**RESEARCH INTEREST**
Application Form to study for a Postgraduate Research Degree
Lewis Sykes - May 2010

*Brief title for your proposed programme of research*

The Augmented Tonoscope: Towards the Artistic Representation of Modal Wave Phenomena through the Construction of a Hybrid Analogue and Digital Visualisation Device.

*Your reasons and purposes for undertaking this project (100 words)*

The early abstract filmmaker Walther Ruttmann predicted that a “new, hitherto latent type of artist would emerge, approximately half-way between painting and music.” The Augmented Tonoscope is an instrument inspired by this foresight – a contemporary version of the sound visualisation device first built and coined the ‘tonoscope’ by Cymatics researcher Dr Hans Jenny in the 1960s.

The project is motivated by my interest in the convergence of art and science and a fascination with the relationships between visual and acoustic phenomena. It builds upon my MA and subsequent practice in creating technologically transparent, interactive, visual and aural virtual environments - while exploring the complexities that underpin them. Ultimately I intend to use it to produce a series of works for installation, live performance and screening.

(125 words)

*Your research project (500 words)*

• **The research problems or questions you intend to address.**

The Augmented Tonoscope will address the question:

• How far can artistic investigation into modal wave phenomena – also known as Cymatics - develop a deeper understanding of the physical nature and elemental properties of sound?

The physical instrument will be a minimalist ‘objet d’art’. Its analogue output will be captured and analysed and then projected and superimposed with meta levels of informational data, interpretative content and artistic representation derived from a secondary but integrated virtual system - an emulated tonoscope. In combination they will create an augmented device where real and virtual outputs interplay and are artistically analysed and treated.

• **The research context in which those problems or questions are located.**

There is an active UK and international community of researchers and practitioners exploring the relationship between sound and image e.g. “Seeing Sound”, 19-20 Sept 2009, Centre for Musical Research, Bath Spa University:

• Jan Meinema and Dan Blore (2009); Dr Mick Grierson (2008)

The study of modal phenomena has a long and rich history and a significant body of theory and empirical evidence:

• Dr Hans Jenny (1967, 1972)
• Ernst Chladni (1787).

This has inspired contemporary research into Cymatics as a means to reveal a deeper understanding in areas such as acoustics, musicology and spatial form:

• John Stuart Reed (2000)
a wide range of contemporary artistic output:
• Thomas McIntosh - *Ondulation* (2002),
and software and creative coding modeling its effects and manifestations:

• *The particular contribution to knowledge and understanding in this area that you hope to make.*

My proposal is unique in the field in combining the analogue and digital domains. I believe there is significant potential to provide new insights and understanding, which can only be addressed by designing and building a new hybrid device.

I plan to share my study with the research and wider communities through an ‘open source’ modus operandi – making all aspects of my research freely available under a Creative Commons license.

• *The research methods and critical approaches that you plan to use to address the problems or questions you have set.*

I plan to draw from the model of research methods and critical approaches developed through the PaR initiative.

I intend to keep a research journal via a WordPress blog – with documentation including a physical and digital sketchbook, photography, video and audio - showing how the various aspects of my study inform one another through the ‘categories’:  
• complementary writing; critical reflection; documentation of process; artistic outputs; and review and feedback.

The practice itself will be the most substantial evidence I submit though I will also produce an ‘evidence box’ of materials which makes the research context manifest.

• *The sources that you will use, if appropriate.*

I require:
**Ongoing**  
*Studio & Workshop*
• space and fabrication facilities  
*Materials & Equipment*
• ongoing material costs/essential equipment costs  
*Research*
• attendance at relevant conferences etc.  
• exchanges with research centres  
• subscriptions to relevant journals  
*Supervision*
• split the annual supervisory time with an external supervisor’s institution  

**Occasional**  
*Access to Expertise, Equipment & Facilities*
• relevant areas within the University  
• a licensed CymaScope  
• high quality sound generation equipment, still/video cameras and post production facilities, music recording studio  

It’s unlikely that MIRIAD and MMU will support all my needs. Luckily years of freelance and contract work have practiced me in being adaptable and making creative use of limited
• How the project will develop over the period of study.

