

Ecomusicology: Bridging the Sciences, Arts, and Humanities

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Abstract:

Paul Ehrlich is a key figure in modern environmental studies. In addition to ecological research, Ehrlich is known for his warnings about human overpopulation (Ehrlich, 1968). In the 1970s, he made a well-known wager with economist Julian Simon: Ehrlich contended that natural resource prices would increase continually during the 1980s, indicating increased scarcity and human suffering brought about by overpopulation, while Simon believed that prices would decline. Ehrlich was a good sport, and because his neo-Malthusian concerns lost to Simon's cornucopianism, he paid up and admitted he was wrong—but he was wrong only for that decade. Considering a longer time scale, from 1900 to 2008, we see that Ehrlich's perspicacious concerns were indeed correct (Kiel, Matheson, & Golembiewski, 2010). In the inaugural edition of the *Journal of Environmental Studies and Sciences*, Ehrlich (2011) provided his “personal view” of environmental education. Considering his role as an important and respected environmental thinker and leader, and given the presentation of his ideas in such an auspicious forum, Ehrlich's advice merits our consideration.

Keywords: music | environmental education | arts and humanities | humanities | ecology | sustainability | trees

Article:

Environmental Studies and “The Two Cultures”

Paul Ehrlich is a key figure in modern environmental studies. In addition to ecological research, Ehrlich is known for his warnings about human overpopulation (Ehrlich, 1968). In the 1970s, he made a well-known wager with economist Julian Simon: Ehrlich contended that natural resource prices would increase continually during the 1980s, indicating increased scarcity and human suffering brought about by overpopulation, while Simon believed that prices would decline. Ehrlich was a good sport, and because his neo-Malthusian concerns lost to Simon's cornucopianism, he paid up and admitted he was wrong—but he was wrong only for that decade. Considering a longer time scale, from 1900 to 2008, we see that Ehrlich's perspicacious concerns

were indeed correct (Kiel, Matheson, & Golembiewski, 2010). In the inaugural edition of the *Journal of Environmental Studies and Sciences*, Ehrlich (2011) provided his “personal view” of environmental education. Considering his role as an important and respected environmental thinker and leader, and given the presentation of his ideas in such an auspicious forum, Ehrlich's advice merits our consideration.

In his outline of environmental education for the future, Ehrlich explains what is necessary to generate “an environmentally literate public” via education from childhood through adulthood; he further addresses potential obstacles in existing and potential educational systems. The subject areas Ehrlich says should be part of the curriculum include the following: earth science, thermodynamics, photosynthesis, climatology, evolutionary biology, biodiversity, demography, epidemiology, ecosystem services, politics, and economic behaviors (Ehrlich, 2011). He briefly mentions ethics, a subject he has written about elsewhere (Ehrlich, 2009), but a significant component of the foundation of university learning is still absent from Ehrlich's agenda: The sciences are privileged at the expense of the arts and humanities. Such a bias skews the education of environmental leaders.

Most higher education curricula in the liberal arts are subdivided into the arts, sciences, and humanities. Those are modern categories, but the medieval roots of the university reveal something similar. After the ancient Greek organization of learning into nine liberal arts (i.e., studies for the “free” or “liberal” mind), the medieval university was organized around seven liberal arts in two categories: the *trivium* and *quadrivium*, which mean “three-fold path [to wisdom]” and “four-fold path [to wisdom],” respectively. The liberal arts categories remained the basis of the educational system even with the rise of specialization, which began developing in the later medieval faculties of medicine, law, and theology. The trivium consisted of grammar, logic, and rhetoric, and the quadrivium, of arithmetic, geometry, astronomy/astrology, and music. Music was a speculative engagement; that is, it was philosophical and mathematical but not practical because performance lessons were not involved (although some singing of plainsong was). Nevertheless, music was one of the most important of the liberal arts, for it engaged mind, spirit, and body: It allowed for intellectual stimulation as well as the worship of God and the enjoyment of earthly pleasures. (For more on the medieval university, see Ridder-Symoens, 1992.)

