Again & Again
Musical Repetition in Aesthetics, Analysis, and Experience

25–26 April 2019
City, University of London
Department of Music
Repetition is one of music’s most fundamental and definitive features.

From the recapitulation in sonata form, to self-similar cells in the late music of Morton Feldman, to the layering of repetitive loops in Electronic Dance Music, to cyclical quasi-repetition in African drumming: the notion of repetition penetrates all areas of music-making. In fields such as music production, industry, education, and performance, the notions of repetition and repeatability have similarly proven to be vital.

‘Again & Again’ aims to stimulate a broad, interdisciplinary conversation about musical repetition in its broadest and its most particular terms. The event invites perspectives from across all domains of music studies, including music history, music theory and analysis, ethnomusicology, composition, performance, popular music studies, and sound studies.
Again & Again
Keynote speakers

Prof Dr Elizabeth Hellmuth Margulis
University of Arkansas

Repetition, Music, and Mind

Elizabeth Hellmuth Margulis, author of On Repeat: How Music Plays the Mind and The Psychology of Music: A Very Short Introduction, directs the Music Cognition Lab at the University of Arkansas. In the summer of 2019, the lab is moving to Princeton University. Her research uses theoretical, behavioural, and neuroimaging methodologies to investigate the dynamic, moment-to-moment experience of listeners without special musical training. She was also trained as a pianist.

Thursday, 25 April
2:45 PM – AG09

Prof Dr Tilman Baumgärtel
Hochschule Mainz

Now and Forever: Loops as a Cultural Form

Dr Tilman Baumgärtel is a writer. He lives in Berlin and teaches media studies at Hochschule Mainz. Previously he was a professor at the University of the Philippines in Manila (2005 – 2009) and at the Department of Media and Communication at the Royal University of Phnom Penh (2009 – 2012). He has written or edited eleven books on various aspect of media culture, including internet art, computer games, the aesthetics of loops and the director Harun Farocki.

Friday, 26 April
11:30 AM – AG09
Again & Again
Concerts

Recital
Mark Knoop

Again & Again

Pianist Mark Knoop plays a lunchtime recital exploring various notions of repetition, rhythmic process and economy of musical material, tracing a path through Scarlatti to the wry understatement of contemporary composers Tim Parkinson and Laurence Crane, and Debussy to the dizzying rhythmic machines of Conlon Nancarrow.

London based pianist and conductor Mark Knoop is known for his fearless performances and individual interpretations. He has commissioned and premièred countless new works and worked with many respected composers including Peter Ablinger, Joanna Bailie, Michael Finnissy, Bernhard Lang, Cassandra Miller, Matthew Shlomowitz, and Steven Kazuo Takasugi. His versatile technique and virtuosity also bring fresh approaches to the standard and 20th-century repertoire.

Thursday, 25 April
1 PM – Performance Space

Tim Parkinson — 2016 No.1
Domenico Scarlatti — Sonata K519
Bryn Harrison — Quietly Rising
Graciela Paraskevaïdis — Sotto Voce
Claude Debussy — (… Des pas sur la neige)
Graciela Paraskevaïdis — Viva Voce
Ana Sokolović — Prélude et fugue pour GG
Laurence Crane — Andrew Renton becomes an International Art Critic
Conlon Nancarrow — Canon B from Three Canons for Ursula
Tim Parkinson — 2016 No.6
Domenico Scarlatti — Sonata K159

This concert is a part of the City, University of London Concert Series
Concert
City Pierrot Ensemble

Simeon ten Holt: Canto Ostinato

The City Pierrot Ensemble performs Canto Ostinato (1976) by Simeon ten Holt (1923-2012), an austere, melancholy and beautiful work which marked a major shift in the composer's style, following two decades of composition of serial and electronic music and works of music-theatre. Constructed from a series of tonal cells for free repetition by a group of unspecified instruments, with consistent figurations, this is a work of both alluring and uncompromising minimal music, which has roots in classic works such as Terry Riley's In C.

Concert
Explore Ensemble

Morton Feldman: Piano, Violin, Viola, Cello

Explore Ensemble performs Morton Feldman's last completed work, Piano, Violin, Viola, Cello (1987), a beguiling tapestry of ambiguous harmonies, hushed timbres, repetitions and variations over a 70-minute span, in which time seems suspended.

Explore Ensemble voyages into the radical frontiers of new music, offering audiences outstanding performances of internationally acclaimed composers, advocating music rarely heard in the UK, and fostering composers with new works to create a repertoire for the future.
Repetition and Computational Music Analysis

Repetition is an inherent property of music; it creates internal cohesion within a piece (or set of pieces) and attributes part of its intra-musical meaning. There have been several studies on how it manifests itself on the musical surface and almost all analytical techniques bring out different repetition, variation and transformation relations within a piece or set of pieces. Analytical choices are mostly based on what is considered to be similar and what different within each specific musical context.

In computational music analysis, the treatment of repetition becomes even more prominent. The first step in any computational analysis is making explicit choices on the type of knowledge representation to be used. The more abstract the representation, the more distant similarity relations it is able to capture. What on the abstract representational level is exact repetition, in the musical surface can appear as a degree of similarity. Also, different knowledge representations capture different aspects of similarity.

Following the choice of music representation, the two main techniques to bring out all kinds of similarity relations in a piece of music are paradigmatic analysis and pattern discovery. In this talk the two methods are explained and juxtaposed. We argue that both are useful in the analysis of the musical work, but it depends on the specific application and the type of results expected to decide which one is more appropriate. At the end, the concept of repetition / similarity and its computational treatment is linked back to the more general notion of musical semantics.

Christina Anagnostopoulou is a musicologist and associate professor of music informatics at the University of Athens. Her PhD was on the computational and cognitive modeling of similarity and categorisation in music (Edinburgh). Before joining University of Athens, she taught at the Universities of Edinburgh, Glasgow and Queen's Belfast. She is the director of the Music Cognition, Computation and Community Lab at the University of Athens, and a community musician who works with different sensitive populations in Athens together with her students.

Katerina Drakoulaki is a PhD student at the National and Kapodistrian University of Athens. She graduated with a BA in Linguistics from Athens and a diploma in music performance from the National Conservatory. She holds an MSc in Speech and Language Therapy and is interested in issues relating to the theoretical connections between language and music, cognitive modeling, as well as music skills of individuals with language impairments.
The repeated recording illusion refers to the phenomenon in which listeners are under the impression that they hear different musical performances while they are in fact identical (Anglada-Tort & Müllensiefen, 2017). The purpose of the present study was twofold: we first aimed to design an experimental paradigm to enable the systematic measurement of the repeated recording illusion. Secondly, we aimed to investigate individual differences (i.e., gender, age, musical expertise, personality, suggestibility, and music preferences) and extrinsic factors (i.e., prestige effect and repeated-exposure) that contribute to it. Seventy-two participants were misled to think that they had heard three different musical performances of an original piece when in fact they were exposed to the same repeated recording three times in succession. Each time, the recording was accompanied by a different text suggesting a low, medium or high prestige of the performer. The same procedure was repeated two times using a piece of rock and roll (highly familiar) and a piece of classical music (unfamiliar). Most participants (75%) believed that they had heard different musical performances while in fact they were exposed to the identical recordings. High levels of neuroticism and openness made it significantly more likely that an individual would fall for the illusion. However, musicians were not any more or any less susceptible to the illusion than non-musicians. For those participants who fell for the illusion, the explicit prestige texts influenced evaluations of the music significantly. In addition, the mere repetition of the stimulus showed a partial effect. These results suggest that repeated exposure modifies the listening experience, giving rise to the feeling that the performances are different. The findings are further discussed in terms of the heuristic-and-biases program (Tversky & Kahneman, 1974) and a novel research framework to study music judgements and choice behaviour, namely, the behavioural economics of music.

Manuel Anglada-Tort is a PhD candidate in the department of Audio Communication at the Technical University of Berlin, Germany. After studying psychology and specialising in psycholinguistics, he completed the MSc in Music, Mind and Brain with distinction at Goldsmiths, University of London. His PhD applies behavioural economics and decision-making to study aesthetics and music choice behaviour. His research interests include the study of cognitive biases and heuristics in music and aesthetic evaluation, social and applied music psychology, and the use of music in advertising and marketing. In 2017, he was awarded a PhD studentship from the “Studienstiftung des Deutschen Volkes” (Bonn, Germany).
The Frequency Facilitation Hypothesis

Music is made up of many small repeated patterns (Margulis, 2014). Research in music perception demonstrates that these patterns are learned implicitly (Rohrmeier & Rebuschat, 2012), and importantly, they are related to listener’s sense of musical anticipation (Huron, 2006). While research on patterns and music has established how these patterns are related to expectancy and melodic segmentation (Pearce, 2018), how music’s repetitive nature affects a listener’s load on memory has not been explored to the same extent.

