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The analysis of electroacoustic music,
the differing needs of its genres and categories

Simon Emmerson and Leigh Landy

Music, Technology and Innovation Research Centre,
De Montfort University, Leicester UK

s.emmerson@dmu.ac.uk – landy@dmu.ac.uk

Abstract

This paper reports on our (Arts and Humanities Research Council funded) project *New Multimedia Tools for Electroacoustic Music Analysis*, designed for a range of genres, drawing together existing methods, engaging the latest interactive and hypermedia tools, and applying them to compare their strengths and weaknesses. This depends on mutually interactive questions such as which tools/approaches, for which works/genres, for which users, with what intentions. We will report on newly developed applications – *EAnalysis* (Pierre Couprie), *OREMA* (Online Repository for Electroacoustic Music Analysis) (Michael Gatt) – a forum for sharing and discussing analyses – and preparations for a major new publication 'Expanding the Horizon of Electroacoustic Music Analysis' (CUP). We initially divided this field into genres or 'practices' (e.g. acousmatic, electronica, glitch); but these have hybridised continuously – an *installation* may include algorithmic generation, be *interactive*, and use *soundscape* and *acousmatic* materials. We need a range of tools for analysis. Descriptions refer to materials or to methods of organisation, but this distinction cannot be maintained. From the listener's viewpoint, does knowledge of a *generative* algorithm influence perception and hence analysis? Analysis may include *socially situated* characteristics of production, perception and consumption. *Glitch* and *hacking* works analysed from their sound alone would surely lose a substantial part of their meaning. How to capture these additional dimensions, including emotional response? What other traces should run in parallel to standard transcription? Any analytical procedure must balance the gravitational pull of genre with a networked, relativistic world of characteristics which reconfigure depending on initial questions.

Introduction

This EMS12 paper is fairly short status report on our three-year research project (2010-2013), 'New Multimedia Tools for Electroacoustic Music Analysis' supported by the UK's Arts and Humanities Research Council. It also included some of our plans for the project's final year. The paper goes hand in hand with the talk that followed ours by project researcher, Pierre Couprie, regarding the EAnalysis program (Couprie 2012) that he has been developing as part of the project. This is a new software package designed to help the user create their own

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representation and analysis of works – and to apply new multimedia applications to this end. One of the project's main outcomes is a book edited by the present authors, *Expanding the Horizon of Electroacoustic Music Analysis* (in negotiation with Cambridge University Press, 2014). As this publication will treat all aspects of the EMS presentation in great depth, this proceedings paper has been restricted to the key points that were presented.

Our research is primarily listener focused – the composer's intentions, methods and approaches may influence but not define the experience of the music. The work is intended for wide use within composition, teaching, analysis and musicology at all levels, including non-specialist users. To this end it brings together existing research, attempts to assess its range and efficacy. From this we can identify needs and try to 'fill gaps' in the toolkit. It is also intended to address a wide range of genres and categories.

Research Methods

The first stage of any such project involves the assembly and comparative evaluation of existing analytical tools. How does each approach *represent* electroacoustic sound and how does this limit the analytical questions? After assembly we will be in a better position to see if there are gaps – that is topics, genres, materials which are not addressed, or do not have relevant tools available. This all should inform the project's software development and innovation (*EAnalysis*).

Some important project points of departure: the four-part question and a template for analytical discussion

The question that we posed when applying for funding for this project was: what do we want from analysis of electroacoustic music and how might we get it? This raises a number of questions, such as: What is music analysis? Why have there been so few analyses made of electroacoustic music? Why are many of these based on poiesis, that is, the construction of a work as opposed to its reception? Why are there so few tools and methods that have been proposed for electroacoustic music analysis and, with this in mind, is it right that so many analyses rely heavily, on the one hand, on Schaeffer's and Smalley's contributions (see, for example, Schaeffer 1977 and Smalley 1997 and 2007) or, on the other hand, on sonograms and other graphic forms of representation. To what extent are approaches used in note-based music analysis relevant? In general, one does not analyse a piece of music from every conceivable angle; instead, one has specific intentions. With this in mind, we have formulated a *four-part question* that is offered as a basis to determine what one might seek when investigating electroacoustic works from the listener's point of view. There is no particular order of importance:

> For which users –
> for which works/genres –
> with what intentions –
> with which tools approaches?