In these seven liberal arts, we can see the basis for the modern arts and sciences and, in turn, the four usual academic administrative divisions: arts, natural sciences, social sciences, and humanities. Although most subject area departments would be positioned in only one of these areas— theater in the arts, biology in the natural sciences, sociology in the social sciences, philosophy in the humanities—some departments fit comfortably in multiple areas. For example, history is either in the humanities or in social sciences, and psychology might be a science or social science; the newer, inherently interdisciplinary field of environmental studies is another example of fitting into multiple areas. Nevertheless, most environmental studies programs are oriented toward the sciences, as Ehrlich's outline indicated. This emphasis is logical because most environmental problems have scientific underpinnings and solutions. Nevertheless, that scientific focus diminishes a balanced approach that understands environmental problems as also having cultural underpinnings and solutions (see Allen in Allen, Grimley, Von Glahn, Watkins, & Rehding, 2011).

If environmental crises threaten the collapse of human civilization—that is, the Earth will continue without us, but humans will suffer—then where are those uniquely human disciplines, the arts and humanities, in the process of understanding, education, and struggle? Should we not seek many paths to wisdom in order to face such crises? We are fortunate to live in one of the many civilizations that has developed to such a degree that we can pursue the arts—together with contemplation, emotion, experience, and so forth—and not just have to struggle for food, shelter, and reproduction. Is a world without the arts and their associated benefits really worth working to save?

By excluding the arts and humanities, Ehrlich is, perhaps unwittingly, reifying the “two cultures” binary between the sciences and humanities. C. P. Snow first laid out this idea in the 1950s and 1960s. He believed that the intellectual life and practical aspects of Western society were split into literary intellectuals and physical scientists: “Between the two [lies] a gulf of mutual incomprehension—sometimes (particularly among the young) hostility and dislike, but most of all lack of understanding” (Snow, 1965, p. 39). Essentially, each group believes themselves to be superior to the other, such that neither group wants to have anything to do with or even acknowledge need for the other: Scientists lack cultural understanding, while intellectuals lack worldly understanding. Snow believed these positions were mutual misinterpretations that stemmed from overspecialization in education; hence, educational reform was necessary to overcome the impasse.

Snow has been criticized and revised continually because his dialectic has many problems: He relied on the British educational model, his concerns are dated and now have many counterexamples, and he oversimplified complex social interactions. (For examples of critiques and follow-ups, see Brockman, 1996, and Kagan, 2009.) Nevertheless, Snow's analysis still resonates, unfortunate though it may be, with positions such as Ehrlich's and with problems such as those faced by environmental studies and sciences (ESS) programs.

As Susan G. Clark et al. (2011a, 2011b) reported, ESS programs have had difficulties integrating interdisciplinary knowledge and educating students in problem solving and leadership; furthermore, such programs suffer from fragmented and ambiguous goals, positivistic disciplinary approaches, and poorly rationalized curricula. As a solution, they argued that such programs should, first, “employ an explicit, genuinely interdisciplinary analytical framework that facilitates the use of multiple methods to investigate and address environmental and social problems in context” and, second, “develop educational programs and applied experiences that provide students with the technical knowledge, powers of observation, critical thinking skills and management acumen required for them to become effective professionals and leaders” (2011b, p. 716). Such research resonates both with my previous critiques and with the ensuing discussion of ecomusicology (the study of the interconnections between music, culture, and nature). Ehrlich's lopsided binary—emphasizing the natural and social sciences at the expense of the arts and humanities—illustrates the difficulty of interdisciplinary integration and the positivist emphasis of ESS programs. In contrast, ecomusicology provides a true interdisciplinary framework that connects scientific and positivistic thinking with humanistic and artistic thinking.

Environmental education in general and environmental leadership in particular can benefit from ecomusicology's capacity to connect the sciences, arts, and humanities. Among many other characteristics, effective environmental leaders are those who illustrate innovative thinking to solve problems through synthetic, interdisciplinary, and multiperspectival approaches; they are environmentally literate, and they think ecologically (i.e., in connected ways that follow and allow for complex interdependencies). Environmental leaders can benefit more from how ecomusicology researchers think than from what such research contains. The benefits, in other words, come from studying ecomusicology rather than, say, being a performer or listening to music (although such activities can certainly be a part of such study). If successful ecological thinking is a goal of environmental literacy and ESS programs, then ecomusicology can help train environmental leaders. If ecological thinking relates to stretching powers of observation—developing imaginative thinking and problem solving, deepening emotional responses to the world and to societies, considering varying and often conflicting philosophical positions simultaneously, and building strong and sustainable communities and teams—and if these goals are important, then the study of ecomusicology in an ESS context is one potential avenue toward developing environmental leaders' ability to think ecologically.

