The history of music: approaches from cultural evolution and musicology

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Abstract

Early musicologists embraced evolutionary thinking in their understanding of historical change. In the last century, however, research on music history has fragmented along methodological and institutional lines—humanities scholars produce rich descriptions of specific examples, including all relevant details and context, while scientists use empiricism to identify the processes driving general trends. We think that the emerging field of cultural evolution has the potential to bridge this gap. In this chapter, we summarize recent research on the cultural evolution of music, focusing on studies of musical content and context, as well as novel methodologies. Then, we address five open questions and key challenges for interdisciplinary research on music history: overcoming epistemological differences, addressing biased historical preservation, understanding globalization and technology, disentangling evolution and progress, and identifying the drivers of innovation. By addressing these challenges, we aim to foster a more interdisciplinary and collaborative approach to musical history and evolution.

Keywords: music, cultural evolution, historical musicology, globalization, innovation

Introduction

Explicit references to music are common in Darwin's early writings on biological evolution. At the same time, music historians draw on analogies of natural growth to describe music's changing styles. In an article considered the foundational document for musicology as an academic discipline, Austrian musicologist Guido Adler (1855–1941) sketches the history of music as a quasi-evolutionary process. For him, studying the history of music entails comparative research on forms of music notation and writing systems, the development of classification taxonomies for different musical forms, styles, and genres, as well as "the investigation of the laws of art of different periods, which takes the highest precedence; this is the actual focal point of all music-historical work" (Mugglestone & Adler, 1981). These "laws of art," he explains further, can be understood in analogy to biological growth, as the central concern for the new field of historical musicology "is to demonstrate and establish how, proceeding from the beginnings of simple melody, the structure of works of art gradually grows" (Mugglestone & Adler, 1981). Setting the progressionist undertones aside, the influences of Darwin's revolutionary conceptions of biological evolution on Adler's thinking about music history and culture are evident. Since then, however, music research has fragmented along methodological and institutional lines, with historical musicology and systematic musicology (e.g., psychology, acoustics) under the roofs of the humanities and the sciences, respectively. The resulting abysmal gap prevents true interdisciplinary exchange to the present day. In the last couple of decades, though, quantitative research on music history has been revitalized by emerging fields like cultural evolution, which we feel has the potential to bridge this gap.

Below, we summarize a wealth of recent research on the cultural evolution of music in broad strokes, focusing on studies on the contents and contexts of music as well as novel

methodologies. After that, we identify five remaining issues and open questions. In particular, we briefly discuss epistemological differences, issues of data preservation, debates surrounding innovations in aesthetic settings, the challenges posed by globalization and technological advancements, and briefly elaborate on the tension between conceptions of function and progress. We conclude with areas where we see promising potential for future interactions between historical musicology and cultural evolution. Note that we are unable to provide more than a handful of citations here because of word limits—full reference lists can be found in Savage (2019) and Youngblood et al. (2023).

Cultural evolutionary research on music

A major focus of cultural evolution research on music has been describing and explaining cross-cultural similarities in musical features and structure. Central findings include that scales in traditional music from around the world tend to be composed of five or seven equal steps, and rhythms usually exhibit isochrony with smaller subdivisions of two or three beats (Brown & Jordania, 2013). These regularities are driven, at least in part, by cognitive biases for simplicity and predictability. In iterated learning experiments where participants transmit information to one another along a chain, similar to the children's game "telephone", melodies and rhythms converge towards cross-cultural universals while displaying variation that reflects local music traditions (Anglada-Tort et al., 2023). Large-scale trends in popular music may also be shaped by cognitive biases—for novelty and rarity in the pop charts, negative emotion in lyrics, and conformity in the samples that artists use (Youngblood, 2019).

Context and community structure also play a major role in shaping musical diversity. Large-scale cross-cultural studies indicate that the context in which music is produced heavily

predicts its acoustic features (e.g., lullabies and love songs have a lower tempo than dance songs), so much so that people are able to reliably assign songs from different cultures to the context in which they appear (Yurdum et al., 2023). Group singing is much more common than solo singing in multiple cross-cultural datasets, especially in contexts such as dance, religion, and mourning. Most work of what we know about community structure comes from contemporary music, where detailed data on artist relationships are easily accessible. Cultural artifacts like music samples appear to "diffuse" through networks of collaborating artists, which loosely map on to genres and subgenres. Genetic population structure, on the other hand, does not have a consistent relationship with traditional musical variation. At global scales there does not appear to be a strong correlation between genetic and musical variation (Passmore et al., 2024).

