Afterword

Ecomusicology and the Problems in Ecology

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In our call for articles for this special issue, we announced our goal to "bring into conversation the diverse yet interconnected fields and disciplines that bring ecological approaches, methods, and thinking to considerations of sound and music." By bringing them into juxtaposition, we intend to highlight recent cross- and inter-disciplinary ecological conversations that have been occurring among musicians, scholars, and scientists (e.g., Post and Pijanowski, this issue) over the places, roles, and meanings of sound and music in our time of environmental crisis. This intellectual ferment has created a new subject area: music and sustainability. It has also created a new and (to an extent) related field: ecomusicology (see Allen's Introduction). In this special Ecologies issue we explore aspects of the "eco" in ecomusicology, as each author engages with ecologies in one form or another. Ecomusicology brings artists, scholars, and scientists together to share perspectives and insights on sound, music, nature, culture, and the environment at a time of environmental crisis,[1] while it also stimulates these thinkers to enlarge their own inquiries by crossing academic disciplines and working inter-disciplinarily.

In the public arena, ecology is often confused with environment, but they are not the same. Not all ecologists consider themselves environmentalists, much less activists. Many prefer to think of themselves as nonpartisan, objective scientists. In popular discourse we read, for example, of "ecological grief" and "ecological loss" (Ellis and Cunsolo 2018). Ecology is a science; it cannot be lost any more than physics or chemistry can be lost. Ellis and Cunsolo are thinking of habitat loss or ecosystem collapse, not ecological loss. As my co-editor Aaron Allen wrote in the Introduction to this issue, ecology refers to the discipline of ecological science begun by Ernst Haeckel, while ecologies (pl.) include its subfields such as behavioural ecology, and related fields such as cultural ecology, ecological psychology, and so on. In the broad sense, ecology has come to mean

Titon, Jeff Todd. 2018. Ecomusicology and the Problems in Ecology. *MUSICultures* 45 (1-2): 255-264.

the study of individuals, groups, and their relations to one another and to their environment. Environment is therefore one of the objects of ecological inquiry, not ecology itself.

When people think about our environmental crisis today, most think about atmospheric carbon and the greenhouse effect, global warming and climate change, energy alternatives, species endangerment and extinction, ecojustice, and the like. As we worry about intensifying storms, earthquakes, and floods, and their impacts upon habitat and biodiversity, on pollution and the spread of hazardous waste, and especially on environmentally and economically vulnerable populations, music and sound seem like an afterthought. Music is thought to be an art, a pastime, not a mainstream activity like agriculture, manufacturing, trade, law, medicine, media, transportation, government, national defense, or foreign policy. Yet Brazilian rosewood and pernambuco are endangered woods, overused in making guitars and violin bows, and ivory, once common in piano keys, can also be found in some fittings of stringed instruments. When the full range of endangered species is considered, animals as well as plants, musical instrument materials make a small but significant contribution (Allen 2012; Trump 2013; and see Edwards, this issue). Beyond the environmental impact of music on endangered species, in the biosphere sound itself is a signal of species presence, as Rachel Carson's title *Silent Spring* suggests (1962).

Ecological approaches to human musicking, to use Christopher Small's neologism for music-making, promise an understanding of music as a human activity within a larger sonic space. Soundscape ecology, or the study of sounds in the landscape — sound makers, sound production, sound communication and reception — involves not only plant and animal soundings (Pijanowski et al 2011) but also ways in which humans communicate with one another in and about a given environment. Ethnomusicologists and anthropologists have long noticed ways in which indigenous peoples' songs and other sonic productions are meant to influence the environment and make it more productive (e.g., Turnbull 1961). More recently, especially in light of the environmental crisis, we have begun to consider how soundscapes provide indigenous ecological knowledge (Lewy 2017; see Post and Pijanowski, Yoon this issue) that may, in turn, be helpful in the global efforts at adaptation and sustainability, especially in confronting the effects of rapid climate change (Pierotti 2010). In this effort, interspecies communication and eavesdropping on animal sound communication plays an important role (Titon 2016). In this issue, Yoon as well as Post and Pijanowski write about sounds and songs of nomadic pastoralism in Mongolia and their adaptation within a modernizing nation.