Ecomusicology

Ecomusicology is an area of inquiry that “considers musical and sonic issues, both textual and performative, related to ecology and the natural environment” (Allen, in press). Thinking about the connection between music and nature dates back to Ancient Greek contemplations of the sounding cosmos (the “music of the spheres”); moreover, such considerations are fundamental in some non-Western societies (see Feld, 1990). Nevertheless, only in the late 20th century has organized consideration of these issues developed. The term *ecomusicology* is not widely used, even when writers, thinkers, students, and musicians engage in ostensibly ecomusicological endeavors. In that sense, the term is more of an organizing principle, an umbrella, to refer to studies of the interconnections between music, culture, and nature—or studies of the interconnections between the arts, humanities, and sciences.

The terms *music*, *culture*, *nature*, and *environment* are complex terms that different people in diverse cultures—and even similar people in the same culture—can interpret in multifarious ways. But such multivalency is constructive because of the panoply of ideas, approaches, and insights that result and can be applied in different contexts. Ecomusicology has emerged from various fields and interests with little unified approach or dogma. From artists to scholars—from composers, performers, and acousticians to ethnomusicologists and historians—many have contemplated the issues and possibilities. One of the most useful intellectual and theoretical tools comes from ecocriticism (“ecological criticism”), a field of literary studies that considers how cultural products, such as texts and films, imagine and portray human-environment relationships. Ecomusicology might be more productively understood not as “ecological musicology” but as “ecocritical musicology.” (Musicology is an established scholarly field of research in, rather than the performance or composition of, music.)

While ecomusicology has the potential to bridge the sciences, arts, and humanities, it is not unique in that regard; environmental history and environmental literature (ecocriticism) share this potential. Nevertheless, I find two compelling reasons for ecomusicology to be a successful

bridging discipline: First, the roots of the liberal arts university are in the trivium and quadrivium, and the study of music was a fundamental part of the latter. Second, music, like history and literature, is a widespread phenomenon that can trigger powerful emotional responses, often quickly, making it a productive medium for environmental education messages. While no panacea, ecomusicology offers instructive perspectives on the critical and connective thinking skills that the arts and humanities provide—and that, pace Ehrlich, should play an important role in environmental education for the future.

Case Studies

The following six ecomusicological case studies from a variety of disciplinary perspectives further three goals; together, these goals show how the arts and humanities play a role in environmental leadership. First, they are examples that can illustrate humanity's diverse places in nature. Second, they show how the arts, humanities, and sciences can work together. And third, they demonstrate that the arts and humanities can help environmental leaders play a role in understanding and confronting the ecological crisis. This crisis is complex, and environmental leaders would do well to think outside the box, overcome divisions, and not give in to simplistic binaries such as the “two cultures.”

No one case study is a singular exemplar of ecomusicology; rather, they touch on some of the key disciplinary areas connected to it: ecology and acoustic ecology/sound-scapes, biology and biomusic, anthropology and ethnomusicology, geography and studies of resonant places, history and musicology, and sustainability and cultural studies of music. The variety of perspectives reflects the diverse intellectual ecology of ecomusicology.¹

Ecology

The well-developed, international field of acoustic ecology is a melting pot of composers, ecologists, and ethnographers who make and study soundscapes. As defined in 2007, soundscape art and soundscape studies are intended “to make explicit the patterns and changes in our sounding world, and to raise awareness about the state of the world, as revealed through sound” (Cummings & Miller, 2007, p. 1). Adding to this definition, acoustic ecologist David Dunn goes beyond environmental awareness to ecological remediation. Dunn is a composer who convened the Art & Science Laboratory in Santa Fe, New Mexico. Since the 1970s, his interest in nature has been reflected in his music, and Dunn's bioacoustics research informs his creative compositional work and scientific scholarship (see, for example, <http://www.acousticecology.org/dunn/solit.html>). Dunn's interdisciplinary methodologies and communication abilities have resulted in creative solutions for environmental problems.

