguing that an aesthetic form of communication is, in human and nonhuman animals, so rich and 'wasteful.'"

8. See Hollis Taylor, "Towards a Species Songbook: Illuminating the Vocalisations of the Australian Pied Butcherbird (Cracticus nigrogularis)," unpublished thesis, Univ. of Western Sydney, 2008, p. 176.

9. Daniel J. Levitin, *This Is Your Brain on Music: The Science of a Human Obsession* (New York: Dutton, 2006) p. 213. See also Bob Snyder, *Music and Memory* (Cambridge, MA: MIT Press, 2000).

10. I recorded this pied butcherbird during a warm winter's day on arid Magnetic Island in Queensland's Great Barrier Reef on 12 June 2005 from 10:45 A.M.–2:00 P.M. He sang from two trees, one a melaleuca, the other a eucalyptus, and thus the name "Two Tree." See Taylor [8] pp. 130–162.

11. W.H. Thorpe, *Bird-song: The Biology of Vocal Communication and Expression in Birds* (Cambridge, U.K.: Cambridge Univ. Press, 1961) p. 90.

12. See Peter Marler, "Song Learning: The Interface between Behaviour and Neuroethology," *Philosophical Transactions: Biological Sciences* **329**(1253): 109–114 (1990) p. 112: "We also see evidence of more creative processes, involving invention and improvisation" [in the red-winged blackbird]. See also Peter Marler, "Birdsong: The Acquisition of a Learned Motor Skill," *Trends in Neurosciences* **4**, 88–94 (1981) pp. 91–92: "Sometimes it is clear that birds indulge in a process of improvization [sic], first memorizing and replicating a theme, and then subjecting it to a series of systematic transformations, as though assuaging an appetite for novelty." See also Eleanor D. Brown and Susan M. Farabaugh, "Song Sharing in a Group-living Songbird, the Australian Magpie, *Gymnorhina tibicen*. Part I. Vocal Sharing within and among Social Groups," *Behaviour* **104,** 1–28 (1988) p. 272: "A magpie develops it [sic] own unique song repertoire by means of a combination of improvisation and imitation." See also Donald E. Kroodsma, Peter W. Houlihan, et al., "Song Development by Grey Catbirds," *Animal Behaviour* **54**, No. 2, 457–464 (1997) p. 457: "Relying little on precise imitation and largely on improvising or inventing, each male developed a highly unique repertoire." And see also Jeffrey Podos, Susan Peters, et al., "The Organization of Song Repertoires in Song Sparrows: Themes and Variations," *Ethology* **90,** 89–106 (1992) p. 104: "We conclude that song variants produced by song sparrows are open-ended improvisations, in many cases unique utterances."

13. See David Borgo, *Sync or Swarm: Improvising Music in a Complex Age* (New York, Continuum, 2007) p. 126: "Physicist Murray Gell-Mann argues that a system should be called complex when it is hard to predict, not because it is random but rather because the regularities it does have cannot be briefly described."

14. Recorded in the summer of 2006–2007 at Vajradhara Gonpa, in the semitropical hills of northeastern New South Wales, Australia. Recordist unknown.

15. Hollis Taylor, "A Call of the Pied Butcherbird," *AudioWings* **8**, No. 2, 4–8 (2005).

16. Françoise Lemaire, "Dialectal Variations in the Imitative Song of the Marsh Warbler *(Acrocephalus palustris)* in Western and Eastern Belgium," *Le Gerfaut* **65**, 95–106 (1975) p. 95.

17. See Jeffrey R. Baylis, "Avian Vocal Mimicry: Its Function and Evolution," pp. 51–83, in Donald E. Kroodsma, Edward H. Miller and Henri Ouellet, eds., *Acoustic Communication in Birds Vol. 2* (New York, Academic Press, 1982).

18. No apologies for what may be considered an anthropomorphic statement, as I believe this is the way we understand our environment, and birds would also mediate their environment through their physical senses.

19. I recorded this pre-dawn solo song by a pied butcherbird on Wordsworth Road, off the Flinders Highway between Townsville and Charters Towers, Queensland, on 28 September 2007 at 4:10 A.M.

20. Dominique Lestel, "The Biosemiotics and Phylogenesis of Culture," *Social Science Information* **41**, No. 1, 35–68 (2002). Lestel argues that language is not a prerequisite for semanticity; p. 42: "As soon as there is the possibility of mimicry, there is a potential for narrativity."

21. See Chris Cutler, "Plunderphonia," pp. 138–156, in Christoph Cox and Daniel Warner, eds., *Audio Culture: Readings in Modern Music* (New York, Continuum, 2007) p. 146: "Plundered sound carries, above all, the unique ability not just to *refer* but to *be*; it offers not just a new means but a new meaning. It is this dual character that confused the debates about originality which so vex it." See also Trevor Wishart, *On Sonic Art* (New York: Routledge, 1996) p. 252 for a discussion on sound-totemism.

22. See Borgo [13] pp. 47–48, quoting Wayne Bowman: "The list of bodily constituted musical 'properties' is an extraordinarily long one, inclusive of such diverse yet central musical features as: tension and release; dissonance and consonance; volume and balance; accent, meter and syncopation; tonal center and modulation; texture and density; line and phrase; height and depth; advancement and recession; vital drive and groove; movement and gesture—to say nothing of the immense range of so-called expressive attributes like seriousness, whimsy, playfulness, tenderness, or violence."

23. Recorded by Sydney Curtis at Christmas Creek, Lamington National Park, Queensland, Australia, 1 October 1988.

24. Lestel [20] p. 43: "All the ritual duets described in ethology can thus be termed dialogues, even if they are invariable and remain highly repetitive."

25. Recorded by David Lumsdaine at Pebbly Beach, Station Creek, New South Wales, Australia, 23 September 1983. **"**'The Singing Lesson': two birds perched side by side on a banksia singing a *solo* song; one sings the fully decorated version of the local dawn solo, the second a sketchier outline version. A beautiful study of what structure, tuning and melodic decoration might mean to pied butcherbirds" (David Lumsdaine, personal communication, 2 July 2005).

26. See Hollis Taylor, "Decoding the Song of the Pied Butcherbird: An Initial Survey," *Transcultural Music Review* **12**, 1–30 (2008). Also see Taylor [8].

27. Arnold Schoenberg, in *Fundamentals of Musical Composition* (London, Faber and Faber Limited, 1967), sees a phrase as possessing a sense of completeness and yet well adapted for recombination with other similar components. He suggests phrase conventions: p. 3: "The end of the phrase is usually differentiated rhythmically to provide punctuation. Phrase endings may be marked by a combination of distinguishing features, such as rhythmic reduction, melodic relaxation through a drop in pitch, the use of smaller intervals and fewer notes, or by any other suitable differentiation." His suggestions are regular occurrences in pied butcherbird song; see Taylor [8] and [26].

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