This paper presents a novel theory of music perception that links music’s repetitive structure to the limits of working memory. I first draw from research in cognitive psychology that hypothesizes that more predictable events are less taxing on memory. Given research in music perception based on the statistical learning hypothesis and the probabilistic prediction hypothesis (Pearce, 2018), I posit that more predictable musical events would be less taxing on memory as a result of more efficient processing.

To demonstrate this, I provide both evidence from a newly encoded corpus of over 750 melodies and a small, pilot experiment (N = 15). I argue that a motive’s frequency distribution in a corpus is related to its load on memory when quantified using the information content measures derived from Pearce’s computational model of auditory cognition. The paper concludes by asserting that studying the repeated patterns in music can help inform both work in memory for melodies, as well as music pedagogy. I end by further speculating that similar research might provide a useful theoretical link to investigate interactions between musical memory and the finite window of working memory, and thus help answer questions of musical perception.

David John Baker is a music researcher and educator passionate about research questions at the intersection of music theory and music science. His research looks to understand how the people learn melodies in order to improve pedagogical practices in aural skills education. He is currently finishing his PhD in Music Theory at Louisiana State University. Using his background in the humanities and training in psychological sciences, David builds testable models of how people hear music. By combining knowledge from both the humanities and sciences, he believes that knowledge gained at this intersection will one day lead to world peace.
The strong identification of repetition as a core characteristic of minimal music has led many commentators to speculate on the identification of musical minimalism as essentially static, ateleological (Mertens, 1981) and ultimately as the musical emanation of a ‘culture of repetition’ (Fink, 2005). Such positions inevitably have to deal with the challenge of reconciling the stasis attributed to such abundant repetition with the presence of gradual and systematic (often process-driven) change over time – an obviously teleological aspect within an apparently ateleological framework. While such discussion is extremely relevant in understanding minimalism’s particular dealing with static and dynamic aspects – think of Fink’s concept of ‘recombinant teleology’ – repetition itself within minimal music is often simply taken for granted.

In order to further question the (a)teleological nature of minimalist repetition, this paper will present a critical examination of repetition within minimalist and postminimalist repertoire. Based on the analytical discussion of different types of repetition as compositional elements, I will propose a typology of repetitive elements in minimal music. Not only does this raise questions about the validity central place repetition would claim in minimalist music, it also demonstrates that repetition in minimal music is all but a homogeneous concept. Taking examples not only from the ‘core’ American minimalist repertoire, but also from European exponents, including the revisiting of ostinato bass lines and cumulative stacking of repeated layers as found in works by Michael Nyman, or the ‘evolving-repetitive’ technique of Karel Goeyvaerts, this paper will present the full array of repetitive elements as a more nuanced basis from which to address the hermeneutical implications of those types of repetition.

Dr Maarten Beirens is a Lecturer in historical musicology at the University of Amsterdam (UvA). He held a postdoctoral fellowship of the Research Foundation-Flanders (FWO) at the University of Leuven, carrying out research dealing with the use of digital sampling in the recent music by Steve Reich. He studied at the KU Leuven, receiving there a Ph.D. in 2005, with a dissertation on European minimal music. Among his recent publications are chapters on Michael Finnissy (eds. I. Pace and N. McBride) and Rethinking Reich (eds. P. ap Siôn and S. Gopinath; OUP, 2019). He is a founding member of the Society for Minimalist Music and was the convenor of the Third International Conference on Music and Minimalism (Leuven, 12-15 October 2011) and co-organiser of the Luigi Nono Symposium (Amsterdam, June 2013).
Musical repetition has been implicated in both grouping (the perception of discrete musical segments) and meter (the perception of a continuous cycle of beats) (Lerdahl and Jackendoff 1983, London 2012, Hanninen 2012). Somewhat paradoxically, the former implies the intuition of boundaries—local beginnings and endings—while the latter suggests a continuous flow that supercedes any such boundaries. Although extensive repetition in groove-based music is typically associated with an enhanced sensation of flow (Hughes 2003, Butler 2006, Margulis 2012), most popular music grooves involve exact repetition of a relatively short ostinato, thus supporting perception of a recurring “groove segment” with clear beginning and ending. In contrast, some recent composers and performers make use of cycles and ostinati that resemble these grooves in important ways—for instance, in their inclusion of certain rhythmic patterns (Toussaint 2013, Abel 2014, Cohn 2016)—while avoiding the articulation of clear boundaries. Drawing on both metric and grouping analysis techniques, I demonstrate how a diverse array of post-tonal passages suppress the perception of segment boundaries through tactics such as metric ambiguity, phrase structural complexity, and variation. A common variation technique is the selective deletion of certain elements of the cycle in each repetition. I argue that, during these passages, listeners experience a sensation of “boundless groove” as they are pulled in by repetition that suggests cyclicity without marking internal beginnings and endings. My examples are drawn from both “classical” post-tonal repertoire, by composers including Harrison Birtwistle and Franco Donatoni, and recent music by “jazz” composer-performers such as Craig Taborn and Kris Davis. Close analysis of this repertoire not only reveals ways that composers combine elements of popular and modernist musical languages, but also suggests reframing our scholarly conceptions of musical repetition and groove to embrace a broader spectrum of contemporary practices.
Musical repetition particularly in minimal music has offered choreographers great opportunities. Belgian choreographer Anne Teresa de Keersmaeker has frequently used the music of Steve Reich. While she and Reich have never collaborated, except for one film project, de Keersmaeker has created a range of dance works to Reich's music. Those choreographic re-creations of compositional structures and processes found in music have challenged existing concepts of choreomusical relationships which were operating between parallelism and counterpoint with moments of visualisation. Her choreography is still following the overall musical structure but does not copy every detail through movement, rather the repetition in the music allows for a play with sameness and difference in the dance. The repetition in both media produces a sense of intensity, caused by the powerful concentration of the performers on each other and by endless repetition that forces our cognitive apparatus to switch between different features of performance. The constant exposure to the same that is not exactly the same undermines also existing ideas of representation and asked for interpretative models that engage with inner sensibilities. Using Gilles Deleuze Repetition and Difference (1968) as a theoretical starting point to challenge forms of perception as based on the semiotic deciphering and to touch instead at questions of (non-)identity and analogy. I will look in particular at two works of de Keersmaeker's 'middle period' Drumming (1998) to Reich's music with the same title (1970-71) and Rain (2001) to Reich's Music for 18 Musicians (1974-76). How has the choreographic re-imagining of compositional features of the music created another layer of repetition that challenging ideas of matching? And where is difference between the two media allowing for a greater distinction and discovery of the same?

Renate Bräuninger’s main research area is choreomusical relationships particularly with regards to the choreography of George Balanchine and Anne Teresa de Keersmaeker. In the context of her work, she is touching also at questions of the archive, notation and approaches to interpretation and meaning gaining processes. Her training is genuinely interdisciplinary, both as a musicologist and as a dance scholar. She has taught at numerous German and British Universities, lately at the University of Northampton and published in both her native language and English.
Representative examples from the approximately 140 piano miniatures of English experimental composer Howard Skempton are viewed in this paper through the twin lenses of music psychology and music theory and analysis. I argue that Skempton’s music creates a sense of expectation—and thus desire—through the creation of pattern repetition that is disrupted, only to be later re-engaged with, creating gratification. Psychological models provide a mechanism for demonstrating this. Meyer proposed long ago (1956, 1973) that prior stylistic exposure creates expectations that can be confounded or confirmed. The psychological trajectory has been developed in more recent studies, including those of Huron (2006), Kramer (2016), Zbikowski (2017), and Hatten (2018), as well as Margulis’s (2014) work on memory and repetition, and Schmalfeldt’s on the “process of becoming” (2011).

My performed examples support Margulis’s claim that “repetition makes it possible for us to experience a sense of expanded present” and Schmalfeldt’s that “repeated hearings can only enrich the memory of expectations”. Running concurrently and relatedly to these studies is the semiotic approach, claiming that music signifies not intrinsically, but rather through how we believe we recognise its coded meanings though metaphor and analogy (Agawu, 2008; Mirka, 2014).

Pairing two different traditions of meaning making may create access to precisely those moments of desire and gratification in Skempton’s music that seem at once to defy rational explanation and yet to demand our most critical attention. The kind of predictabilities possible in fully diatonic classical music (as discussed by Meyer, indeed Schenker) play out differently in Skempton’s less “telic” output. He is perhaps less interested, by accident or by design, in our predictions of what could come next, according to the rules, and more interested, since the rules are less obvious, in encouraging reflection on each moment we are in as listener and/or performer, before moving on.