Dunn's collaboration with physicist James Crutchfield explains how bark beetles attack drought-stressed trees to reproduce and ultimately kill the trees. Their field recordings of the bioacoustic

¹ Three other resources can provide further examples of ecomusicology. First is a review essay of four recent books with ecomusicological themes directed at ESS professionals in teaching and research (Allen, 2012a). Second is a series of five short articles directed at musicologists (Allen et al., 2011). The third is an online bibliography with hundreds of popular and scholarly resources; the website and bibliography are developed by a community of scholars and directed, in part, at other professionals but mostly at the general public (see <http://www.ams-esg.org>).

communication between the beetle and the tree call into question chemical-centric interpretations of the species by showing that beetles can detect the ultrasonic emissions of drought-stressed trees. Furthermore, sound can be used to counter the infestations, thus protecting the trees and interrupting the negative-feedback cycle of climate change-induced deforestation (Dunn & Crutchfield, 2009). Dunn has also produced an album, *The Sound of Light in Trees*, that comprises a soundscape from the interior bark layer of conifers. He has observed that scientists lack the tools, methodologies, and language for investigations like his, which include innovative speculations typical of artists; moreover, Dunn believes that artists have unique and valuable epistemic positions because their outsider status enables them to pose hypotheses external to the scientific canon. In his work, Dunn asserts that sound is a part of understanding ecological relationships.

Soundscape studies are a diverse field, and Dunn's work described above might be understood as situated toward two ends of a continuum—on one side is the artistic work of the composer who produces an album, and on the other side is a scientist involved in ecological fieldwork. Bernie Krause's career resembles Dunn's. Krause earned a PhD in bioacoustics and continues scientific work, but he has also produced over 50 albums (see Krause, 2002). Still others can be positioned more toward the middle of that continuum in an arena broadly construed as cultural studies, as with the work of Järviluoma, Meri, Truax, Uimonen, and Vikman (2009).

Their volume, *Acoustic Environments in Change* (AEC), revisits the study *Five Village Soundscapes* (FVS) directed by R. Murray Schafer, a founding father of soundscape studies/acoustic ecology (his seminal writings, first published in the 1960s and 1970s, are reprinted as Schafer, 1994). In the 1970s, Schafer and his colleagues visited five European villages to explore their soundscapes, partially in response to problems that Canadian cities were experiencing with lo-fi sound conditions; they sought examples of hi-fi sound conditions to analyze and to learn from. Lo-fi conditions are “obscured in an overdense population of sounds” (e.g., traffic), while hi-fi are those “in which discrete sounds can be heard clearly because of the low ambient noise level” (Schafer, 1994, p. 43). FVS investigated the relationship between the sounds and the social structure of the village, and AEC listened in on the villages some 25 years later. The volume (Järviluoma et al., 2009) includes a reprint of FVS and sound examples from both studies, which considered the natural ecology, built environment, social world, personal preferences, and artistic life in the villages. Both AEC and FVS emphasized lessons that could be applied to the design, acoustic and otherwise, of human population centers in order to provide for healthy, beneficial, responsible soundscapes. These musical, sonic, ethnographic, and qualitative approaches could be linked with science and public policy, particularly because “soundscape ecology” has recently been theorized as a “new” field related to landscape ecology (Pijanowski et al., 2011). (For more on AEC and FVS, see Allen, 2012a.)

Biology

From abstract village soundscapes and odious climate change induced pestilence, we move to inspirational and characteristic fauna. Cetologist Roger Payne has been at the forefront of studying the vocalizations of whales as an academic, MacArthur Fellow, and multidisciplinary independent researcher with the nonprofit organization, Ocean Alliance. In the late 1960s, Payne's work galvanized the popular, scientific, musical, and environmental interests in whales.

His article in *National Geographic* contained a small vinyl record of whales that Payne recorded; 10.5 million copies were pressed—the largest single order in recording industry history. Payne's 1970 *Songs of the Humpback Whale* was a best-selling natural history recording, influencing composers such as Paul Winter and Alan Hovannnes. Recently, he has worked with scientists, musicians, and museums to create the *Wild Music* exhibit, which has a website that includes sound examples and further information on Payne's and others' work.