I see the project developing through the following key stages – with several running in parallel:
• devise key frameworks for the research;
• establish a solid foundation of complementary writing;
• build a series of experimental analogue tonoscopes;
• summarise the physical laws and underpinning mathematics;
• collate existing software and open source code;
• curate relevant artistic visualisations;
• develop a series of virtual tonoscopes;
• augment the analogue with the virtual;
• develop exhibitable works.

Throughout the research I intend to:
• build in quarterly intervals of critical reflection;
• schedule annual previews of work-in-progress and invite professional peer review;
• seek opportunities to exhibit work-in-progress and present papers.

(620 words)

Training and preparation (100 words)

I am a longstanding graphic/interaction designer, digital media producer, music technologist and musician.

My practical knowledge has been grounded and informed by critical theory through an MA Hypermedia Studies, University of Westminster, 1999-2000. Research into the political economy of music and the early computer art movement and practical work developing a real-time sound and visual engine led to me coordinate Cybersalon (2002-2007) – a “community of interest” engaged in digital practices and theories; Cybersonica (2002-present day) – an annual celebration of music, sound, art and technology; and my own evolving art practice in the publically funded, collaborative projects The Sáncho Plan (2005-2008) and Monomatic (2007-present day).

(104 words)
Brief title for your proposed programme of research

The Augmented Tonoscope: Towards the Artistic Representation of Modal Wave Phenomena through the Construction of a Hybrid Analogue and Digital Visualisation Device.

Your reasons and purposes for undertaking this project (100 words)

The early abstract filmmaker Walther Ruttmann predicted that a “new, hitherto latent type of artist would emerge, approximately half-way between painting and music.” (‘Malerei mit der Zeit’ (c. 1919), in Film als Film, eds. Birgit Hein and Wulf Herzogenrath, Stuttgart, 1977).

The Augmented Tonoscope is an instrument inspired by this foresight – a contemporary version of the sound visualisation device first built and coined the ‘tonoscope’ by Cymatics researcher Dr Hans Jenny in the 1960s.

The project is motivated by my interest in the convergence of art and science and a fascination with the relationships between visual and acoustic phenomena.

More fundamentally, it is derived from “the acoustic and visual interplay as it has developed and has been artistically analysed and treated since the early 20th century” but with unprecedented potential because “the development of electronic and digital media has enabled a previously unimagined complexity in the coupling of images and sound” (Stella Rollig & Dieter Daniels, Preface to the catalogue of the exhibition at the Lentos Art Museum, Linz - See This Sound: Promises in Sound and Vision, Walther König, Köln, 2009).

It builds upon my MA and subsequent practice in creating transparent, interactive, virtual visual and aural environments - while exploring the complexities that underpin them. Ultimately I intend to use it to produce a series of works for installation, live performance and screening.

Your research project (500 words)

• The research problems or questions you intend to address.

Oskar Fischinger, the seminal experimental filmmaker, believed his synthetic sound production experiments held extraordinary potential for the future of musical composition and for sound analysis.

Encouraged by this sentiment I consider that the Augmented Tonoscope will address the question:

• How far can artistic investigation into modal wave phenomena – also known as Cymatics - develop a deeper understanding of the physical nature and elemental properties of sound?

All of my faculties will be brought to bear in an effort to implement a process of practical, experimental and iterative design to craft a sonically and visually responsive hybrid analogue and digital instrument.