Esther Cavett is a Senior Research Fellow in Music at King’s College London. She works at the intersection between academic music, performance and music education. She has recently co-edited and made a substantial individual contribution to a book on Howard Skempton (Boydell & Brewer, to be published in February 2019), she is interested in the materiality of pianos and their meaning in amateur performance, and she delivers widening participation music projects at KCL and with Water City Music (www.watercitymusic.com). She is also trained in psychological coaching, working largely now with musicians and in educational contexts.
Beyond the Insistence of Signs: The Otherness of Musical Repetition

Repetition, in music, is most often correlated with the insistence of signs, that is to say the iterative dimension of his writing, which unfolds at different scales, from the note to the macro-form. Despite this regulating and memorizing function of identity, which tends to structure a logical time, repetition has itself a power to deconstruct the temporal framework which, in periods of mutation in particular, benefits the spatial dimension of music: when time freezes, space opens up.

There is also another repetition, just as insistent although less directly audible as such, and which is inscribed as the hidden face of a repetition located in the symbolic register: the return of a gap, the encounter, always missed, with the rationality of language. This is a repetition no less insistent than that of signs, but which is played out in otherness itself, on the level of the unsymbolizable.

We will propose a quick exploration of this “Other of the musical language”, through a few examples, in order to show how repetition in music is both the operator of a time space rich in perspectives and the index of the psychic structure of the subject.

Joseph Delaplace is Professor in musicology at Rennes 2 University, dean of the faculty of “Arts, Letters and Communication”. He teaches analysis and aesthetics of 20th century music. He has published a book on the processes of repetition in the music of György Ligeti (György Ligeti, un essai d'analyse et d'esthétique musicales, Rennes, PUR, 2007), directed a collective book entitled L’art de répéter: psychoanalysis and creation (Rennes, PUR, 2014), and written several articles on repetition in 20th century music.
The reproduction of sound through the use of recording technologies would appear to be a clear example of repetition in music. The recording and reproduction of sonic events, however, inevitably involves the reframing of those events, often in ways which were not imagined by the original producers of the sounds. Reproducing sounds in new contexts changes the reception of those sounds, often subtly but also often in ways which may significantly alter any meaning the sounds may have had, possibly without the consent of the original authors. This paper examines these issues and explores parallels with repetition and reproduction in architecture and the visual arts, specifically with regard to attribution, ownership and meaning. The importance of environment, place and context in architecture has resonance when considering the recontextualization of recorded sound. Recorded sounds, when reproduced, can become divorced from their original contexts and take on new meanings suggested by their new environments. Their original contexts, however, cannot be erased fully. Ways in which musicians have repeated the work of other musicians, as well as ideas from the wider culture also have parallels with the visual arts. This paper considers repetition in music through recorded sound in a broad context to explore any similarities with borrowing and copying in other forms of music, and with other arts. Different categories of appropriation are examined and illustrated with examples from music, architecture and photography. The paper concludes by considering ethical implications in the deliberate or accidental appropriation of authorship in the arts.

Marc Estibeiro is an associate professor of music at Staffordshire University. He has degrees in Music, Music Technology and Applied Linguistics from Middlesex University, Essex University and Bangor University. In 2016, he received his PhD in Composition from Durham University. His work has been presented at conferences, workshops, concerts and seminars in France (IRCAM, Paris), Italy (Conservatorio di Musica, Cagliari), Mexico (Visiones Sonoras, Morelia), China (ICMC, Shanghai 2017), Germany (MuSa 2017 and 2018, Karlsruhe), Canada (Brandon University March 2018), South Korea (ICMC 2018), and the United Kingdom (University of Wales, Staffordshire University, Durham University, Keele University and others).
Involuntary musical imagery (INMI), at its core experience, it most often a repetitive, fragment of music (Williamson et al., 2012). However, music itself involves repetition, not only within its musical structure (Bigand, Tillmann, Poulin-Charronnat, & Manderlier, 2005), but also on the ways that individuals listen to music, and how they repeat it throughout their lifetimes (Margulis, 2014). The main premise of this paper is that this repetition, (of and within music) is creating a conditioning relationship with the everyday life of individuals and involuntary musical imagery (INMI), or else the music that plays in one’s head without their own volition, is the product of this conditioning relationship.

This hypothesis has been investigated in three studies, two laboratory-based behavioural experiments and an Experience Sampling (ES) study. The first experiment explored whether the conditioning process could be recreated in a laboratory context, by repeatedly pairing music with an activity. The second experiment explored the already established conditioning by investigating whether INMI would occur in the place of music: individuals who use music to regulate their stress, would experience INMI after participating into a stress induction experiment, as a coping mechanism, in the place of music. The third study examined the music behaviours in the everyday life of individuals and how these behaviours correlate with INMI in a real-life setting.

The findings of these three studies were encouraging to the hypothesis, suggesting that there is a relationship between uses of music and INMI, showing an overall comparability on the aspects of activities, mood regulation, genre, and valence, thus showing some evidence that INMI can indeed be a conditioned response. While there were no strong findings that INMI can act in the place of music, the findings indicated that INMI had similar functions.

Dr Ioanna Filippidi is currently holding a 6-month Creative Economy Engagement Fellowship, funded by the Arts and Humanities Research Council (AHRC), working at the Royal Northern College of Music, in Manchester, with Dr Michelle Phillips (project title ‘Hacking the Live Music Earworm’). She completed her MA and PhD studies at the University of Sheffield, under the supervision of Dr Renee Timmers (PhD thesis title: ‘Involuntary Musical Imagery as conditioned by everyday life music listening’). Her academic interests lay in the domains of music psychology, involuntary thoughts, memory, learning, music cognition, and neurosciences and music.
Repetition is an important (if not the single most important) aesthetic feature of popular dance music genres – from funk through disco to current genres of electronic dance music (EDM). Though acknowledging its importance, many authors have placed a greater emphasis on its ‘significant other’ – variation. While funk-musicians continuously ‘shape’ their grooves (Danielsen), electronic music production allows for exact repetition. Such an emphasis makes repetition in EDM “not only […] a fundamental structural principle but also […] a deliberate aesthetic strategy” (Butler 2014: 187).

This raises multiple questions: What makes repetition such an important feature of EDM? What psychological and aesthetic mechanisms are at work, that translate musical repetition in bodily and emotional, corporeal and affective pleasure? In first part of my presentation, I will suggest some answers to these questions, approaching them from a musicological as well as phenomenological and psychological perspective.

During the second part of my talk I will focus on the DJ and his/hers approaches to repetition. The DJ remains the dominant type of performing artist in EDM, although for a number of years the importance of laptop performers has increasingly blurred the lines between the two. One important difference worth noting is that, while laptop performers mostly construct their music, relying on repeating grooves and patterns, DJs have to de- and re-construct their musical material. These processes alter the timeflow and formal structure of the musical material used. Taking this context into account, I will suggest a threefold theoretical concept of analysing a DJ- set and its poiesis by the DJ considering repetition in relation to its production, modification or omission.

**Lorenz Gilli** (*1977) is research assistant and PhD candidate in media studies at University of Siegen (Germany). His PhD-project focuses on the aesthetic and performativity of DJ-sets in electronic dance music. He studied business and social sciences in Vienna and Berlin and has been working as repertoire-manager for a music service provider specialized in Horeca and retail trade.
Richard Glover (University of Wolverhampton)
Repetition and Interaction in Gradual Process Music

The presentation will trace the changing role of repetition within the author's own music, from iterative change through to interactive performance mechanisms. The paper first explores how repetition and near-repetition in gradual process music can expose various details within the surface of the sound and aural phenomena, evolving a listener’s auditory faculties and enable a more decentralised perceptual field. Listeners are invited to examine the same sonic gesture from numerous different listening perspectives (akin to Merleau-Ponty's “totality open to a horizon of an indefinite number of perspectival views”). The paper will explore how gradual process music set within a teleological framework appears only to repeat, but over time clearly demonstrates change - and how repetition provides aural confirmation of that change. The paper will then trace how the author's composition focus has turned towards interaction between performers within these reductionist process environments. Players make continuous decisions, and repetition is now employed as a performance decision-making mechanism. Repetition confirms choice, and demonstrates consensus amongst performers. It is not just as a tool to invite the listeners further inside the sound, but as an apparatus for performers to communicate, choose their own path and consider the consequences of their actions. The paper will consider recent pieces such as Build-a-Chord Workshop and Blends, which demonstrate these repetition-mechanics within performance interaction scenarios. Ideas will be demonstrated through video documentation and a short live performance. This performance will draw attention to the manner in which the lack of visual notation prompts players to use repetition as an interactive device, rather than an aural phenomenon. This work will be situated within other contemporary performance practices based upon group decision-making within reductionist environments by James Saunders and Stephen Chase, and further uses of repetition within performance interaction are also explored for future avenues of research.