Interspecies communication, real and imagined — also themes in articles by Hui on ducks and Graper on bats in this issue — offers an opportunity to

consider humans along with other animals along an evolutionary continuum, and music along an evolutionary continuum of sound. Like Kafka's *The Metamorphosis*, about a person who wakes up one morning to find himself inside the body of a cockroach, both these articles are written from an anthropomorphic perspective. We do not quite know how bats experience human sounds. Whereas Thomas Nagel (1974) famously claimed that bat experience is impossible for a human to grasp, recent research in mirror neurons suggests that some non-human animal experience is closer to human experience than previously thought (Ferrari and Rizzolatti 2014).

Ecological considerations of music enlarge the scope of musical scholarship. Like ecocriticism in the study of literature, ecocritical approaches to music foreground the relationships of humans with the environment: the more or less natural environment, disturbed environments (Dirksen, this issue), artificially built natural environments such as zoos (Quinn et al, this issue), and environmental imaginaries (Ottum, Hui, Graper, this issue). The minimalism of guitarist and composer Will Ackerman (Ottum, this issue) offers a musical equivalent of an ecosystem's climax stage, in a gently oscillating, dynamic equilibrium.

Ecologies also inform musicking from the standpoint of perception (Harlow, this issue). While Gibsonian ideas concerning perception have helped shape ecological psychology, they are also useful in the study of animals, where perception of sound signal vibrations plays a crucial role and allows for the possibility of a phenomenological approach to animal sound communication, something that has previously seemed problematic. In this area of ecology, an important precursor is the Baltic naturalist Jakob von Uexküll, whose idea of *umwelt* anticipated Gibson's key notion of affordances (Von Uexküll 2010 [1934]). Just as affordances (Harlow, this issue) are possibilities for action within a given environment, so umwelt is the environment or perceptual field enabling an animal to express its particular being, including the possibilities for sound communication. Interestingly, Gibsonian perceptual ecology also appears useful for ecocritical musicology (Jamieson, this issue). More directly, ecologies offer a platform for consciousness-raising interventions in the environment in order to mitigate the effects of climate change (Pedelty 2016) and habitat loss (Edwards, this issue).

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Sixty years ago, I grew up, as most in my generation did, thinking that the environment consisted of life in the midst of inert matter: beings like animals and plants were alive, surrounded by non-living things like rocks and tables

and automobiles. In high school chemistry I learned that, as a rule, living, organic matter contains carbon atoms, whereas non-living, inorganic matter does not. And when on Christmas Day, 1972, I saw the famous "blue marble" photograph of the Earth from space I understood that Earth doesn't just contain life — it *is* alive, a complex, biological whole. I learned an ecological lesson: that at different levels of scale, different understandings emerge.

One of the oldest and most persistent music-ecological ideas is that the universe, governed by natural, mathematical laws, is a harmonious whole. This is another way of expressing the metaphor of natural balance. Readers may recall the music of the spheres — a theory attributed to Pythagoras which states that the motions of astronomical bodies and consonant musical intervals are governed by the same mathematical ratios, and that therefore these heavenly bodies must make pleasing music (although the sounds were beyond human hearing). Less well-known is that a harmonious universe was important to the ancient Chinese as well. They, too, had developed a pitch system based on the mathematics of the overtone series, one that was accompanied by a legendary tale of the discovery of the musical notes or *lus* and their correspondence to nature as represented by birdsong. According to the ancient book of the Chunqiu[2] (Ch'un Ch'iu), in the 3rd millennium B.C.E. the Yellow Emperor Huangdi sent one of his courtiers, Lin Lun, to the western mountains to "make music" — that is, to invent or discover music. There he gathered hollow bamboo and made twelve pipes of "superior and inferior generation" producing the same twelve tones as the Pythagorian scale (qtd. in Sachs 1943: 114). These were said to match the pitches Lin Lun heard in the harmonious singing of the mythological fenghuang birds.[3] The Chunqiu goes on:

> Since he heard the male and the female bird Phoenix sing at the foot of the Yüan Yü mountain, he accordingly distinguished the twelve notes. He made six out of the singing of the male Phoenix, and also six out of the singing of the female Phoenix, which all could be derived from the main note huang-chung. (qtd. in Sachs 1943: 114; see also Picken 1957: 93-4 and Liang 1985: 37-8)

It was also believed that in a new dynasty the Emperor would order the fixed-pitch instruments to be readjusted in order to bring them back in tune with the universe (Lai and Mok 1981: 26). The idea of a harmonious universe was essential to medieval and Renaissance European music philosophers, and to educators who made the study of music a required part of the quadrivium. But the Enlightenment consigned these ideas to literature, magical thinking, and Aeolian harps. Since the 19th century, most Euro-Americans have thought

of music as an ennobling aesthetic experience, or as a pleasurable diversion, or both. Yet it is still recognized that music can drive people to ecstasy or madness.