The *Wild Music* project is an example of the productive collaboration of biomusic researchers who study the music of nature and the nature of music, primarily with life- and natural-science methodologies. Biomusic is a long-standing research collaboration between scholars of neurology, biology, evolution, and anthropology and music researchers in cognition, education, and performance, among other areas (Gray et al., 2001). Transcribing and studying whale song has resulted in greater understanding of whale mating, whale migration, and the acoustic environment of the ocean. In that context, we are only recently beginning to comprehend the impact of human noise pollution in the sea, from military sonar to commercial vessels in shipping channels. Moreover, “save the whale” campaigns have benefited from aesthetic understandings regarding both its purely sonorous makeup and its formal structures, which Payne and others have analyzed like human music.

Biomusic studies have also been interested in that most musical (to our ears, at least) of species: birds. From Aristotle to Darwin and beyond, observers have recognized that some birds learn their song, and such considerations have led evolutionary biologists down many paths to correlate human and animal music making (Fitch, 2006). Philosopher and clarinetist David Rothenberg has taken a different approach from scientific study by considering the role of improvisation in nature and human music as well as the ability of humans and other species, particularly birds and whales, to perform together in a dialogic manner (see Rothenberg, 2002).

Anthropology

In addition to bioacoustic, evolutionary, or jazz-inspired performance, another way of considering the importance of bird song to humans comes from the field of ethnomusicology, which studies music and dance in social and cultural context using anthropological and ethnographic methods (i.e., fieldwork and interviews) as well as musical, sociological, religious, and other analytical approaches.

In the highland plateau of Papua New Guinea, ethno-musicologist Steven Feld has documented connections between the Kaluli, the people indigenous to the Bosavi area, endemic avian fauna, and local forest ecology. In his anthropological and linguistic work, Feld collected the language, stories, myths, and behaviors of the Kaluli; he also recorded their songs and related a subset of them to a particular bird, the *muni* or beautiful fruit dove. The *muni* is central to the Kaluli conception of sadness and mourning, and it is through consistent evocation of this bird's descending call in ritual and recreational singing that the Kaluli express themselves and their connection to what they understand as the spirit world of birds in the forest. Kaluli music has a self-conscious aesthetic termed *dulugu ganalan* or “lift-up-over sounding,” which the Kaluli acknowledge to be in response to their sonic rain forest environment. Kaluli even analyze their own songs as trees: Refrains are trunks, and verses are branches (Feld, 1990). In essence, Kaluli

epistemology is inextricable from their forest sound world. The idea of “acoustemology”—that is, the truths of sonic understanding—is an apt way to comprehend such human-nature connections (Feld, 1996).

Unfortunately, logging and mining have moved into Kaluli lands, and foreign companies have clear-cut, strip-mined, and polluted their waterways. Furthermore, the power of religious missionaries has convinced many Kaluli to change their ways. Younger Kaluli no longer sing like the muni or appreciate *dulugu ganalan*; they have adopted Western styles and instruments. As biodiversity goes extinct, so too does cultural and musical diversity (Feld, 1991). Feld has protested these actions, resigning from his position as a tenured professor at the University of Texas at Austin over that institution's financial ties to mining companies; the government of Papua New Guinea has even banned Feld from returning to the country. While the future of the Kaluli and their music is in question, Feld has at least documented their beautiful sounds and informative perspectives.

Many ethnomusicologists consider the relationships between sound, culture, and place. For example, Theodore Levin (2006) explores the sounds of Tuvan musicians and their connections to elemental sounds (wind, water, echo) and to birds and animals. Nancy Guy (2009) studied songs about Taiwan's main river, the Tamsui, that reflected ideas about nature and concerns about the environment. Some scholars have begun taking a more active and explicitly environmental activist approach. Angela Impey (2006) worked with high school students in South Africa and used music together with local knowledge to encourage conservation. Impey reflects,

Promoting dialogue through the recovery and public dissemination of cultural and environmental heritages may be an empowering process, may encourage community building, and may challenge the reductionist global gaze that is typically advanced by eco- and cultural tourism. Through active reflection of self, community and senses of place, the project sought to raise awareness about the value of the environment as a cultural asset, and in so doing, to support broader initiatives in the region to achieve a more integrated, community-driven paradigm for the custodianship of the environment. (Impey, 2006, p. 104)

In essence, the project demonstrated a valuable ecomusicological lesson: Impey used music as a tool to connect local knowledge of culture and nature with environmental stewardship.