One of the biggest contributions of cultural evolution to the study of music are new quantitative methods for description, some of which are based on explicit analogies with biological evolution. These methods enable reassessment of historical findings and put them to the empirical test. Phylogenetic reconstruction, which traditionally uses genetic data or physical traits to infer species relationships, has been used to investigate plausible lineages of manuscript copies, the historical trajectories of melodies and songs, modes, rhythms, and instruments. Sequence alignment, which is used to align DNA sequences with mutational differences, has recently been used to track changes in English and Japanese folk music melodies. More broadly, statistical modeling approaches from ecology and the social sciences have been used to track the historical development of harmony in Western classical music (Moss et al., 2024) as well as major trends in popular music including lyrics, harmonics, timbre, and pitch and chord transitions (Mauch et al., 2015).

Open questions: epistemological differences

While cultural evolution and historical musicology share a common interest in understanding how music developed in the past, and how music cultures, styles, and technologies have changed over time, they often disagree with respect to particular research interests and epistemologies. Musicologists, and humanities' scholars more generally, are often interested in "thick description", the minute study of (ideally) all relevant details and contextual aspects, and express skepticism towards generalizing statements and findings that claim to explain historical processes, which is a common goal in the social sciences, including cultural evolution, and approaches to predict history. Interdisciplinary tensions are thus no surprise. However, as both perspectives embody the desire to reduce uncertainty surrounding knowledge of the past, we believe that these can be at least partially reconciled if there is a deeper conversation about epistemic goals. In particular, the act of describing something can be understood as a form of data modeling, and this may build conceptual bridges. The development and quality assessment of descriptive models such as standardized encoding formats for sheet music or the (re-)construction of historical networks, then, adheres to similar scientific criteria as those for predictive or causal models, for instance to explicitly state model assumptions, to avoid under- or overfitting, and to seriously engage in model comparison.

Additionally, historians have begun to more seriously engage with "counterfactual histories" as a research methodology. In simple terms, this is an attempt to play through possible alternative scenarios to real historical events, constrained by what is already known. Far from being mere "fanfiction", these accounts aim at better understanding what was in light of what could have been. This loudly resonates with empirical simulation of sampling-based studies, e.g. prior/posterior predictive analyses in the context of Bayesian analytical frameworks.

Cross-fertilizing the rigorous statistical methodology from the social sciences with the acute awareness for cultural intricacies of the humanities seems a most promising avenue for historical musicology and cultural evolution to interact. That being said, different epistemologies are not only possible but desirable if they are complementary or, at least, provoke productive interdisciplinary exchanges. A multifaceted phenomenon like music necessitates and deserves a wide range of scientific approaches. What would be beneficial both to the humanistic and scientific study of music is to identify specific areas of disagreement and to collaborate towards their resolution.

Open questions: historical preservation

Apart from institutional obstacles, interdisciplinary research on the history of music that applies both quantitative and qualitative methods is also limited by factors that one could coarsely subsume under "data issues". The myriad ways of preserving and transmitting music between individuals and from one generation to the next range from explicit oral one-on-one instruction to implicit imitation to different forms of writing systems and codifications. As with any cultural artifact, the written record in stone, paper, or silicon usually facilitates the reconstruction of things of the past, whereas preservation is limited to the memory of living individuals and societies for oral cultures. Moreover, different notational systems omit different musical facets that are not deemed important or assumed to be known implicitly by anyone, which might not be true anymore for future generations. This selection bias becomes amplified even more strongly when implicit or explicit criteria for inclusion and exclusion are taking effect. The music of certain individuals or groups may be banned or celebrated; judgements of differing aesthetic or economic value may lead to conservation or canonization of some but not of others.

Most importantly, even when forms of notation exist, they are not the music but a mere attempt to write down what is essentially ephemeral. Music historiographies, in particular in the West, have focused mostly on its notational and representational aspects, as those can be read from the written record. But, as uses of music change, e.g. responding to larger socio-political developments or simply to the dynamics of taste and fashion, so do its functions. While drawing inferences about past musical behaviors from implicit notational forms (e.g. in the forms of instruments or drawings) is challenging, it is clear that research into the cultural evolution of music needs to be based on a larger basis than notated musical pieces alone. In short, there is no archeological record of music, only of music codifications. Studying music history quantitatively requires sophisticated models that do not hide these issues but rather express the associated uncertainty.

Cultural evolution and musicology can also collaborate in the areas of cultural heritage preservation. Coordinated efforts to document endangered music cultures threatened by globalization or climate change are needed in order to safeguard humanity's musical heritage, and provide "missing links" in the evolutionary history of human music-making (Wallin et al., 2001).