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As far as *for which users* is concerned, one might think of describing potential users based on specialists (musicologists, musicians, educators) or non-specialists (e.g., school children). Another way of looking at this would be to support understanding related to: research, composition/practice and teaching. Let's tease this out briefly. *Research* needs the least amount of elaboration as most analysis has been undertaken with this specific goal in mind. Thus the goal is the greater understanding of certain aspects of a given work, not necessarily with any particular application envisioned. *Composition/practice* is an area that has not yet been considered by many involved with analysis in our area. One can analyse before an act of composition to understand aspects of one's own or another person's work that might influence the new work. One can also analyse a work after it has been completed to identify characteristics that were not consciously part of the compositional process. Finally, and perhaps the most radical, one can analyse what is taking place during performance. For example, a laptop ensemble's members may be able to track what they're playing and, on the fly, select materials used and either return to them or modify them. As far as this project is concerned, this aspect falls under the category, 'future plans', as it is not in our current remit. Teaching refers to both specialists (e.g., higher education level) and non-specialists in schools. Analysis can be used in teaching not only to support the general understanding of a work, but also to exemplify things that are being introduced. For example, in Landy's other current project – the EARS II Pedagogical project (to be completed in 2013 and presented at EMS13; www.ears2.dmu.ac.uk) – brief analyses are presented to young learners (11-14 years old) to introduce them to particular concepts and to aid their appreciation of this type of music. An example of how this might be done is presented below.

The question: *for which works/genres* will be treated at some length in the following section. Please note that the horizon is very wide. It is for this reason that not all tools and approaches will be universally applicable. The list of *tools and approaches* is quite finite currently. We have Schaeffer's 'typomorphologie' and Smalley's 'spectromorphology' and 'spatiomorphology' as well as Roy's and Thoresen's additions related to these (Roy 2003, Thoresen 2007). Furthermore there is UST ('unités sémiotiques temporelles', MIM 1996) on offer, not to mention Emmerson's 'language grid' (Emmerson 1986) and Landy's 'something to hold on to factor' (Landy 1994). Of course there may be some tools/approaches unknown to us and we would be pleased to be informed of those. Beyond this, there are new computational ones; ones to do with structure beyond the level of gesture; ones to do with live performance, installations or audio-visual works. These are to be discovered after our survey of optimal existent tools. The goal is to offer as many of these as we can on EAnalysis and add newly developed ones that can also be implemented later. However, these tools and approaches do not exist in isolation. They should always be related to an analytical intention.

Analysis can be about something, a number of things or interconnected goals. The question *with what intentions* is our means of articulating these goals. Intentions might include aspects, such as structuring, layering, narrative discourse, sound qualities[1] and their evolution in time, gestures at the local level, movement from one type of listening to another, e.g., from contextual to musical or vice-versa, drawing in social and or emotion or meaning elements,

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1 "This is used as an umbrella term […] referring to a single or composite sound's aural characteristics. Instead of discussing source and cause, in this case one describes the sound's colour or timbre, aspects related to its texture and any other description related to its sonic as opposed to contextual value." (Landy 2012: 195–196)

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and any of the above in combination with other performance-related and sonic aspects, and so on. Furthermore, a composer's dramaturgic intention and/or compositional aspects may be triangulated as part of an analysis. The following list forms the basis for the project's template.

A list consisting of 'headers' has been put together in the form of a template for analysis. This template has been proposed in order to offer people a potential model for the consistent – yet flexible when specific concerns are of importance – presentation of analyses based on analytical intentions. This has been sent to all authors presenting analyses in the project's book. Detail has been restricted to allow for a quick overview of its structure. Once a number of people have used it, it will be updated dynamically.

Representation – What are the most effective form(s) of representation? The *EAnalysis* software is being developed so that it will be seen to be highly flexible to optimise its usefulness. NB: this is the only entry that not only falls under intentions, but also under tools.

Materials – What are the types of sound sources and sound synthesis including sound morphologies used?