The physical device will be a minimalist ‘objet d’art’. Its analogue output will be captured and analysed and then projected and superimposed with meta levels of informational data, interpretative content and artistic representation derived from a secondary but integrated virtual system - an emulated tonoscope. In combination they will create an augmented device where
There is an active UK and international community of researchers and practitioners exploring a broad range of multimedia work highlighting the relationship between sound and image - including Cymatics – illustrated through the informal two-day symposium “Seeing Sound”, 19-20 Sept 2009, Centre for Musical Research, Bath Spa University and featuring related research and practice:


The study of modal phenomena has a long and rich history and a significant body of theory and empirical evidence most notably:


with significant predecessors including:

- Robert Hooke’s observation of nodal patterns on glass plates (1680); Ernst Chladni - *Discoveries in the Theory of Sound* (1787); Lord Rayleigh - *Vibrations of Plates* chapter in his major treatise *The Theory of Sound* (two volumes -1877,1878); and Margaret Watts-Hughes invention of the Eidophone (1885).

This has inspired contemporary research into Cymatics as a means to reveal a deeper understanding into areas such as acoustics, musicology, and spatial form:


and software and creative coding modeling its effects and manifestations:


The particular contribution to knowledge and understanding in this area that you hope to make.

My proposal is unique in the field in combining the analogue and digital domains.

I believe there is significant potential in the real-time, dynamic and aesthetic interplay between audio and augmented visual outputs to provide new insights and understanding into the effects and manifestations of sound and vibration which can only be addressed by designing and building a new hybrid device.

By locating my research within an Art & Design context I intend to combine an inventive use of technology with a stronger sense of artistic control and integrity.

I see a strong corollary with the work of early experimental filmmakers - Oskar Fischinger, Len Lye and Norman McLaren – and early computer artists – John & James Whitney – and their artistic explorations into sound and vision using the technology and mediums of their time.

I plan to share my knowledge and insights with the research and wider communities through a
decidedly ‘open source’ modus operandi – making my own evolving tool set, methodology, code and software, electronic and design schematics, documentation and outputs freely available under a Creative Commons Attribution-Noncommercial-Share Alike license and thus adding rich aspects to the field.

I’m excited by the creative and technological challenges; of extending my own and others knowledge; and in adding to the rich history of work in this area.

• The research methods and critical approaches that you plan to use to address the problems or questions you have set.

I intend to draw significantly from the model of research methods and critical approaches developed through the PaR initiative.

By specifying a clear research enquiry at the outset succeeded by attention to and dialogue with the process of my art practice I aim to encourage and reveal research imperatives and significance, original insight and distinct and discreet approaches to the curation and dissemination of knowledge.

I plan to work within the following documentation methods over the course of the project:
• a physical and digital sketchbook - via tumblr.com
• photography - via flickr.com
• video - via vimeo.com
• audio - via soundcloud.com

I intend to keep a research journal via a WordPress blog - showing how the various aspects of my study inform one another through the clearly structured ‘categories’ of:
• complementary writing - locating my praxis in a lineage of similar practices and relating and referencing my specific inquiry to broader contemporary debate;
• critical reflection - making my embodied ‘performer knowledge’ explicit - comparing and contrasting other work, finding resonance between my research and contemporary debates, offering new insights into the conceptual framework and theory implicated within my practice;
• documentation of process – recording evidence of my ongoing practical, experimental and iterative design including tool sets, methodology and outputs, capturing moments of insight and happy accident;
• artistic outputs - demonstrating rigour in respect to the imaginative creation, thoughtful composition, meticulous editing and professional production of new artwork;
• review and feedback – presenting evidence of professional peer review and limited data gathering through structured interviews with select audiences

The practice itself will be the most substantial evidence I submit though I will also produce an ‘evidence box’ of materials - drawn from my documentation and complementary writing - which makes the research context manifest and is deemed to assist the sub-panel.

• The sources that you will use, if appropriate.

I require the following sources and materials:
**Ongoing**
**Studio & Workshop**
• studio space - ideally soundproofed
• workshop and fabrication facilities
**Equipment & Materials**
• ongoing material costs - solenoids, transducers, piezo sounders, cone and flat panel
speakers, amplifiers, lighting, LEDs, acrylic, electronics etc.