Open questions: globalization and technology

One area where historical musicology could inform research on the cultural evolution of music is the role of globalization and technology in musical change. For decades, musicologists have been deeply concerned about the effects of global interconnectedness on cultural diversity. Alan Lomax may put it most strongly: "a mismanaged, over-centralized electronic communication system is imposing a few standardized, mass-produced and cheapened cultures

everywhere" (Lomax, 1977). The limited quantitative research on music globalization broadly supports this assertion. European pop music charts have become increasingly American-dominated since the 1960s, and releases from countries that are more central in the network are more likely to become hits. At the same time, the spread of music production technologies can lead to surprising and fascinating new forms of musical variation. Auto-tune, for example, has become extremely popular among singers in North Africa because of how it interacts with melismatic vocals (Clayton, 2016). Some of this variation traces postcolonial human migration. Sound system culture—innovated in Jamaica and brought to the UK by the Windrush generation—laid the groundwork for half a century of popular music in the UK, from post-punk to jungle and drum and bass.

Cultural evolution is well-equipped to study how increases in global connectivity and the diffusion of new technologies affect music. Network analysis, acoustic feature analysis, and other methods have been used to address a variety of related questions, such as the role of the internet in delocalizing artist communities and the impact of wars on music discovery behavior. However, good studies of globalization and technology diffusion require the kind of in-depth domain knowledge that historical musicologists are able to contribute. Work like this also often requires big data, and at this point most datasets on contemporary music are Western-centric and rather small. Luckily, recent years have seen the development of new corpora that focus on music outside of the traditional Western canon. The Global Jukebox, which expands on Alan Lomax's groundbreaking Cantometrics project from the 1980s, includes original recordings with standardized acoustic features from over 1,000 societies (Passmore et al., 2024). Another notable example is the CompMusic project, which includes thousands of transcriptions and recordings of music from India (Carnatic and Hindustani), North Africa (Arab-Andalusian), Turkey (makam),

and China (jingju). Both historical musicology and cultural evolution are themselves undergoing a process of "globalization" to consider the full diversity of human cultural life (Kroier, 2012). Interdisciplinary collaborations should catalyze this process by prioritizing the analysis and construction of cross-cultural datasets.

Open questions: disentangling evolution and progress

Teleological misconceptions of evolution are commonplace. The "march of progress" cartoon—depicting a linear transition from apes to humans—continues to shape popular perceptions about evolution, despite the fact that biologists have since long rejected the progressive view of evolution for decades. In the words of Stephen Jay Gould, progress is a "noxious, culturally embedded, untestable, nonoperational, intractable idea that must be replaced if we wish to understand the patterns of history" (Gould, 1988). Naturally, applications of cultural evolution are frequently subject to criticisms based on the misconception that evolution implies progress (Savage, 2019). An early example for a progressionist model of music evolution is given by the Belgian music theorists François-Joseph Fétis (1784–1871). According to his theory, music is governed by a system of relations between tones that he calls "tonality," a neologism at the time. His innovation is to recognize that the organization of tones is subject to geographical and diachronic change and not, as earlier theorists would have it, determined by universal laws (physical or cosmological-divine). Fétis proposes a four-stage model (Fétis, 1844) in which music proceeds from simple monophonic melodies in a single mode or key to a stage where modulations are possible to a stage where multiple keys are equally important to a stage where, finally, all tones and relations between them are equal. His merit is to recognize change in tonal organization, his failure is to assume progress towards an entropic totality. In some respect,

his prediction has indeed been fulfilled with twelve-tone serialism. However, it is also evident that serialism remains a marginal phenomenon in the face of the world's varieties of music to the present day.

In cultural evolution research, progress is most often discussed in relation to cumulative cultural evolution (CCE)—the improved functionality of behaviors, tools, or other variants over time (Mesoudi & Thornton, 2018). CCE does not imply inevitable "progress" in human culture as a whole, as there are many examples of behaviors becoming less complex, efficient, or functional. It simply provides a framework for understanding the "ratchet effect" that occurs in some forms of human culture, like technology. As others have noted, there are several problems associated with applying CCE to aesthetic domains like music. Even if one takes for granted that music has a single function, such as social bonding, the features associated with that function are contextual and constantly changing. In other words, music and other forms of aesthetic culture are optimized for moving targets. Is it possible to determine whether UK rave music is better at enhancing social bonds than the all-night song and dance traditions of Xingu people? Probably not.