Listening behaviour – Listening strategies: e.g., Heightened <–> Reduced listening (or contextual <–> musical; recognisability of sounds and how this affects the listening experience)

Behaviour of materials – Contextual elements: where source identification is possible, what is the relationship between foreground and more contextual sounds?
– Development of sound qualities (as defined above)

+ *Ordering* (a pair with Behaviour of materials) – Order and organisation: this includes horizontal and vertical behaviour; audible salient characteristics related to sonic and structural behaviour as well as discourse & (a future project aim) computational sound/sonic behaviour spotting + where relevant, relationships between note-based and sound-based behaviour
Some important parameters might include:
Pitch treatment
Duration information (events)

Other time-based aspects, e.g., elements at gestural level, sequence level, structural (formal) level, narrative and/or discourse issues.
Dynamics
Density
Order and disorder
Simultaneities (parallel with traditional harmony)
Horizontal relationships, e.g., layering (parallel with traditional counterpoint)

Space – Treatment of space and movement (spatiomorphology)

Performative – Performative elements/liveness: related towards live, in particular improvised performance (and the eventual need to investigate more than one performance of a given piece)

+ *Intention/reception* Dramaturgic information and receiving poietic intentions

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Social, *Emotional* and *Meaning-related* aspects

Etc. + Elements specific to a given genre or piece – such as audio-visual coordination in, for example, installations, visual music and the sampling example list that will be presented below

<u>and</u> additions to this template that we have not thought of yet. If readers have any, do let us know.

The four-part question and its associated template allow us to look at electroacoustic analysis holistically. Please note: the four-part question could be used for any type of music. It has been proposed here to help people identify exactly what they might seek from an analysis of an electroacoustic work or genre. These two together have helped us try to delineate the area of electroacoustic analysis and offer a point of departure for those interested in undertaking analytical studies. It forms an important part of this project's foundation.

Genres and categories

EARS (http://www.ears.dmu.ac.uk/) lists 81 *genres* and *categories* of electroacoustic music – these are effectively naming conventions, clustering into two categorisations which are in no way exclusive: a *genre* is a musical or artistic grouping – for example *soundscape* or *acousmatic*; whereas a *category* is grouped around a *performance situation*, an *aspect of technology*, or an approach – for example *installation*, *microsound*, *algorithmic*.

Genre and category may be seen as essentially social constructs, in some ways sub-cultures which are based on shared practice. As has been much discussed by ethnomusicologists over the years this can create problems of 'insider/outsider' decoding – members of a given social group may articulate the important features of their culture in very different ways to an outsider. These have been termed 'etic' and 'emic' differences. Etic refers to a measurable difference, emic to a significant difference. Thus the idea of emic is based on salient features as defined by the community of practice. One theme of our research is the deliberate use of a language derived from one genre (or category) applied to another – a deliberate confusion of etic and emic, but one which can be tested to see what might be valuable. What kinds of things do we want to examine? What are the salient aspects? The following terms are all found in the literature to mean roughly the same thing – *parameters*, *variables*, *qualities*, *attributes*, *properties*, *features*.

Each genre or category is thus 'generated' by its salient features[2]. These features work effectively like tags which configure into 'clouds' for a given genre practice. These demand languages of description – that is vocabularies – which in turn help define suitable tools for analysis. The following list reduces the large range of analytical issues described above in the 'template' to four key areas – material, construction, interpretation, site and place. These interact continuously but help define the vocabularies we have seen emerging in the last fifty years for the definition of genre.

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[2] Not the other way round.

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Material
- sounds – acoustic/objective description

Construction (descriptive) – organisation – behaviour – form

Interpretation
- significance
- source/cause surmising – real/imaginary/imaginative
- indicative field
- imagined affordance
- personal response –narrative, meaning, affect, feeling

Site and place
- where I am, who I am with (effects salient features and *emic* qualities)
- theatre and dramaturgy – suspension of disbelief, empathy

We thus have a reciprocal and dynamic relationship: as salient features change thus does the vocabulary of description of genre – in continuous evolution.