Geography

Place is a common theme in ecomusicological explorations, in both ethnomusicology (above) and musicology (below). But geography's considerations of space, place, and of landscape have also resonated with music studies.

Daniel Grimley's study of Norwegian composer Edvard Grieg demonstrates that landscape was fundamental to Grieg's music and to his reception. The Nordic environments (natural) and landscapes (human constructed) where Grieg lived and where audiences appreciated his music were important to his conceptions and to others' views of him. Rather than just a pleasant

backdrop for picturesque music, landscape affects ideology, which affects the compositions and their understanding (Grimley, 2006).

Grimley has also considered the use of Scandinavian music for evocative, emotional purposes that aid environmental activism. In the late 1960s, the Lithuanian-born Australian wilderness photographer Olegas Truchanas toured Tasmania to campaign against proposals to flood Lake Pedder, a unique inland freshwater lake. Although mostly unsuccessful, the campaign symbolized the birth of the environmental movement in Australia. Among Truchanas's activities to raise awareness among Tasmanian residents and politicians were slide shows of his photographs of Lake Pedder, accompanied with music by Finnish composer Jean Sibelius, particularly the finale of his Fifth Symphony. Music here is used as an emotional foil for exporting a particular ideology of landscape from Scandinavia to Australia. Moreover, Grimley recognizes the significance of music, including classical music, used in environmental activism. The association of particular music with landscape can aid in such emotional and political connections (Grimley in Allen et al., 2011).

The United States has been fertile ground both for composers connecting with place and for the scholarly inquiry into their inspirations and relations. Composer John Luther Adams (2009) has written eloquently about the importance of Alaska for his music, while Mitchell Morris (1998) made connections between Adams's music, deep ecology, and the American environmental movement. As with Grimley's study, Denise Von Glahn (2003) shows how place helps create national and regional identities and how music can evoke both the places and identities in powerful ways. In the 19th century, Niagara Falls had become “America's most iconic place” (p. 10), and Von Glahn examines three Niagara symphonies in relation to the composers' and audiences' identification with the falls. It was not just nature that interested composers—as with pieces about the West, the Mississippi River, and the Hudson Valley—but also human ingenuity in regard to controlling or tapping into it; hence, Von Glahn's study of Ferde Grofé's music, written to celebrate the 1961 opening of the power plant at the falls, and her consideration of the sounds of major cities reflected in works by composers as different as Aaron Copland, Edgard Varèse, Duke Ellington, and Steve Reich. Overall, Von Glahn and her subjects are interested in places represented in art music; issues of environmentalism, while present, are not prominent. Aspects of environmental conservation and preservation do come to the forefront in Brooks Toliver's (2004) study of Grofé's *Grand Canyon Suite*. Toliver finds tensions in this music that reflect both the early 20th-century debates about land use, which played out in relation to the canyon itself and on a national level, as well as the paradoxes of wilderness as something preserved and conserved, exploited and created.

History

Toliver's (2004) and Von Glahn's (2003) studies are, in fact, historical studies, but I grouped them above in the section on geography because of their more prominent concern with place. But Von Glahn and other music scholars have used historical approaches to engage with past conceptions, both distant and recent, of nature.

Von Glahn's forthcoming book *Music and the Skillful Listener* considers nine American women composers, from the late 19th century to the dawn of the 21st, who have written nature-inspired

music. The common thread among these women, developed through an examination of their biographies and compositions as well as the cultural context in which they lived and worked, is a careful tendency to listen, collaborate, and communicate effectively their musical ideas and philosophical ideals about the place of women in society and history, the fate of our planet, and what it means to be human. One of these composers is an apt case study for our present purposes not just because of her ecomusicological engagement but also because of her significant roles as a leader.