- essential equipment costs - hi-spec MacBook Pro, compact digital mixing desk, self-powered audio reference monitors, data projector, specialist workshop and fabrication tools

**Professional Research**

- attendance at relevant conferences, symposia and festivals
- exchanges with UK and international research centres
- subscriptions to the Computer Music Journal and Leonardo Music Journal

**Supervision**

- confirmed agreement to split the nominal 30 hours of annual supervisory time with an external supervisor's institution – specifically Dr Mick Grierson, Digital Studio, Goldsmiths College, University of London

**Occasional Access to Equipment, Expertise & Facilities**

- relevant areas of expertise within the University e.g. defining a design process, physical modeling
- a licensed CymaScope via the University or research partner
- high quality sound generation equipment - signal generators/crystal oscillators
- high quality still/video cameras and post production facilities
- music recording studio

It is unlikely that MIRIAD and MMU will provide access to all the sources I require and support all my material needs. Luckily years of freelance and contract work has practiced me in being adaptable and making creative use of limited resources – so I'll manage with what I’m offered - and find ways to supplement and realise my research through the Studentship, additional small grant applications and opportunities that present themselves through my extensive network and knowledge of community facilities.

- **How the project will develop over the period of study.**

"Designing is not so much a process of careful planning and execution as it is a conversation, in which the conversing partner - the designed object itself - can generate unexpected interruptions and contributions. The designer listens to the emerging design, as well as shapes it." (Bringing Design to Software, ed. Terry Winograd, Addison-Wesley, 1996)

While noting Terry Winnograd's advice I see the project developing through the following stages – with several running in parallel:

- devise key frameworks for the research - the design process, critical reflection, journal and documentation;
- establish a solid foundation of complementary writing - locate my praxis in a lineage of similar practices and relate and reference my specific inquiry to broader contemporary debate;
- join and make active contributions to relevant online communities - such as the Cymatics community site http://www.cymatics.co.uk/ and the School of Cymatics - http://cymatics.ning.com/;
- experiment with the CymaScope - learn from its functionality and behaviour;
- build a series of experimental analogue tonoscopes - iteratively refine their design to extend their responsiveness and define their aesthetic;
- summarise the physical laws and underpinning mathematics that describe the effects of sound and vibration;
- collate and explore existing software and open source code that models this behaviour
- prototype a series of experimental virtual systems based on the physical laws of modal wave phenomena;
- curate relevant artistic visualisations and explore the creative software employed - to inform the development and aesthetic of the virtual output;
• develop and experiment with a series of virtual tonoscopes that respond in a similar way to the analogue device but have the potential to have their output extended, bent and twisted;
• augment the analogue with the virtual - integrate the virtual system into the physical device to produce a meta level of informational, interpretative content and artistic representation;
• develop exhibitable works for performance, installation and screening.

Throughout the research I intend to:
• build regular quarterly intervals of critical reflection into the timeline;
• schedule annual previews of work-in-progress and invite professional peer review;
• seek opportunities to exhibit work-in-progress, make presentations and present papers at relevant artist and research conferences and symposia and in relevant journals.

Training and preparation

I am a longstanding graphic and interaction designer, digital media producer, music technologist and musician – and as a veteran bass player of the dub reggae fusion scene of the mid-90s well versed in the effects and manifestations of sound and vibration.

My practical knowledge has been grounded and informed by critical theory through an MA Hypermedia Studies, University of Westminster, 1999-2000. My MA research into the political economy of music and the early computer art movement and MA practical work developing a real-time sound and visual engine led to me coordinate Cybersalon (2002-2007) – a “community of interest” engaged in digital practices and theories based at the Institute of Contemporary Art (ICA) and Science Museum’s Dana Centre; Cybersonica (2002-present day) – an annual celebration of music, sound, art and technology; and my own evolving art practice most notably in the publically funded, collaborative projects The Sancho Plan (2005-2008) and Monomatic (2007-present day) - see attached project profiles and samples.