'Poietic leakage'

While the orientation of this project is clearly to focus on the listener's experience and how the music may be analysed in these terms, it is of course impossible to *exclude* the composer's intentions on the one hand and the social context on the other. Both of these must contribute to the prescriptive construction of the music in some way. For example, this is clearly true when socially sited aspects become dominant – perhaps, too, a very real social critique is embedded in the performance. Take *hacking* – here the primary purpose lies in social activity, the practice resists acousmatic aestheticisation of the sound alone and demands visualisation and some knowledge of the real objects and social circumstances of the performance. And again *site-specific installation* builds this into its descriptive title. We may also listen differently if we know (or are told) that a work is generated from a *swarm* algorithm. There are many more such examples of *poietic leakage* being vital to the listening experience.

Some examples

Each *EAnalysis* page shows contrasting examples of salient features addressing material, construction, interpretation with reference also to issues of site and place – in each genre a similar features may be present but with (very) different emphasis. Types of relevant language and 'holes' in the descriptive vocabularies will be highlighted and hopefully filled as the research progresses. We have in general suggested that many 'taboo' issues of representation and description be abandoned as a way of 'freeing up' the discussion. Thus if we believe we hear a cicada sound, then perhaps a pictogram of a cicada will illustrate that this is indeed a real world referent for the listener (Figure 1). On the other hand there is no (simple) pictogram for mains hum[3] – so perhaps use the written phrase (Figure 2).

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[3] Of course other electrical symbols might be useable.

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Thus an example from a fixed media acousmatic tradition – *Hot Air* by Jonty Harrison – is rich with real world references 'feeding back' into the more musically abstract discourse[4]. Its salient features and hence vocabularies of description reflect this wide range.
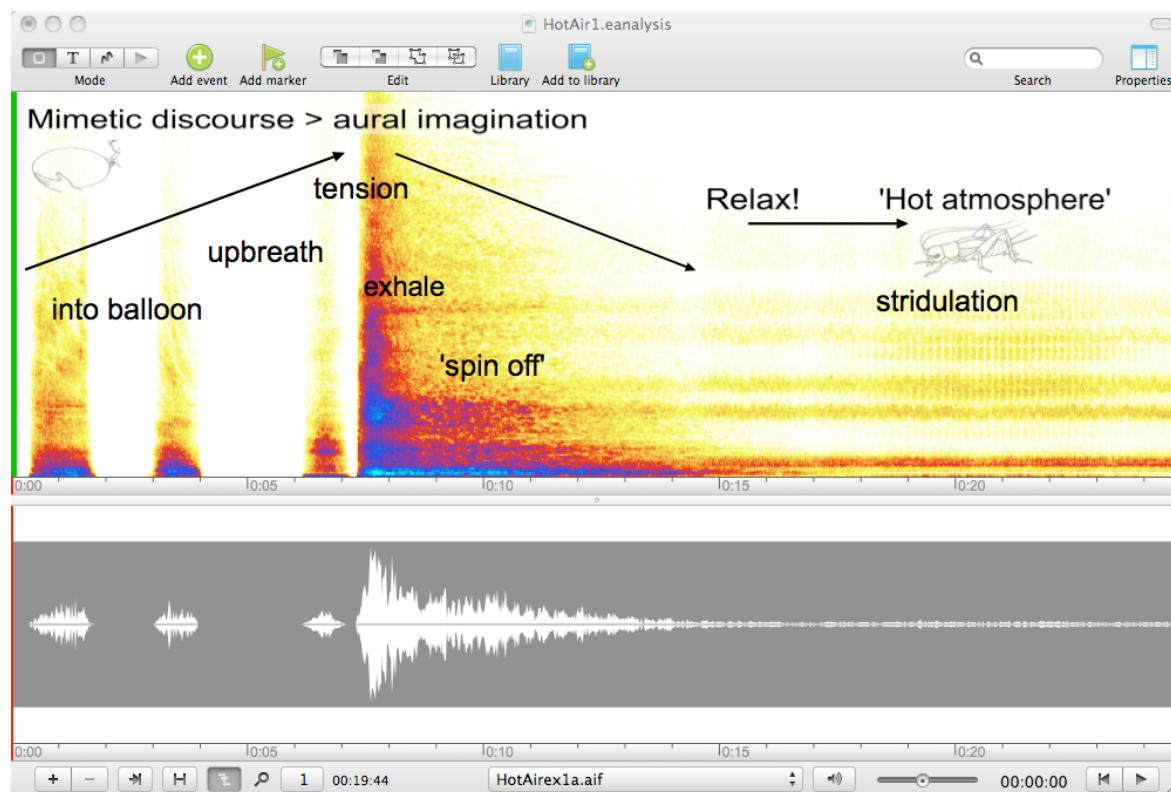