Victoria Bond (born 1945) pursued a career as a composer and conductor just as the cultural climate in the United States was changing to be more accepting of women in such roles. She was the first woman to receive a doctorate in conducting from the prestigious Juilliard School, and soon after graduating in 1977, she held a number of significant posts. Bond's music reflects her personal connections with the natural world; since early childhood, her family nurtured her exposure to music, animals, and the outdoors. In 1994, she composed *Thinking Like a Mountain*, which is based on the seminal text from Aldo Leopold's *Sand County Almanac*. The music includes a Chinese folk tune in the context of her Western art music idiom as a way to signify global cooperation, and it unfolds in a series of reflections on the life scales of rocks, trees, animals, insects, and flowers. Many of her other works—from songs to string quartets to solo instrumental pieces, some including poetry she has written herself—are inspired by or contain references to the natural world. While some composers may find interest in abstract connections with nature, Bond's ecomusicological interests relate to her personal life: She built her home on a minimally thinned wooded lot, and rather than choose a grass lawn like her neighbors, she created a natural garden that involves minimal human intervention and allows natural cycles to proceed. Her music and life reflect respect for nature and an active engagement in protecting it, while imploring others to do the same. Bond's success as a woman in a male-dominated field is also something she hopes will inspire others (Von Glahn, in press).

Composer Emily Doolittle is another subject considered in *Music and the Skillful Listener*, for she is the author of many nature- and animal-inspired musical works. But Emily Doolittle has also written on the varied history of animal song in music of different times and cultures: from human communication with nonhuman animals to past symbolic representations and source materials for composers to more recent interests in greater collaboration between human and animal composers (Doolittle, 2008). Elizabeth Leach (2007) focused on one particular topical and historical area that Doolittle also considered: the meaning of birdsong in medieval European thought about music. Leach found that although music was understood to be a rational art and therefore fitting of human beings, and even though birdsong was irrational and therefore beneath the dignity of human engagement as music, birdsong was nevertheless used in musical compositions to praise musicians and in music theory. Such contradictions are an important element of understanding both the complexities of history and perceptions different from modern ones. The volume edited by Suzannah Clark and Alexander Rehding (2001) provides a broader engagement with music theoretical thought via nine articles that consider different understandings of nature and natural order in European music theory since the 16th century. Music theorists have commonly justified their approaches as “natural” or based somehow on nature's order, but cultural and historical differences provided for quite different understandings of just what nature was. That may be a deceptively simple conclusion, but the associated intricacies allow for a richer understanding of our world and human conceptions of it.

Sustainability

The final case study is from my own research on the instruments of the violin family, which are fundamental to the sound of Western art music in its most hallowed traditions (e.g., symphonies and operas). To construct these professional instruments, builders require Brazilian pernambuco and Italian spruce. Considering the life history of these instruments as cultural commodities shows the connections between cultural sustainability and ecological sustainability: Cultural decisions have ecological ramifications.

Professional bows are made from wild-grown pernambuco trees, *pau brasil*, which grow only in the South American Atlantic Coastal Forest. European colonial powers discovered that this wood could dye regal garments, and so they warred over it with each other and with indigenous peoples. Eventually, Europeans named the country Brazil after the tree. Today, pernambuco is nearly extinct because of numerous ecological pressures; only 8% of the original forest is extant, and only 5% of pernambuco habitat remains. In the 18th century, archetiers crafted this supple wood into bows that were concave rather than convex; such changes led to the modern form and idiomatic use of the violin bow in classical music. Bow makers working with ecologists have tried to preserve habitat, find alternatives, and use the resource responsibly; yet professional players continue to insist on ecologically destructive pernambuco bows. (Other musical woods, for example, rosewood and ebony for guitars, could tell similar stories of use and exploitation.)

The spruce used for violins has fared better. This species is widely distributed, but the unique Alpine microclimate in the Italian Val di Fiemme's Paneveggio Forest produces straight, even wood grain with excellent sonic properties. Luthiers use this resonance wood for the soundboards of professional instruments such as violins. The creations of perhaps the most famous Western luthier, Antonio Stradivari, contain this resonance wood and have contributed to the renown of this forest. Myths abound regarding his jaunts through the Val di Fiemme seeking out the most musical trees, and such associations led to the Paneveggio's moniker, the “forest of violins.” Stradivari's enthronement as the king of luthiers was a cultural process involving writers, builders, performers, and dealers that gradually added value to his creations, which now sell for millions of dollars. The powerful Venetian Republic also wanted Paneveggio's tall, strong trees for their navy, but Fiemesi traditions of management since the 12th century, along with the unique topological features of the region, thwarted such threats. Many musical and nature tourists are attracted to the Paneveggio, which, thanks to its sustainable management traditions and the fame of its musical woods, now produces more trees every year than Fiemesi loggers harvest. The forest of the violins is a model of centuries-long ecological and cultural sustainability.