To my knowledge, the first scholar to make a connection in print between ecology and music was William K. Archer, in a brief excerpt from a 1962 lecture before the International Congress on Music and Its Public, held in Rome. He wrote that:

> Music is especially amenable to an ecological approach in which a mobile, fluid, dynamic interrelationship with every other social aspect exists. … It may be as fruitful to consider sources of raw materials for instruments, patterns of leisure, technological developments, musical "listening-spaces" and the like, as to consider the music itself. … This peculiarly rich "information bearing system" [i.e., music] is, I suggest, largely formed and changed (and appreciated) because of factors utterly outside itself. (1963: 13)

Nowhere did he use the term ecosystem, ecology's dominant concept at the time he wrote. Rather, he was more likely influenced by cybernetics, specifically in his idea that music is a rich, information-bearing system.[4] Unfortunately, beyond this published lecture he did not follow up, in print, on this insight; he was the kind of thinker who was happier making bold connections than developing them.[5] Ethnomusicologist Daniel Neuman, acknowledging Archer's pioneering work as inspiration, concluded his book on the social organization of Hindustani music with a chapter he described as leaning "obviously and heavily on … cultural ecological theory," considering music producers, consumers, contexts, and technology (1980: 26). Perhaps the first time the ecosystem concept appeared in print as an explanatory framework for people making music occurred when this author wrote that "Each world [of music] can be regarded as an ecological system, with the forces that combine to make up the music-culture … in a dynamic equilibrium" (Titon and Slobin 1984: 9).[6] There, I drew on ecological scientist Eugene P. Odum's understanding of ecosystems as not only interrelated but also dynamic.[7] For Eugene Odum, and his brother and colleague Howard T. Odum, ecosystems were driven by energy exchanges; my thought was that music was the energy that drove the exchanges in a music culture. I developed this idea further in the "four circles model" involving affect, performance, memory, and history (Titon and Slobin 1992), and in writings on musical and cultural sustainability (Titon 2009a, 2009b, 2009c, 2015a).[8] Just as conservation biology makes it possible to restore and maintain the health of an ecosystem, so its principles may be applied to

manage the health of and develop resilience in organizations and institutions within music cultures, and in the music cultures themselves (Chambers, this issue). Huib Schippers has employed the ecosystem idea to develop a detailed taxonomy of "factors that influence musical vibrancy" and their relationships which, when taken in particular combinations, are important considerations for sustainability (Schippers 2019: 133; Schippers and Grant 2016).

In his Introduction, Allen calls attention to the "problem of ecology" when ecological insights are borrowed and developed outside of the natural sciences without due consideration of the physical environment. I would also call attention to two related "problems *in* ecology," each of which also has implications for music and sound studies. The first problem is the change, during the past half-century, in ecological science's paradigmatic view of nature; the second problem is the division among ecological scientists between ecosystem ecologists and population ecologists. Among ecological scientists in Europe and North America, the balance-of-nature paradigm gave up its dominance to the disturbance-and-change paradigm in the last half-century or so. Today, the consensus is that there is no single balance point, only temporary equilibria, and that tumult and disorganization is more "natural" than balance. No doubt, there were also pressures from outside of ecological science on the balance-of-nature paradigm, not to mention on the Western concept of "nature" itself — pressures notably from deconstruction, the science wars, feminism, postmodern anthropology, and cultural studies, including sound studies. Nonetheless, because the balance-of-nature metaphor retains its perennial hold in the popular imagination and in much of the environmental movement, many ecologically-inclined scholars in ethnomusicology, ecomusicology, environmental philosophy, and other fields have overlooked the altered paradigm and as a result, their work is open to charges of outmoded idealism.

The second "problem in ecology" arises over internal differences within ecological science itself, namely those between population ecologists and ecosystem ecologists. Although both population and ecosystem ecology examine organisms and their interactions with each other and with biotic and abiotic environments, population ecology works from the bottom up and ecosystem ecology from the top down. Most environmentally-inclined ethnomusicologists have taken a bottom-up approach to people making music individually and in groups (single populations), and in their interactions with the environment, particularly among indigenous social groups where animals, plants, landforms, weather, and so on loom large in traditional daily life. As noted earlier, a few ethnomusicologists have taken a top-down, systems approach which tends to be theoretical, comparative, and concentrated on complex music cultures as ecosystems, rather than engaging robustly with the relations between populations

and the environment. Within ecological science, the holistic ecosystem approach is identified, deservedly or not, with the balance-of-nature paradigm; this is despite efforts by contemporary ecosystem advocates to modernize it for applications to conservation biology, restoration ecology, and ecosystem services by taking a resilience approach involving adaptive management in the face of disturbance-and-change.[9] These two "problems in ecology" render the "problem of ecology" even more challenging for environmentally-inclined music scholars who wish to engage with the various ecologies that Allen delineated in his Introduction.