Figure 1: Jonty Harrison – *Hot Air* (opening)

The glitch work *Cyclo (C2)* by Ryoji Ikeda and Carsten Nicolai is centred on technological artefact. The hum, spark sounds and glitches have extraordinarily characteristic spectra quite unlike the natural environmental sounds of the Harrison. We can also easily extract the rhythmic articulation and the 'call and response' patterns within the motifs. Sounds originally associated with 'breakdown' or 'failure' are now commonplace and have migrated to other genres and sites of practice.

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[4] This would be described as a 'balance of aural and mimetic discourse' in Emmerson (1986) and as 'expanded listening' in Harrison (1996).

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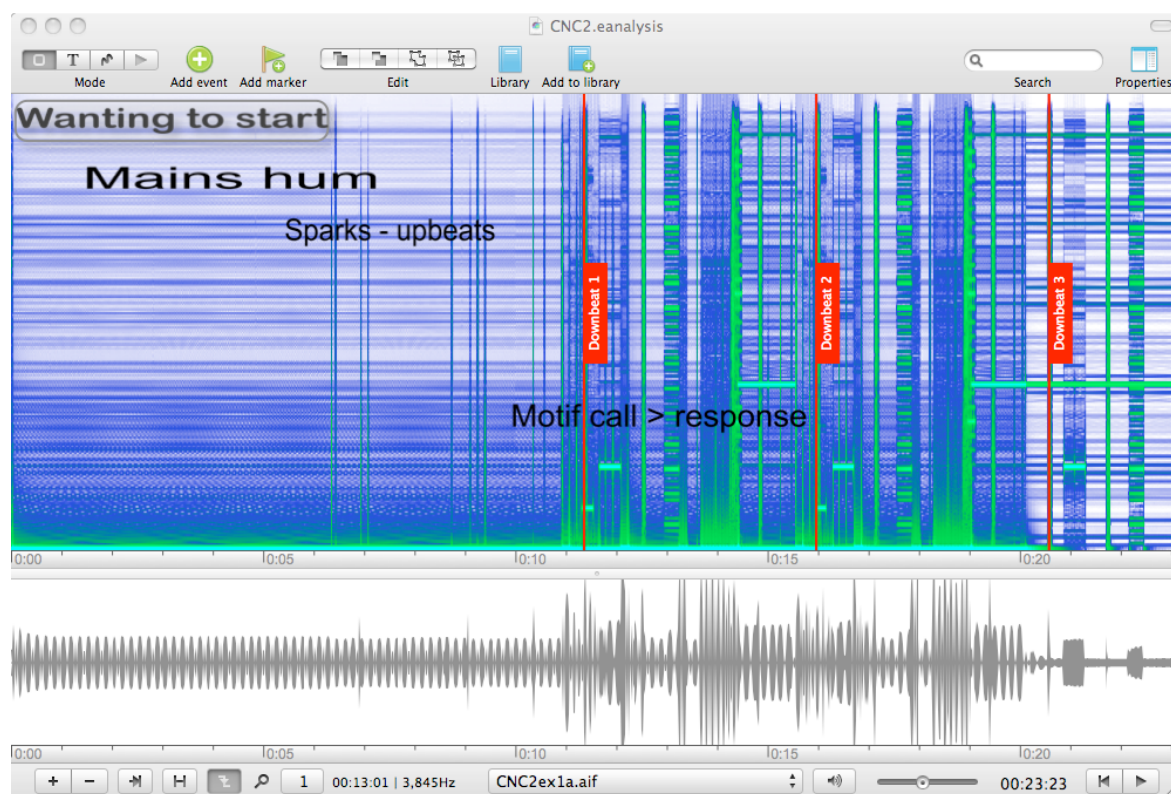
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Figure 2: Ryoji Ikeda and Carsten Nicolai – *Cyclo (C2)* (opening)