The values accorded individual trees (spruce and pernambuco) and the cultural commodities dependent on them (violins and bows) together create a ripple effect that reverberates globally. Western classical art music—a presumably threatened elite tradition, which suffers from declining record and ticket sales and an aging audience and which seems in need of preserving—contributes to both threatening and sustaining the unique resources on which it depends. The impacts, positive and negative, of classical music can be felt well beyond the ephemeral sounds of the concert hall (Allen, 2012b).

Sustainability is a word with many interpretations. In the preceding, I used it in the context of long-term preservation of ecologies and natural resources that humans use. Others have considered the word more as a model or theoretical framework for understanding the preservation of entire cultural traditions, for instance, dance or musical practices—but without considering ecological or environmental impacts. Jeff Todd Titon uses sustainability in this way to theorize applications of cultural management. He regards music as “a biocultural resource, a product of human life; further, it is a renewable resource. . . . In short, sustaining music means sustaining people making music” (Titon, 2009, pp. 5–6). Sustainability here is used as an analogy: Titon adapts some core tenants of conservation biology—diversity, limits to growth, interconnectedness, and stewardship (Titon, 2009)—for application in cultural policy regarding heritage management. He is not concerned with nature or environmental issues, except by analogy. Such an approach, however, can suffer from the very “unintended consequences” that worry Titon (2009, p. 121): Cultural sustainability can be excessively anthropocentric and privilege a sort of cultural sustainability that has the simultaneous potential to cause environmental unsustainability (e.g., the demand for pernambuco violin bows). Sustainability has recently become much more important in discussions of art and culture (e.g., Kagan & Kirchberg, 2008), and such conversations will develop our understandings of these concatenated issues.

Summary

In his groundbreaking study of ecocritical interpretations of American popular music in the latter half of the 20th century (the era of the rise of the modern environmental movement), David Ingram (2010) acknowledges that “music is obviously not a solution to environmental problems in and of itself” (p. 240). But he recognizes that “music can nurture our imaginative, emotional and spiritual responses to the natural world” and thus extend “human rationality” (p. 238). I agree that music will not save the world. But music itself should not be our only consideration; rather, we should consider the study of the cultural, historical, physical, and intellectual connections that music can facilitate. To be sure, Ingram adopted for his study a laudable “aesthetic pluralism” that respected various philosophical, environmental, musical, and political perspectives. It is that selfsame pluralism that guides ecomusicological thought and that can be of such benefit to its students.

Ecomusicological approaches are not unified. They reflect a messy reality in the field that reflects the messy reality of art and humanity in the world. If not ecomusicology specifically, then certainly musicology in general seems an unlikely way to approach the daunting and time-sensitive challenges we face. Ecomusicology can be a part of the environmental literacy agenda by helping to balance the usual curricula that emphasize the natural, physical, and social sciences at the expense of the arts and humanities. Studying ecomusicology and achieving a better understanding of sound and music in general can help environmental leaders (a) use their imaginations, (b) appeal to audiences in intelligent and emotionally meaningful ways, (c) make informed decisions by taking into account a variety of sources of data, (d) consider diverse perspectives (aesthetically, philosophically, politically), (e) develop an ease with interdisciplinary approaches, and (f) think critically in new and innovative ways to solve

problems and build teams. Environmental leaders need to approach challenges with such creative and multidisciplinary thinking that bridges the sciences, arts, and humanities.

The environmental crisis, the scientific-cum-cultural problem of our time, is complex. We need all the understanding of humanity's place in nature we can muster. We need to collaborate in innovative and imaginative ways—ways that cross between the arts, humanities, and sciences. And we need well-educated environmental leaders who can think creatively and overcome simplistic divisions such as the “two cultures.” Ecomusicology can help environmental leaders learn to listen—to the natural world, to other humans, and to each other.

Note

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