Music's power is cultural but also corporeal and sonic. It turns out that sound is very much at risk in the environmental crisis. Sound is indispensable for communication among species; it is one of the most important means by which animals and, we are learning, even plants signal each other (Gagliano 2013). Sound communicates critical things like the location of food supplies, the danger of nearby predators, care of the young, interest in mating, and maintaining order within social groups. Far from being inconsequential, animal sound communication is vital for life as we know it (Titon 2012). For that reason, a conversation that considers the relations among the merging domains of sound, music, nature, and culture becomes necessary in a time of environmental crisis. We intend that articles in this special issue make a contribution to this conversation. We would be pleased to hear responses from readers; we may be reached via email at our respective institutions.

Notes

1. Also a time of continuing cultural crisis, as the binaries music and sound, nature and culture, human and non-human, living and non-living, are increasingly inadequate to describe the world we live in.

2. Written by Lü Buweh in the 3rd century B.C.E. The music-making events themselves were said to have occurred in the 3rd millennium B.C.E.

3. These were mythological, immortal creatures, sometimes called the Chinese phoenix, representing both male and female elements (a yin-yang harmony). "Their rare appearance was said to be an omen foretelling harmony at the ascent to the throne of a new emperor" (*Britannica Online*, https://www.britannica.com/topic/fenghuang).

4. In the 1950s, the ecosystem paradigm became dominant in ecological science. As it developed in that decade, it was influenced by the new field of cybernetics, another influential example of systems thinking.

5. A fuller version of Archer's lecture was published a year later (Archer 1964).

6. By a music-culture I mean a social group's total involvement with music —

that is, sonic materials, behavior, generative procedures or ideas, receptive procedures or responses, material aspects of sound including mechanisms of sound production and reception, material culture of music, and so forth (Titon and Slobin 1984: 1-2).

7. Although the ecosystem idea was introduced in 1935 by Arthur G. Tansley, who coined the term, it was not developed into a systematic theory until E. P. Odum did so in his extraordinarily influential textbook, *Fundamentals of Ecology*. In its first edition he defined the ecosystem as "any entity or natural unit that includes living and nonliving parts interacting to produce a stable system in which the exchange of materials between living and nonliving parts follows circular [i.e., cyclical] paths in an ecological system or ecosystem. The ecosystem … includes both organisms (biotic communities) and abiotic [i.e., non-living] environment, each influencing the properties of each other and both necessary for maintenance of life as we have it on the earth. A lake is an example of an ecosystem" (Odum 1953: 9).

8. As I developed further the idea that music-cultures are ecosystems, I came to think of affect as the energy, and music and sound vibrations as the material (matter) of exchanges in a music-culture.

9. Population ecology characterized ecological science in the 19th and early 20th centuries. Ecosystem ecology arose out of Frederic Clements' idea of natural succession and climax, combined with Arthur Tansley's invention of the term ecosystem in the mid-1930s and the development, by Clements and Victor Shelford, of the biome concept. It was not until 1953 with the publication of Eurgene P. Odum's *Fundamentals of Ecology* that ecosystem ecology became wholly paradigmatic within ecological science. An entire generation of ecologists was educated to think of ecology in this way. (I count myself among them, for the 2nd edition of Odum's textbook [1959] was key to my college education in ecological science.) The holism of ecosystem ecology was compatible with the philosophy of the environmental movement, and ecosystem models dominated in ecological research and funding from the 1950s through the 1980s. However, the mixed success of ecosystem models, coupled with the rise of the disturbance-and-change paradigm challenged ecosystem ecology as well as the balance-of-nature ideal, and by the 1990s ecological science had decentered ecosystem ecology, as reflected in textbooks such as Ricklefs' 3rd edition, which was foundational for Allen's education in the field. Today, however, ecosystem ecology continues to influence the environmental movement, particularly through conservation biology and restoration ecology; in their applied ecologies they advocate a policy of adaptive environmental management based in resilience.

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