Open questions: the generation of new innovation

Another area where interdisciplinary collaboration between historical musicology and cultural evolution could be particularly fruitful is the question of innovation, which is understudied relative to other drivers of cultural change. Research on the cultural evolution of contemporary music has yielded some interesting insights into how innovations emerge and influence future musical variation. Songs with novel sounds and lyrics do better in the pop music charts, and "underground" artists who introduce novel sounds are often copied by more popular

artists. Musical innovations can open up new styles of music and the originators of these styles experience elevated success over time. That being said, we still lack an understanding of how the creative practices of artists lead to innovations in the first place. Moving towards a better understanding of innovation requires two things: new quantitative models, and rich historical examples. Cognitive scientists and information theoreticians have developed several candidates for models of innovation that deserve more attention by cultural evolution researchers, such as "information dynamics of thinking" (Wiggins, 2020). Historical musicologists, particularly organologists, have detailed many examples of innovation in instrument designs, notation, and other musical practices that would be excellent models for cultural evolutionary research. However, truly understanding innovation as a process requires artist- or community-centered examples that include details about the technologies used, the cultural context, and ideally a record of the artists' creative process (e.g., from journals, letters) (Meyer, 1983).

One such example might be innovations in tuning systems and temperaments. A number of particular temperaments and the musical affordances they entail have been developed several times, and are extremely well-documented by historical musicologists. Direct results from innovations in temperament are creative choices such as "triadic atonality"—the juxtaposition of tonally distant harmonies—featuring centrally in both 15th-century motets and 19th-century symphonic poems. For the former, it seems that it was not fit enough for the cultural environment at the time (i.e., tuning systems, listeners' taste), whereas the latter flourished and still heavily impacts on contemporaneous film music. Indeed, integrating experimentation, innovation, and creativity into theories of the cultural evolution of music may be crucial to reconcile them with these sorts of historical and cross-cultural accounts.

Conclusion

We feel that the field of cultural evolution has the potential to bridge the gap between historical and systematic approaches to musicology by contributing new methods, models, and cross-cultural insights. In turn, expertise from historical musicology has the potential to illuminate fundamental questions about cultural evolution, such as how and why creative innovations emerge. The epistemological differences between the two approaches are complementary, and potentially reconcilable. By identifying general trends and cross-cultural mechanisms of musical change, cultural evolutionary researchers can provide a "backdrop" for the more detailed and nuanced accounts of historical musicologists. Simulation-based approaches may also be useful for addressing other interests of humanities scholars, such as dealing with historical uncertainty and exploring counterfactual scenarios.

The models and methods used to study the cultural evolution of music are often strikingly similar, if not the same, as those used to study change in other domains like literature and the visual arts. Within cultural evolution, this means that many researchers who study music are also deeply interested in other forms of aesthetic culture. There is also a great deal of overlap with the computational humanities and empirical aesthetics communities, with members of all three fields attending similar conferences, co-hosting workshops, etc. As a result, we feel that cultural evolution may act as an interdisciplinary umbrella connecting different areas of interest within the humanities, and linking them to psychological and cognitive work being done on music, art, and aesthetics.

In this chapter, we have focused on high-level ways that interdisciplinary collaboration can contribute to our understanding of music history, but we will close on a more practical note—with recommendations for how cultural evolution researchers can directly engage with

musicology. First, the historical musicology literature is full of interesting, untested hypotheses that could be investigated using quantitative methods. Cultural evolutionary researchers are also often interested in whether models are able to generalize to unseen and unusual data, and there is rich documentation of such cases by musicologists. Second, cultural evolution usually analyzes artifacts, whereas musicologists often focus on practices and experiences. The latter are less reductive, and capture more of the complexity of real musical behavior. Finally, one pitfall of cultural evolution is that methods sometimes take precedence over questions. In other words, researchers sometimes find datasets and questions that they can apply their existing methods to, rather than prioritizing the questions and developing new models to address them. Musicology is much more guided by questions—something that we think cultural evolution could benefit from.

Overarching research questions

- How can cultural evolution and historical musicology reconcile their epistemological differences?
- How do we address the data quality issues introduced by biased preservation?
- What roles do globalization and technology play in the cultural evolution of music?
- How can we investigate the functions of music while avoiding concepts of progress?
- How and why are new innovations generated in music?

Take-home messages

- Music from around the world often exhibits common features, such as scales with five or seven equal steps and isochronous rhythms.