Applying the four-part question and the template

In this brief section a few examples related to the four-part question and its template are proposed. Firstly it is demonstrated that one might look into a number of intentions for one piece or genre and, conversely, that one might use one tool for different genres. This is followed by a list of points related to the question of genre-specific issues related to sample-based music. The section concludes with a short description of Landy's planned analysis for the project book and how it relates to the four-part question. Of course, an analysis may include investigations of many aspects. One might consider analyses involving three *intentions for one piece* – investigating the relationship between order/disorder and narrative discourse, the relationship between layering and simultaneities or the relationship between source identification and structure in the same work. One could apply *a single tool across three dissimilar genres*. One might consider investigating sound recurrence and variation through sound spotting in an acousmatic, a lower case or a sound artwork.

In other words, there is in general no isomorphic relationship between intentions, tools and genres. Nonetheless, there are certain intentions that are more relevant to some genres than to others. Let's look at *sampling culture* to exemplify this. Which tools/approaches are of particular importance to this body of music? In some cases they take on a specific importance, even though they might be of relevance to other genres. In other cases, they are of particular relevance to the genre, itself.

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Which (types of) sources?
How are they treated? (e.g., with respect, ironically)
Are they used legally?
Have they been modified? If so, to what extent are they still recognisable?
What role do they play in the work/performance?
How have they been integrated into the composition/performance?

In particular the second and third questions above are specific to sample-based music. The others are more generic but take on a special function in many such works. A list related to any other electroacoustic genre or category might look quite dissimilar to this one.

Taking this example one step further, Landy plans to analyse a sample-based work for the book. The work, Trevor Wishart's *Encounters in the Republic of Heaven* (2010, discussed in Wishart 2012) is a large-scale eight-channel piece from which one section of one act has been chosen. Looking at the four-part questions, the answers would be: an analysis for children of the age group 11-14 investigating the section *Children's Stories II* from the piece using EAnalysis for graphic representation, segmentation, structure and identifying other salient details with the intention of making a sample-based work attractive and comprehensible to new listeners.

As the analysis is to be published soon, only its plan of attack is to be sketched here. A few starting points need to be made immediately. As this work uses recordings of voices from Northumbria (NE England) as its source material, the question: can one make music from speech, is the starting point of this presentation. Let's not forget that young people know about the use of speech in music, for example due to rap's continuing prominence. A story-telling approach, as opposed to a fairly dry list of details, will be used to sustain the children's interest. Just to name one example, one can ask whether the pitches generally produced by the speaking voice are largely chromatic, just like the keys of the piano. This unexpected question can be easily demonstrated to produce an affirmative answer and subsequently referred back to once they have heard the piece and note how many words fit this way. To get the ball rolling the difference between contextual and musical listening will be introduced as both play a significant role in this piece.

After introducing the composer and his interest in the voice and extended techniques related to the voice as well as his interest in text-sound composition, a link can be made to today's sampling culture, something most young people will be aware of in one form or another. The background of the piece is introduced, as is one remark that the composer has shared that has to do with his interest in discovering harmonic, melodic, rhythmical and spectral characteristics of the recorded voices and developing these qualities musically. This forms something important to hold on to in this piece; the texts used are another important navigation tool. Furthermore, the ages-old concept of theme and variations is discussed as this plays a major role in this movement of some $2_{1/2}$ minutes, an excellent duration for the age group. The piece is played without and then with the visual representation, and details can be discovered by all present in a classroom; these analytical details are to be introduced in the book chapter. All of the aspects in the list of questions related to sample-based music will be returned to, as will many of the items listed on the template including Wishart's relatively simple spatialisation of this section of his work. Thus understanding, appreciation and adventure by secondary students are the combined intended outcome of this analysis.