Richard Glover’s compositions explore gradual process, perception in reductionist sound environments and experimental approaches to notation. His portrait cd Logical Harmonies was released in 2013, and his music has been performed by ensembles such as the Bozzini Quartet, musikFabrik, and the Birmingham Contemporary Music Group. He co-authored the book Overcoming Form with Bryn Harrison, with whom he collaborated for the recent publication Being Time: Case Studies in Musical Temporalities. He has also published chapters and articles on minimalism, technology, and the perception of sustained tone musics. He is currently Reader in Music at the University of Wolverhampton.
The repetition principle is omnipresent in western music, whether it intervenes as a rhetorical effect in order to create a thematic hierarchy or it proceeds as a structural means, for example to assure stability to the form. During the twentieth century, repetition also allows to think a new kind of musical writing, according to the growing attention for space. In this perspective, the iterative processes fulfil a particular function in the emergence of a new form of musical discourse based on multiplicity and equivocity to which both Luigi Nono and Pierre Boulez dedicate themselves from the end of the 1950s. The idea of musical discourse inherited from the tonality, whose fixity and linear nature is then considered obsolete, needs to be updated in a way that reflects the complexity of the sound phenomenon and the diversity of composer’s thoughts. The act of composition is then determined by the presentation of a material built through a network of heterogeneous “potentialities”. The logical organisation of the work is then confronted with a paradox: how to present the multiplicity and simultaneity of this heterogeneous material in a succession of events, as requires the temporal nature of music?

Therefore, this communication aims to question the issues of repetition in the development of a “mixed” musical logic in the electroacoustic works of Pierre Boulez and Luigi Nono. Indeed, if the compositional perspectives of the two composers appear to diverge at first glance, their aesthetic implications converge towards a discursive approach which unifies heterogeneity without abolishing it nor constraining its perception. We would like to demonstrate that this logical configuration then tends to unfold a reflexive discourse based on the concepts of aura and resonance, in which the iterative processes mixed with the possibilities of electroacoustic technologies seems to have a structural role.

Dr Kevin Gohon graduated his PhD at the Université de Rennes 2 in 2018. His dissertation ‘Criticism of the musical discourse and emergence of an “mixed” thought in Pierre Boulez’ and Luigi Nono’s electroacoustic works aims to identify the aesthetical and technical implications of a non-univocal musical logic in relation to the integration of electronic technologies and the renewing of the spatiality of music. His recent works focus on the analysis of the different forms of heterogeneous logic in contemporary music and literature, on the aesthetic implications of an ornamental thought in modern music and on computational analysis of electroacoustic spatialisation.
Notions of repetition in the late work of Morton Feldman

Notions of repetition are central to the last decade of works by composer Morton Feldman. Feldman himself has testified to the role of repetition in his music, and music analysis has recognised that exploring repetition is pivotal to gaining an understanding of his work. Musicologists and music analysts such as Hanninen, Laws, Kane, and Hirata have discussed the relevance of this repetition for the performer and the listener. We propose that the next logical step in this field of enquiry is a large-scale empirical study that draws upon theories and psychological models of memory and perception, to further this understanding. This paper outlines a framework for research for a collaborative project between a composer and a music psychologist. Questions explored include: 1) What does existing analysis identify as constituting repetition in the late output of Morton Feldman? 2) Do such notions of repetition align with existing research in music psychology (e.g. Deliege’s ‘cue abstraction model’) and theories of memory? 3) What alternative models might be relevant, or might be developed, to further our understanding of how repetition and memory operate in this music? The overall project addresses these and related research questions using methodologies including analysis of Feldman’s late works, interviews with performers, experimental work, creation of new works, and interactive online material. Drawing on a range of musical examples that includes Piano, Violin, Viola, Cello, and For Samuel Beckett, Harrison and Phillips present the framework for this research, outlining some of the potential methodologies to be employed.

Bryn Harrison is a composer and Reader in Composition at the University of Huddersfield from where he obtained a doctorate in composition in 2007. He has developed a close working relationship with ensembles such as Plus Minus, Asamisimasa, Elision, Exaudi, Apartment House and the Bozzini Quartet as well as with soloists such as Philip Thomas, Mark Knoop and Aisha Orazbayeva. His pieces have been performed by many other ensembles such as Ensemble Recherche, Klangforum Wien, London Sinfonietta and the London Symphony Orchestra. He has given papers on issues of temporality in his own practice and co-authored with Richard Glover, the book Overcoming Form: Reflections on Immersive Listening (University of Huddersfield Press, 2013). A new publication, joint authored with Jennie Gottschalk and Richard Glover entitled Being Time: Case Studies in Musical Temporality was published by Bloomsbury in 2018. Bryn Harrison is a recipient of the Paul Hamlyn Foundation Award for Composers.

Michelle Phillips’ research explores music and the perception of time, music and maths, and audience response to live and recorded music. Ongoing research projects include a collaboration with the Manchester Institute of Biotechnology which attempts to effectively illustrate processes of genetic mutation through new music, and work with AHRC Creative Economies Engagement Fellow Dr Ioanna Filippidi on involuntary musical imagery in live music. An edited collection entitled Music and Time: Philosophy, Psychology and Practice, co-edited by Michelle and Dr Matthew Sergeant, is due out in 2022 with Boydell & Brewer. Michelle is a founding member and Music Perception Lead of the PRiSM research hub at the RNCM and a member of the TimeLab Manchester. Recent publications accepted and under review explore music and the golden section, music and mindfulness, and music and memory. Michelle is a senior lecturer and Assistant Head of Undergraduate Programmes at the RNCM.
My presentation will propose a listening strategy for gradual process in music. By gradual process in music I mean a piece of music or a technique within a piece in which the form and content come from applying a pre-determined linear process of gradual development to an initial material. This is most easily identified in the early works of Steve Reich like Pendulum Music, in which the whole piece consists of a singular process. Like many ideas of the minimalist composers, though, gradual process has since been used alongside other techniques, such as in the works of Tom Johnson, William Basinski and Carl Stone.

I will argue that one way to adequately understand gradual process, in terms of Ola Stockfelt’s theory of adequate listening strategies, involves perceiving the music in the moment as static repetition (even though it is in fact progressing), comparing this form of perception to Jerold Levinson’s theory of concatenationism to elucidate. This then leads to either detailed listening to the sound as if it were static, or letting it become background music.

After a period of time, the listener suddenly becomes aware, unconsciously or through conscious choice, that the piece has in fact progressed. This second aspect involves the use of memory similar but not identical to Peter Kivy’s theory of architectonics. From this, the listener experiences a sudden realisation of their own subjective perception, due to the radical shift in their perception of the music from static repetition to linear progression, which Richard Middleton’s definitions of repetition in music help to explain.

I will end with an argument for the validity of my proposed listening strategy based on the grounds of its aesthetic and historical relevance to the ideas of the minimalist music and art scenes/aesthetics from the 1960s to the present day.

Ollie Hawker is a composer/musician based in Glasgow. He received his MA in Music from the University of Glasgow, where his focus was on twentieth and twenty-first century composition and musicology, specifically in the combination of ‘doggedly determined’ process and live improvisation. He has exhibited his composition-performances at various festivals in Scotland including Sound Thought, Radiophrenia, Hidden Door and Glasgow Open House Arts Festival. Alongside his compositional work, he currently plays and writes for the bands Decent Sweets and Neuro Trash, and works with the music charity Paragon.
Much recent scholarship on musical repetition has focused on minimalism, electronic dance music, pop and historical classics. The fact that there has been less engagement with New Music in this field might be explained by the studious avoidance of repetition found in most 20th century approaches to classical composition (for example: serialism, sound mass, New Complexity, collage). In recent decades, however, New Music has been engaging anew with repetition through the music of composers such as Bernhard Lang and Cassandra Miller which intersects with the broadening out of the minimalist project seen in post-minimalist composers such as Lois V Vierk. Repetition in the New Music of the post-minimalist era is often used in subtle and oblique ways which present analytical challenges, but also the opportunity to open up new perspectives on our understanding of the use and perception of repetition in music.

This paper presents an analysis of repetition in Red Shift by Vierk. I will demonstrate that the piece presents processes and repetition at a variety of levels, and I will discuss the listening experience engendered by these elements of the composition.

This analysis will draw on the study of repetition across psychology, musicology, popular music studies and philosophy referencing the work of Elizabeth Margulis, Richard Middleton, Rebecca Leydon, Peter Kivy, and others. Using frameworks and approaches from this scholarship, my aim is to find a vocabulary to discuss the role of repetition in the piece, and the effects of its repetition strategies on the listener.

Jamie Howell is a UK guitarist, teacher and composer currently studying for a PhD in Composition at the University of Southampton under Matthew Shlomowitz and Ben Oliver. His interests cover jazz, funk, New Music, improvisation, looping, network open score compositions, and recycling musical materials.
In my current research, I concentrate on the history of melodic writing in contemporary art music. Within this field, I focus on the specific “culture” Richard Taruskin labels as “modernist”, “late romantic”, or “sublime”, as opposed to the “culture of beauty” (Taruskin, 2000, chapter 11). Whereas melodies are deconstructed within the former, traditional melodic objects remain an essential feature and represent a permanent value within the latter.