- Cross-cultural similarities in traditional music, as well as contemporary trends in popular music, appear to be driven by cognitive biases for various features.
- Acoustic features are strongly associated with the context in which music is produced, and people globally can reliably pair songs to their context based on these features.
- Community structure (e.g. who performs with or learns from who) plays a major role in shaping musical diversity, whereas genetic population structure does not seem strongly correlated with musical variation.
- Cultural evolution has contributed new quantitative methods for description—such as phylogenetic reconstruction, network analysis, and statistical modeling—that have led to significant findings about the history of music.

References

Anglada-Tort, M., Harrison, P. M. C., Lee, H., & Jacoby, N. (2023). Large-scale iterated singing experiments reveal oral transmission mechanisms underlying music evolution. *Current Biology*, *33*(8), 1472-1486.e12. https://doi.org/10.1016/j.cub.2023.02.070

Brown, S., & Jordania, J. (2013). Universals in the world's musics. *Psychology of Music*, *41*(2), 229–248. https://doi.org/10.1177/0305735611425896

Clayton, J. (2016). *Uproot: Travels in 21st-Century Music and Digital Culture*. Farrar, Straus and Giroux.

Fétis. (1844). *Traité complet de la théorie et de la pratique de l'harmonie* (2nd ed.). Eugène Duverger.

Gould, S. J. (1988). On replacing the idea of progress with an operational notion of directionality. In *Evolutionary Progress*. The University of Chicago Press.

Kroier, J. (2012). Music, global history, and postcoloniality. *International Review of the Aesthetics and Sociology of Music*, *43*(1), 139–186.

Lomax, A. (1977). Appeal for cultural equity. *Journal of Communication*, *27*(2), 125–138. https://doi.org/10.1111/j.1460-2466.1977.tb01838.x

Mauch, M., Maccallum, R. M., Levy, M., & Leroi, A. M. (2015). The evolution of popular music: USA 1960–2010. *Royal Society Open Science*, *2*. https://doi.org/10.1098/rsos.150081

Mesoudi, A., & Thornton, A. (2018). What is cumulative cultural evolution? *Proceedings of the Royal Society B: Biological Sciences*, *285*, 20180712. https://doi.org/10.1098/rspb.2018.0712

Meyer, L. B. (1983). Innovation, choice, and the history of music. *Critical Inquiry*, *9*(3), 517–544. https://doi.org/10.1086/448215

Moss, F. C., Lieck, R., & Rohrmeier, M. (2024). Computational modeling of interval distributions in tonal space reveals paradigmatic stylistic changes in Western music history. *Humanities and Social Sciences Communications*, *11*(1), 684. https://doi.org/10.1057/s41599-024-03168-1

Mugglestone, E., & Adler, G. (1981). Guido Adler's "The Scope, Method, and Aim of Musicology" (1885): An English Translation with an Historico-Analytical Commentary. *Yearbook for Traditional Music*, *13*, 1–21. https://doi.org/10.2307/768355

Passmore, S., Wood, A. L. C., Barbieri, C., Shilton, D., Daikoku, H., Atkinson, Q. D., & Savage, P. E. (2024). Global musical diversity is largely independent of linguistic and genetic histories. *Nature Communications*, *15*(3964). https://doi.org/10.1038/s41467-024-48113-7

Savage, P. E. (2019). Cultural evolution of music. *Palgrave Communications*, *5*(16). https://doi.org/10.1057/s41599-019-0221-1f5z3

Wallin, N. L., Merker, B., & Brown, S. (Eds.). (2001). *The Origins of Music*. MIT Press.

Wiggins, G. A. (2020). Creativity, information, and consciousness: The information dynamics of thinking. *Physics of Life Reviews*, *34–35*, 1–39. https://doi.org/10.1016/j.plrev.2018.05.001

Youngblood, M. (2019). Conformity bias in the cultural transmission of music sampling traditions. *Royal Society Open Science*, *6*, 191149. https://doi.org/10.1098/rsos.191149

Youngblood, M., Ozaki, Y., & Savage, P. E. (2023). Cultural evolution and music. In *The Oxford Handbook of Cultural Evolution*. Oxford Academic. https://doi.org/10.1093/oxfordhb/9780198869252.013.42

Yurdum, L., Singh, M., Glowacki, L., Vardy, T., Atkinson, Q. D., Hilton, C. B., Sauter, D., Krasnow, M. M., & Mehr, S. A. (2023). Universal interpretations of vocal music. *Proceedings of the National Academy of Sciences*, *120*(37), e2218593120. https://doi.org/10.1073/pnas.2218593120