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Outcomes

OREMA *(Mike Gatt)*

The Online Repository for Electroacoustic Music Analysis (http://www.orema.dmu.ac.uk/) was not predicted with the original application to the funding council and is an initiative which has emerged as part of research student Mike Gatt's contribution to the project.
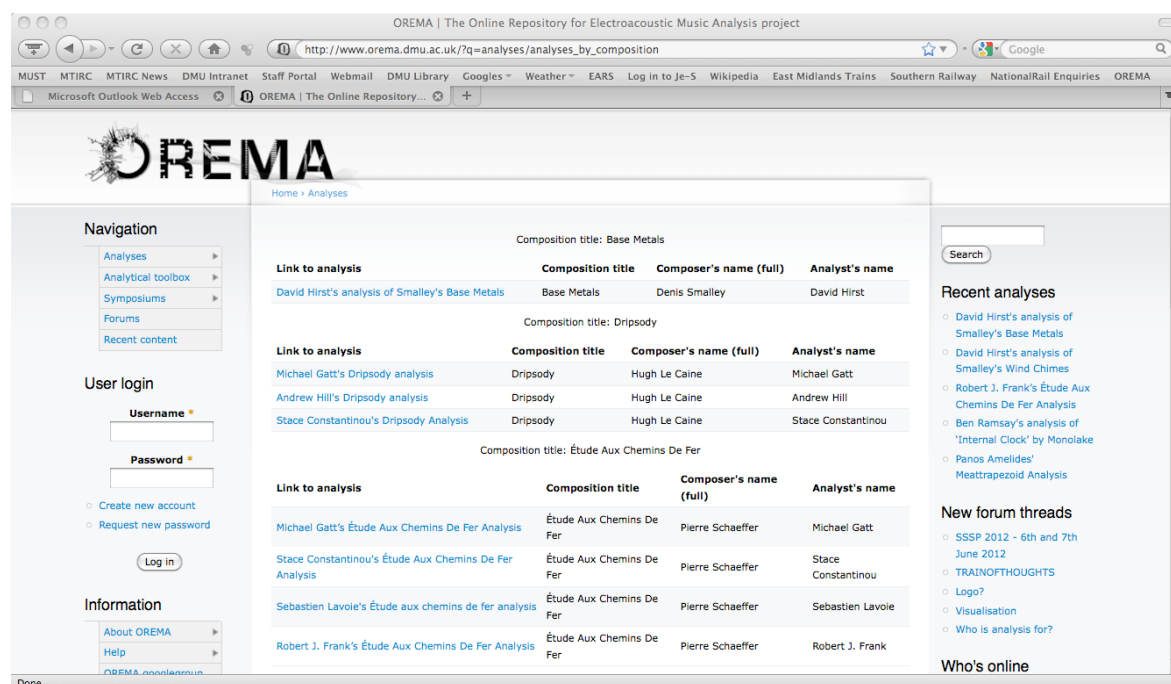

Figure 3: *OREMA* front page (Mike Gatt)

One of the main aims of the site is that analysis may be created within a community, not by an individual addressing a group. The content is generated through sharing analyses, subsequent discussion and modification of ideas. Analyses can thus evolve within the community.

EAnalysis *(Pierre Couprie)*

The *EAnalysis* programme has been presented separately at EMS12. It aims to bring together ideas from a range of representation, evocative transcription, – both visual and through the use of existing vocabularies. Eventually sorting and a degree of data manipulation. The working method is designed to be 'fed' from the team's toolbox analysis and the *OREMA* project. The outcomes of the three Project Symposia hosted at De Montfort University in 2011-2012 are also influential in all these outcomes and will result in a substantial number of the book contributions.

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Book (under negotiation with CUP) – 'Expanding the Horizon of Electroacoustic Music Analysis' (eds. Simon Emmerson and Leigh Landy)

Part 1 – the genres & categories of electroacoustic music and its analysis (Emmerson and Landy);

A substantial expansion and elaboration of what has been presented here, with many more examples of analytical procedures for a wide range of genres and categories. What are the most appropriate for each? What salient features must be addressed?

Part 2 – selected chapters regarding issues related to EA analysis that can potentially contribute to the toolset or its future development (multi-author);

A range of contributors address some of the high-level questions of analysis – such as mental processing, machine assistance, community-based analysis.

Part 3 – commissioned chapters: analyses of key works in a wide range of genres (multiauthor);

Works from a wide range of practices including acousmatic and mixed music, live electronics, installation, improvisation, audio games and sampling culture will be analysed.

(No) Conclusion

Open ended – the research aims to open doors to new futures and we anticipate further development of the software and of the OREMA community after the conclusion of the project funding in September 2013.

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