My starting point is Ernst Toch’s description of the classical and romantic melody, which he compares to the ideal type of classical tragedy (Toch, 1923, p. 27-35). Toch likens the highest pitch (tonischer Höhepunkt) of the melody to the turning point (peripeteia) in the tragedy. The narrative and rhetorical character of such melodies is largely deconstructed during the 20th Century by means of, on the one hand, continuity (glissandos for instance) and, on the other hand, by grinding or crushing the melodic sentence into brief entities, allowing various kinds of repetition.

I isolate some types of melodic repetitions, such as the “beelike” melody (buzzing around a central pitch), the biomorphic melody typical for musique spectrale, and the melody as loop. I draw on examples by such composers as Jonathan Harvey, Salvatore Sciarrino, Bernhard Lang, Gérard Pesson, Johannes Schöllhorn, Arnulf Hermann, Ramon Lazkano, Enno Poppe, and Simon Steen-Andersen.

The trajectory of modernist melodic writing leads from hypotaxis to parataxis, from melodies designed as sentences to melodies dominated by metre and/or rhythm. This evolution, I argue, may be explained by the overall presence of popular music (Fink, 2005) and the increasing technomorphosis of classical music itself.

Not all the arts of time are equal about repetition. Traditionally, a tragedy, a novel or a film never repeat any sequence, whereas music deals definitely with bare repeats and repetitions, delayed or not: periods, themes, whole sections, even movements in baroque suites; symmetrical organisation of mirror forms, retrograde canons, etc.

If its role differs accordingly to genres and periods, the play of repetition in the formal conception of the musical work of art makes questionable the absoluteness of its unfolding procedure. Unlike the unalterable destiny endured by the tragic hero, time in music seems to be of non-linear essence: no event in a musical experience is able to cause specific consequences, no succession is objectively irreversible. While the twentieth century showed that every single tone or tone structure can be followed by every other one, the numerous levels of repetition in music throughout its history show a certain relevance of this assertion regardless of harmonic contexts.

This communication aims to shed some light on the logical possibility of repetition in the relationship of tones by means of an analogy with the discursive forms of knowledge in Kant’s first Critique. Here, the concept of “simultaneity” expresses a specific causal relationship between the substances of a unified experience, when “the perception of one can follow the perception of the other reciprocally”; applied to music, this lets us to think the coexistence in time of tones and tone structures as a community of interactions. Yet musical signification is precisely based upon its temporal organization, it may be recalled that a same room can be visited several times in an architectural construction. The paradox of repetition hence leads us to consider a hermeneutic dichotomy at the core of the compositional gesture: the logical construction of pure harmonic concepts as an organic space of potentialities; its temporal presentation, or visit, according to an aesthetical ordering.

That the music of Classical Hollywood (c. 1930-1960) cultivated a late Austro-German Romantic style has been acknowledged for over thirty years. Hollywood's adoption of this musical register, despite its anachronistic qualities, became one of its defining aesthetic features, along with continuity editing, which produced the seamless literary quality of narrative realism. This paper investigates the formal qualities of an opposing historical paradigm of audiovisual and musico-dramatic expression, namely, that between post-war European art cinema (c. 1955-1970) and pre-existing eighteenth-century classical music. This politically leftist, yet culturally elitist, group of auteurs forged lasting bonds - heretofore little-, or under-celebrated - between leading filmmakers and canonic composers as a form of resistance to Hollywood. These included, for instance, filmmakers, such as Bresson, Bergman, and Tarkovsky, and the music of Bach, Beethoven, and Mozart.

Whilst repetition is a key, if not defining, structural feature of pre-Romantic classical music's topography, art cinema directors magnified this facet of eighteenth-century musical form on the soundtracks of their modern films. They repeatedly used ritornello-like quotations of sentential musical structures with visually discontinuous editing creating an almost abstract style of audiovisual minimalism. This paper identifies three defining examples: Bresson’s films of the 1950s, Pasolini’s post-neorealist works of the early 1960s, and, lastly, Godard’s essayistic feature films of the mid-1960s. I argue that a critical genealogy of influence may be traced between these auteurs, each of whom were aware of the other’s work. Godard, for instance, sought to build on precedents to create a more radically estranged aesthetic, which strayed from the dictates of cause-and-effect narrative linearity, ultimately foreshadowing his later postmodernist phase from the 1980s onwards.

Douglas Knight is currently in the latter stages of writing up a Ph.D. in musicology at Royal Holloway, University of London. He is supervised by Professor Julie Brown and supported by a Crossland Research Scholarship. His doctoral thesis concerns the use of eighteenth-century classical music in post-war modernist European art cinema and its contemporary legatees. He holds undergraduate and graduate degrees from the University of Oxford, has been published in Music, Sound, and the Moving Image, and is active as a Director of Music and organist at a North London church.
Repetition and variation are basic common structures in figurative arts, poetry and music during the so called Baroque Era. Repeated modules and obsessive or hypnotic figurae were introduced in Seventeenth century profane and sacred, vocal and instrumental music for architectural, rhetorical and ‘affective’ reasons. Lorenzo Bianconi focused on the “obsessive repetition” of Frescobaldi’s Cento partite sopra passacaglia, one of the frankest example of the enthralling and undomitable power of reiteration. Etienne Darbellay explained instead how the composer’s attempt to catch the listener into a hypnotic, exciting, in some way “crazy”, flow of “one-more-time” formulas invested the musical form and his content, potentially transforming them. Repetition and variation weren’t simple artifices useful to write music simply and efficaciously: they were the most effective and communicative specifically musical devices to surprise, charm and seduce the listener. Spread across Europe, the prodigious power of reiteration fascinated virtuoso violinists of the second half of the century. Among them, Carlo Ambrogio Lonati, known as ‘Il gobbo della regina Cristina’, stands out for his eccentric art. The composer shows the intensive use of this musical artifice both in overall forms and in narrow details. The paper analyses Lonati’s solo sonatas for violin and continuo in order to show his skillful technique of repetition and variation across a wide range of musical settings and situations. The treatment of melodic, rhythmic and harmonic replication, the visionaire utilization of perfidia and ostinato-structures (exceptional for their extension and articulation across different musical forms), the overflowing Canzona-pieces, Largo hypnotic movements and multi-refrain complex dances, the recourse to obsessive figurae: all of this contributes to build pieces of glance fashion that are grounded in a tireless search of the miraculous compromise between directionality and continuous return.

Musicologist and keyboardist specialised in early music performance, Federico Lanzellotti is carrying out a PhD project at University of Bologna on Carlo Ambrogio Lonati, tutored by Prof. Marco Beghelli, Prof. Nicola Badolato and Prof. José María Domínguez Rodríguez. He graduated in Piano with a thesis on Richard Strauss’ Das Schloss am Meere and in Basso continuo in organ and harpsichord repertoire of the 17th and 18th centuries with a thesis on Carlo Ambrogio Lonati. His musicology dissertation, consisting of the critical edition of a viennese serenata of Giovanni Bononcini, L’Euleo festeggiante nel ritorno d’Alessandro Magno dall’Indie, was welcomed in Giovanni Bononcini opera omnia edition led by Fondazione Arcadia of Milan and is now in print. Correspondent from Bologna for Amadeus and collaborator of Tagliavini Collection of Bologna, he contributes to specialistic periodicals and writes for Brilliant e CPO labels.
Canto Ostinato for keyboard instruments (1976-1979) is the most famous work of Dutch composer Simeon ten Holt (1923-2012). The work contains a number of internal tension points, most markedly through combining minimalist harmonic language and the principle of repetition with indeterminacy: performers decide on instrumentation, dynamics, articulation and the number of repeats of (most of) the work’s 106 sections. Canto is also the first of several works by ten Holt focussing on social interaction between the performers. More importantly, ten Holt states that repetition in this work is used to “create a situation in which the musical object affirms its independence […] Time becomes the space in which the musical object floats.” This paper will examine the effect of the social interaction between Canto’s most prolific advocates, piano duo Sandra and Jeroen van Veen, on the repetition in their various recordings. The interplay between repetition and indeterminacy will also be discussed briefly. This paper answers to the lack of scholarly literature on both the composition and the composer, providing a starting point for studying the performance practice of Canto.

Stacey Low commenced piano studies at the age of five, but has always been keenly interested in an all-rounded study of music, finding her forte in high school in music history and analysis. Her Honours thesis was on the investigation of performance practice of Brahms’ Intermezzo in A Major, Op. 118 No. 2 from 1997 to 2007, completed in 2017, and she is aiming to finish Masters in musicology in early 2020.
This paper explores the transmediality of Laurie Anderson through two complimentary works that appeared in 2015 - Heart of a Dog — a film she wrote, directed, co-produced and scored (the soundtrack of which was subsequently released on Nonesuch) and her installation at Park Avenue Armory entitled Habeas Corpus, a work that focuses on Chadian Guantánamo Bay prisoner Mohammed El Gharani. The former project looks at death through the lens of personal fragments and footage while the later invokes an exterior focus to address many of the same themes. As Anderson describes: “for me these two completely disparate projects aren’t really that different … [t]hey’re both about how you tell stories, and what they mean, and how you create a world with them.” I offer a taxonomy of repetition for transmedial and multimodal analysis.

Dr John McGrath is a Lecturer in Music at University of Surrey. He has a monograph with Routledge entitled Samuel Beckett, Repetition and Modern Music (2018), which explores the writer's extensive use of repetition alongside the responses to his work by composers such as Morton Feldman and Scott Fields.
This paper presents three sound visualization artworks: imagery that deconstructs and re-invents musical score in order to visualise and analyse the use of repetition within musical composition. These novel scoring systems use the visual language of mapping and notating to explore links between repetitive musical motifs and organic, natural patterns. These music maps re-invent traditional score, visualising the complexity of the compositions in order to express sound layering, texture, tone, rhythm and emphasise repetition. They map music as circular rather than linear graphic score, with pitch as radius and time as circumference.

A Classic on Vinyl is a series of etchings drawn from Clair de Lune by Claude Debussy. Whenever a motif within the music repeats, the score creates a new concentric circle, producing distinctive diagrammatic patterning. The etched score is layered on top of a print taken from the original vinyl of Clair de Lune, thereby feeding back into the cycle of listening, visualising, and re-creating.

Circular Score visualises Fratres by Arvo Pärt – a piece which itself explores the musical convention of variations on a theme. Within this set of works, repeated motifs generate a new diagram instead of a concentric pattern, each image echoing the previous one. The segmented disks both within and outside the etched score depict volume dynamics.

Score for the Prayer draws inspiration from the repetitive actions of the Berimbau – a percussion instrument used within the composition Oraço by Mestre Toni Vargas. It is a Ladahina (or Prayer) to begin the Brazilian game of capoeira. Instead of concentric circles or echo diagrams, this score splinters off into constellation-like patterns, determined by the angle at which the individual motifs finish.

The finished scores are reinterpreted by musicians and performed live. This has ranged from modernist piano improvisations to electronic sound-art compositions and live percussion events.

Liz K Miller (b. 1983, Hexham) is a London-based artist and printmaker. She graduated from Edinburgh College of Art (BA), Camberwell College of Art (MA), and was a print fellow at the Royal Academy Schools (2013 to 2016). In 2018, she was awarded an AHRC TECHNE scholarship to undertake a practice-led PhD at the Royal College of Art, researching sound-visualization and eco-acoustics in forests. The work is sensory-immersive and aims to reflect upon our relationship to, and our dependency on, the woodland hydrological cycle by highlighting the complexity, fragility, and necessity of ‘green water’. 
All of the modern scholarly literature on Schubert's G major string quartet has emphasised the importance of its repetitive structures, and many writers - including Walter Frisch and Scott Burnham - have equated this feature to the psychological role of memory as musical process. In an analytical discussion of the quartet's second movement I challenge this idea, offering an alternative reading which is informed by semiotics and literary theory. I show how the use of repetition in the quartet is a marked departure from the cyclical precedents set by Beethoven, and how this leads to Burnham's claim that "Repetition is like a holographic presence in this quartet." In asking who or what this presence might be I make an analogy with the notion of Voice as described by Gérard Genette in his narratological study of Proust, Narrative Discourse, arguing that the kind of repetition in evidence here generates a plurality of Voice within the work.

My analytical strategy interprets the second movement in terms of its evolving perception by an idealised listener, considering the relationship between hypothetical and evident meanings, and the question: at what point do we perceive repetition as a repeat?

My conclusions point to a much more discomfiting understanding of the piece than generally acknowledged, suggesting that the agency of the listener is progressively eroded to the point that they can no longer participate in the music in the creative sense that Frisch and others have suggested. I also ask questions about the tensions between traditional theoretical musical analysis and cognitive-based models, and how this quartet exemplifies the need for a new conversation between the two disciplines.

Glasgow born violinist Richard Montgomery attended St Mary's Music school in Edinburgh from 2010 to 2016 where he developed a keen interest in chamber music. In 2016, he accepted his place at the Royal Academy of Music where, as well as becoming a founding member of the Atelier Quartet, he has discovered a passion for music analysis. In 2018, he won the Academy's Harry Farjeon award for his academic achievements, being awarded the highest mark in his year for his work on Beethoven's string quartet Op 59. No. 2. Areas of research Richard is particularly interested include semiotics, literary theory, cognitive analysis, and the philosophy of language.
Nicholas Moroz (University of Oxford)

A Rondo of Everything: Understanding Micro and Macro Form by Pattern Class Analysis in Morton Feldman’s Piano Violin Viola Cello

Morton Feldman’s late works present several unusual problems for the musical analyst owing to how the composer beguilingly entangles materials via verbatim and evolving repetition throughout both micro and macro structural scales. The vast duration of the works further complicate matters, rendering virtually futile most conventional analytical methods that seek to schematise musical form by reduction to generic models. While some analysts have grappled with these works in their entireties (Hummel 1994; York 1996), the results have arguably failed to go beyond tautology. Nonetheless, more fruitful discussions have grown out of critical and phenomenological approaches that explore features such as temporality, repetition, and memory (Saab 1996; Jurkowski 2009; Laws 2009). Hanninen’s 2004 paper stands out here for its remarkable integration of score-based analysis with phenomenological sensibilities. Her method of associative sets applied to the opening of Feldman’s Piano Violin Viola Cello (1987) generates a contextual association graph (2004, 246), which illustrates the motile web of shifting relations that emerge between individual musical cells (or to Feldman, ‘patterns’) across short to medium scales. Yet, her approach seems inoperable when applied to an entire long-duration work. Thus, against this backdrop of seeming intractability, the question arose: how can we (meaningfully) visualise an entire late Feldman piece? With Piano Violin Viola Cello as a case study, the search for a response here lead to the method of pattern class analysis (PCA), in which individual patterns are taxonomised by the analyst according to degrees of similarity and gathered as pattern classes, then, via a simple indexing system, visualised in graphical form (somewhat guided by principles of infographics) to reveal the arboreal yet fuzzy formal structures, invisible repetitions, and recombinations of materials, thereby testing Feldman’s own description of the piece as a ‘rondo of everything’. Thus, this paper will present the musicological background of late Feldman analysis, demonstrate the method of PCA in relation to the case study, summarise interpretative insights from PCA – for example advancing the notion of multistability in late Feldman (borrowed from Fell 2018), and finally suggest some paths for developing the method in relation to other late Feldman works.

Nicholas Moroz is a composer, researcher, and electronic music performer based in London and Oxford, UK. He is currently studying an Arts and Humanities Research Council funded DPhil in Music degree at the University of Oxford, supervised by Martyn Harry and Jonathan Cross. His research integrates orchestral instruments with live electronics, machine learning, and spatialisation. He is the artistic director of Explore Ensemble, which he co-founded in 2012 with fellow musicians at the Royal College of Music. He also holds a Masters degree in musicology from the University of Oxford, as well as Bachelors and Masters degrees in composition from the Royal College of Music, where he studied with Jonathan Cole, Kenneth Hesketh, Simon Holt, and Gilbert Nouno.
The ‘obstinacy’ which lends ostinato basses their name is a striking feature of Dieterich Buxtehude’s six extant chaconne-cantatas. Not only are transposition and ornamentation of the bassline utterly eschewed, but Buxtehude also appears uninterested in searching out alternative harmonisations of his ostinati. Such incessant bass repetition renders these pieces resistant to conventional analysis, owing to a long-standing musicological predilection for discussing musical variation/development at the expense of repetition/stasis. Indeed, a sense of discomfort around repetitiveness is manifest in many recent studies of seventeenth-century ostinato-bass compositions. Repetition in these contexts tends to be addressed as a compositional problem to be ‘solved’: in such thinking, a piece’s success is judged by the degree to which repetitiveness is alleviated by non-repeating musical or textual elements. Even when examined in its own right, bass repetition is usually interpreted as ‘standing for’ something. To be sure, ‘meaning-oriented’ readings of ostinato basses are useful, and ideas concerning the balance of repetition with variation are important in seventeenth-century musical thought. This paper, however, seeks to shift conversations beyond questions of how the ‘monotony’ of bass repetition is mitigated compositionally, or even what ostinato basses might signify semantically. Instead, the focus here is on how bass repetition operates on seventeenth-century listeners at an affective level, and how this might have been harnessed by composers like Buxtehude. To this end, recent work on repetition’s effects on listeners is brought into dialogue with Early Modern theories of listening to construct a historically-situated framework for understanding the operation of seventeenth-century musical repetition. Through analyses of Jesus, meines Lebens Leben (BuxWV 62) and Quemadmodum desiderat cervus (BuxWV 92), I argue that Buxtehude cultivates repetitiveness in his chaconne-cantatas in a way that transcends textual illustration: rather, repetition is leveraged to engender in Lutheran listeners a truly embodied experience of the cantata’s message.

Originally from New Zealand, Paul Newton-Jackson is currently working towards a PhD at Corpus Christi College, University of Cambridge. Paul’s undergraduate and masters’ degrees were also at Corpus Christi College, during which he completed research projects on meter and musical time in eighteenth-century music, ‘Englishness’ in the fifteenth-century polyphonic Mass, national musical styles in Early Modern Germany, and the analysis of twentieth-century New Zealand art music. His PhD investigates Georg Philipp Telemann’s relationship with Polish and Bohemian music, asking how this repertoire might cause us to rethink current theories of musical exoticism and Early Modern national/regional identity.
Richard Parncutt (University of Graz)  
Prenatally Audible Sound and Movement Patterns: Repetition with Variation

Why is repetition so characteristic of music (as opposed to language), and why do we like musical repetition so much? Why does it carry “meaning”? In Deutsch’s (2003) speech-to-song illusion, repetition transforms language into music. How does that happen? According to Margulis (2014), music’s repetitiveness, which is intrinsic to both music cognition (learning, segmentation, expectation) and ritual (changed states, entrainment), suggests that the primary function of repetition is aesthetic, not communicative. But explanations of these kind may be circular, explaining music in terms of itself. Can musical repetitiveness be explained by non-musical phenomena? Childplay and infant-directed speech are interesting candidates for an explanation. I have argued elsewhere that music is a cultural transformation of patterns of sound and movement within the human body, as perceived repeatedly by the fetus in the third trimester. From an evolutionary perspective, fragile human infants, born early due to the human obstetric dilemma, are more likely to survive in dangerous ancient hunter-gatherer settings if they can better communicate with their mother and other adult carers. For this reason, ancient infants may have constructed a “mother schema” (analogous to the infant schema of adults) that links together maternal body-sound patterns (voice, heartbeat, footsteps), body-movement patterns, (especially walking), and biochemical changes (emotionally relevant composition of placental blood and amniotic fluid). This schema may then have regulated infant behavior to enhance survival. Evidence for the theory is circumstantial; a list of musical features is consistent with it, but they could also be explained differently. The repetitiveness of music is a point on that list: consistent with the theory, prenatally audible sound patterns, such as the pitch-time patterns of speech phrases (speech declination in human and non-human primates: Hauser & Fowler, 1991), are characteristically repetitive, although (like musical patterns) they also feature interesting, meaningful variations.

Richard Parncutt is Professor of Systematic Musicology, University of Graz, Austria (since 1998) and director of its Centre for Systematic Musicology (since 2009). He was chair of the 15th International Conference on Music Perception and Cognition (ICMPC15/ESCOM10, Graz, Montreal, La Plata, Sydney, 2018), and president of the European Society for the Cognitive Sciences of Music (ESCOM, 2015-2018). He holds Bachelor’s degrees in Music and Science (Melbourne) and a PhD (New England). His research addresses musical structure (pitch, consonance, harmony, tonality, tension, rhythm, meter, accent), music performance (psychology, piano, applications), the origins of tonality and of music, and musicological interdisciplinarity.

Please note: this is a YouTube live stream from the University of Graz. Join into the conversation live on your mobile device, laptop or tablet and send Richard your questions or remarks via https://www.youtube.com/watch?v=1QjmfE6-sjQ
Byzantine music is largely composed by using pre-existing melodic building blocks, which carry their own tags, and are repeated as a piece unfolds in time. When analyzing this type of music, two processes have to be discussed: The first is segmentation, which brings out these pre-existing musical blocks or categories, together with their included sub-segments, and the second is the categorisation of segments into these pre-existing categories. Until today, no criteria for segmentation and categorisation have been explicitly discussed in the literature. There is an issue as to what extent this process relies on the analyst’s intuition and whether it can be reproduced algorithmically.

In this paper, we firstly explore the process of segmentation and discuss the criteria upon which the segmentation process takes place. We base our discussion on four issues: The use of argies (a group of signs) as segment endings, the spelling, the use of explicit grouping signs (called subsidiary signs), and the melodic movement within each Echos (Ήχος/Mode) in pitches that are considered as dominant. As a second step, we look at musical instances within each category and discuss the degree of variation allowed, as well as the differences across categories. In this way we make explicit the criteria for categorisation.

As our case study, we use Heirmologion, with music composed by Theophanis Karykis, Patriarch of Constantinople (1597) and famous 16th century byzantine music composer. This work includes 262 pages of hand-written music together with the words (manuscript Iviron 1154). The choice of this work is not random: On one side, the identification of the pre-existing melodic categories is much more complex than in other types of Byzantine music. Therefore, the discussion of this complicated case can help greatly in the identification of categories in the more general Byzantine music. On the other side, the composition by Theophanis Karykis sets out the rules for the melodic compositions on the same work in the centuries that follow.

Polykarpos Polykarpidis studied computer science at the University of Piraeus, and is currently a PhD researcher of Byzantine Musicology at the Department of Music Studies, University of Athens. He is the cantor at Saint Philothei of Athens, teaches Byzantine music, and participates in the music cognition and informatics projects which run in the Department.

Christina Anagnostopoulou is a musicologist and associate professor of music informatics at the University of Athens. Her PhD was on the computational and cognitive modeling of similarity and categorisation in music (Edinburgh). Before joining University of Athens, she taught at the Universities of Edinburgh, Glasgow and Queen’s Belfast. She is the director of the Music Cognition, Computation and Community Lab at the University of Athens, and a community musician who works with different sensitive populations in Athens together with her students.
The Dutch composer, Simeon ten Holt (1923-2012), is best known for his Canto Ostinato (1976-79): a work – most familiar in its versions for multiple pianos, which can last well over two hours – that, thirty and forty years after its composition, became an unlikely success in “cult” live performances, on CD and on iTunes. This paper will examine the role of repetition in this music, which would conventionally be termed minimalist. Any unfolding of Canto Ostinato may, however, be argued to operate along lines rather different from those to be found in the outputs of, say, Terry Riley, Steve Reich or Philip Glass; and the approaches to the listening experience that ten Holt’s music seems to encourage are, I suggest, of especial interest.

This paper will investigate just a few of the issues that listening to Canto Ostinato raises, with reference to a 20-minute segment of the work selected from a consecutive sequence among its multiple sections. Concerns to be touched on will include how repetition has been handled by the composer, and is being handled (in the recording under review) by the performer; and, especially, how the consequent unravelling of musical material – heightened (or otherwise) by the intensified scrutiny arising from such extended repetition – affects moment-to-moment, as well as overall, listening in “real time”.

The paper will follow an unusual format in combining commentary with a simultaneous rendition of a recording of the music being discussed. In this manner, it is hoped to address, in particular, how relevant listening issues might be directly experienced by the audience for my paper, as both text and music unfold in tandem.

Keith Potter is a Professor of Music at Goldsmiths, University of London. A musicologist and music journalist, he was, for a decade, a regular music critic for The Independent daily newspaper. His publications include Four Musical Minimalists: La Monte Young, Terry Riley, Steve Reich, Philip Glass (2000) and The Ashgate Research Companion to Minimalist and Postminimalist Music (2013), coedited with Kyle Gann and Pwyll ap Siôn. He has also been involved with collaborative projects on musical perception and cognition. Recent publications on Reich have appeared in Tonality since 1950 and Contemporary Music Review (both 2017).
This paper proceeds from a definition of cycle—the basic unit of persistently repetitive textures—that leverages the distinction that music theorists (e.g. Lerdahl and Jackendoff 1983) make between grouping and meter. Under this definition, a cycle may involve a series of events with distinctive qualia, such as pitch, pitch category, or timbre, but whose durations vary.

For performers, repeating a qualia cycle entails reproducing distinctive events in a fixed order but without necessarily repeating their rhythm. For listeners, such repetition engages sequential memory (Margulis 2013) but not metrical entrainment: they can anticipate what kind of event will happen next, but not exactly when. Accordingly, qualia cycling lends itself to hierarchically structured inexact repetition that may create distinctive processes of gradual change. The concept of a “template”—a generalization of the “paradigm” of semiological analysis (Ruwet 1987, Nattiez 1982)—helps to characterize it.

Qualia cycles structure some popular music, and appear in some European isorhythmic and serial compositions, but a deeper appreciation of them and their associated processes can be gleaned by examining traditional music across the world. I will demonstrate with three brief analyses:

1. In a round dance from Brittany, two alternating singers present the same sequence of pitches with variable timing, tempo, and elaborations.

2. In a lament of the Huli people of Papua New Guinea, just two events constitute the template, but onto each iteration the soloist prepends a varying number of other events, creating a large-scale process of departure and return.

3. The template of a performance by a Wapaka (Bolivian) panpipe orchestra embeds an indigenous notion of instrumental gender that affords hearing a formative process spanning multiple cycles, and explains some striking variations during later iterations.

While variable-duration qualia cycles are not the norm, their wide dispersion suggests they tap into cognitive mechanisms that are shared cross-culturally.

John Roeder (Ph.D., Yale 1984) is Professor of Music at the University of British Columbia in Vancouver, Canada. He studies rhythm, mathematical and computational models of music, contemporary art music, and traditional music from across the world. With Michael Tenzer he edited Analytical and Cross-Cultural Studies in World Music (Oxford, 2011). His recent work includes essays on rhythmic processes in repetitive world music and analyses of compositions by Chen Yi, Bartók, Saariaho, and Adès. His research was honored with a Killam Research Prize and an Outstanding Publication Award from the Society for Music Theory.
16th century ornamentation practice called diminutions is the main compositional technique used in the Renaissance to embellish a melody. Diminution is based on replacing existing melodic intervals of the original melody with predefined longer melodic interval sequences called figurations. In this study, we show that the repetitions of figurations on a corpus of 150 diminution compositions written in the 16th century follow a Near-Zipfian distribution. The Zipf’s law is the most well-known law in computational linguistics which states that the repetition of a word decreases as a power law of its rank. Yet, the explanation for the law has puzzled researchers for the last 75 year in both the area of computational linguistics and in the many other areas of science where this law occurs. The similarity of cognitive pressure of processing music and language (pressure on both the transmitter and the receiver) and the similarity of the data itself in terms of a stream of complex hierarchical structures suggest a reasonable ground for adopting some of the communicative linguistic explanations of Zipf’s law. These explanations are based on optimization processes by using information theory concepts of data compression, entropy and cost function. Thinking of ornamentation repetitions as influenced by an optimized communication process rather than determined by aesthetics, rigorous contrapuntal or melodic rules offers a different perspective on music analysis and may be used as a tool for exploring new styles of music.

Sarig Sela is a recorder player, a musicologist and a technology system architect. He graduated from the Jerusalem Academy of Music and Dance with a B.Mus. in performance practice and continued to M.A. in musicology in the Hebrew University of Jerusalem. His interest in formal sciences led him to complete a B.Sc. in mathematics and computer science in the Ben-Gurion University of the Negev. While having a successful career as an IT system architect in leading Enterprises and as a recorder player Sarig initiated and engaged in computational corpus-based research of 16th century ornamentation practice as part of his PhD in the Hebrew University of Jerusalem.
A common device of musical repetition is the musical echo, particularly in late Renaissance and baroque music, evident in works as varied in style as madrigals, the motets, canzone and sonatas of Giovanni Gabrieli, Monteverdi’s Vespers, and instrumental works such as Salomone Rossi’s ‘Sinfonia in eco a 3’, through to Bach’s frequent echo effects in keyboard works and cantatas. Echo devices are also a common feature of classical and late-Renaissance and baroque poetry and drama, musical and dramatic echoes finally coming together as an almost obligatory component of music-theatre works, starting with the arias of Harmony and Arion in the 1589 Florentine Intermedii. The device is picked up in numerous early operas such as Dafne (set by both Peri and Gagliano, 1598/1608), Giaccobi’s L’Aurora Inganata (1605), Monteverdi’s Orfeo (1607) and Stefano Landi’s La morte d’Orfeo of 1619. The echo scene may be judged an obsession of early modern culture that came decisively into its own in opera.

The properties of echo also exercised early-modern scientists such as Bacon, Galileo, Mersenne (often described as “the father of acoustic studies”), Descartes and Kircher (who named the new science “echometry”), all of whom considered that in the study of echoes might lie the secret to the property of sound itself. The extensive interest of natural historians in echoes indicates that the ubiquity of echo as an artistic topos may have been more than just a mannerist or baroque indulgence in clever word play or aural illusion, but was part of an extensive intellectual and cultural preoccupation with sonic phenomena and verbal meaning.

For Deleuze repetition occupies a space outside both resemblance and representation. In this paper, I will consider the baroque musical echo as symptom of a culture negotiating the transition from the semiotics of resemblance/correspondence to that of representation in the early modern era.
Comparative analysis holds a tenuous place in the field of ethnomusicology, where a history of oversimplification and faulty conclusions led many to mistrust the process. Yet as Bruno Nettl argues, "the prescription would seem to be not avoidance of comparative study but more and better comparative study" (2005: 67). One area where comparison may offer rich insight is the examination of musical repetition and change. Until relatively recently, many viewed these as mutually exclusive organizing principles, juxtaposing the inherent cyclicity of Balinese gamelan or Ewe dance-drumming, for instance, with the relative linearity of much Western common practice music. Yet work by Monson, McGraw, Margulis and Beatty, and others shows diverse musics freely and simultaneously employing both processes. I propose that most musical forms seek to strike a balance between absolute predictability and absolute uncertainty, aligning with theories of entropy in language, but that the musical parameters through which they achieve those ends differ widely and are often genre-specific.

In this paper, I compare applications of repetition and change in the Balinese gamelan piece Oleg Tumulilingan and the first movement of Beethoven’s Piano Sonata No. 1, touching also on the Ewe dance-drumming piece Gahu. I examine these processes at several timescales: motifs, meter and hypermeter, harmonic and melodic progressions, formal structures, and processes spanning multiple performances. While each piece balances familiarity and newness at all timescales, each chooses different musical elements through which to explore them. Large-scale formal repetitions may be defined by harmonic, melodic, or rhythmic parameters, for instance, large-scale change through tonal center shifts, tempo and dynamic shifts, improvisation, or even dance. And while certain embedded cultural attitudes may have led to the perception of repetition and change as polarities, a comparative analytical method stressing more nuanced descriptions of temporality as layered and multidirectional may enable useful insights.

Leslie Tilley is an Assistant Professor in Ethnomusicology at the Massachusetts Institute of Technology, where she teaches classes in World Music, Indonesian Music, Balinese Gamelan, and rhythm studies. Leslie has published on the history of music analysis in ethnomusicological research, the use of sociolinguistic theories to examine regional musical variation, and the intersections of ethnography and music analysis in the study of Balinese drum improvisation. Her forthcoming book, Making It Up Together: The Art of Collective Improvisation in Bali and Beyond, examines the concept of collective improvisation and proposes a toolkit of terminology and approaches for analyzing its manifestations across cultures, demonstrating its use through contrasting Balinese case studies.
Repetition is an essential feature of music, but it is not often used in music modelling tasks. In this study, we explore the use of pitch repetitions in music analysis and prediction tasks. We model the pitch relationship as the absolute of the pitch differences in semitones. In our network models, we call this a DR unit (differential rectifier). We apply the DR units to all pairs of notes in a context of a given length (input DR), as well as to all pairs of notes in the context with the following note (output DR). We then investigate the relationship between the pitch repetitions within the context and the repetitions between context and next note.

We evaluate the approach on a subset of the Essen folk song collection, consisting of 7 folk song corpora and a corpus of Bach chorale melodies with between 2,691 and 11,056 notes. In our first experiment, we find that the relationship and distribution of input and output DRs vary widely between different DRs and between the 8 different corpora. This suggests that repetition patterns are specific to musical cultures in a way that has not yet been studied.

We study this phenomenon further by testing the predictive power of the DRs in music language models, i.e. models that predict the next event, here specifically the pitch of the next note. We add the DRs as inputs to Markov models and neural networks. The results show that the repetition detectors improve the overall prediction performance in Markov models and neural networks.

The experimental results show that repetition of notes is a distinguishing feature of melodic styles and deserves further attention in studying melodic structure. It also indicates, that repetition patterns have the potential for MIR applications such as melody classification and generation.

Radha Manisha Kopparti is currently a PhD student in the Research Centre for Machine Learning in the Department of Computer Science, City, University of London. Prior to joining City, she finished her Bachelors and Masters in Computer Science at IIIT-Hyderabad, India. Her research work focuses on abstract structured representations and generalisations of deep neural networks for sequential data.

Tillman Weyde is a Senior Lecturer in the Research Centre for Machine Learning in the Department of Computer Science, City, University of London. He holds degrees in Mathematics, Music, and Computer Science and has published widely in Machine Learning and Data Analysis applied to Music and other fields. Tillman led and co-led a number of research projects, including the AHRC funded Digital Music Lab – Analysing Big Music Data with the British Library, and the Dig That Lick - Analysing large-scale data for melodic patterns in jazz performances. His research focuses on modelling sequential structures.
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