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

a PhD practice-led research project by Lewis Sykes
My Art Practice

- **MA Hypermedia Studies** - '99-'00
  - 2HYPM03 - Interactive Media Design
  - Groovatron - experiments with visual feedback

- **iRiealists/Dublab All Stars** - '01-'05
  - experimental interactive audiovisual works and visualisation for live performance - in Flash & Director

- **The Sancho Plan** - '05-'08
  - a progressive audiovisual collective who explore the realtime interaction between music and video

- **Monomatic** - '07-present day
  - a collaboration, experimental playground and halfway house of work with Nick Rothwell a.k.a. Cassiel - composer, performer, software architect, programmer and sound designer

- **blog.lewissykes.info** - '07-present day
  - my ongoing musings on sound, music, art and technology - increasingly in Processing and Arduino

- Builds on my existing work in exploring:
  - acoustic and visual interplay;
  - real-time interaction with virtual systems;
  - modelling real-world physics;
  - haptic and minimalist user interfaces.
My Art Practice

- **MA Hypermedia Studies** - '99-'00
  - 2HYPM03 - Interactive Media Design
    Groovatron - experiments with visual feedback

- **iRiealists/Dublab All Stars** - '01-'05
  - experimental interactive audiovisual works and visualisation for live performance - in Flash & Director

- **The Sancho Plan** - '05-'08
  - a progressive audiovisual collective who explore the realtime interaction between music and video

- **Monomatic** - '07-present day
  - a collaboration, experimental playground and halfway house of work with Nick Rothwell a.k.a. Cassiel - composer, performer, software architect, programmer and sound designer

- **blog.lewissykes.info** - '07-present day
  - my ongoing musings on sound, music, art and technology - increasingly in Processing and Arduino

- Builds on my existing work in exploring:
  - acoustic and visual interplay;
  - real-time interaction with virtual systems;
  - modelling real-world physics;
  - haptic and minimalist user interfaces.
My Art Practice

• MA Hypermedia Studies - '99-'00
  • 2HYPM03 - Interactive Media Design
    Groovatron - experiments with visual feedback

• iRiealists/Dublab All Stars - '01-'05
  • experimental interactive audiovisual works and visualisation for
    live performance - in Flash & Director

• The Sancho Plan - '05-'08
  • a progressive audiovisual collective who explore the realtime
    interaction between music and video

• Monomatic - '07-present day
  • a collaboration, experimental playground and halfway house of
    work with Nick Rothwell a.k.a. Cassiel - composer, performer,
    software architect, programmer and sound designer

• blog.lewissykes.info - '07-present day
  • my ongoing musings on sound, music, art and technology
    - increasingly in Processing and Arduino

• Builds on my existing work in exploring:
  • acoustic and visual interplay;
  • real-time interaction with virtual systems;
  • modelling real-world physics;
  • haptic and minimalist user interfaces.
My Art Practice

- **MA Hypermedia Studies** - '99-'00
  - 2HYPM03 - Interactive Media Design
  - Groovatron - experiments with visual feedback

- **iRiealists/Dublab All Stars** - '01-'05
  - experimental interactive audiovisual works and visualisation for live performance - in Flash & Director

- **The Sancho Plan** - '05-'08
  - a progressive audiovisual collective who explore the realtime interaction between music and video

- **Monomatic** - '07-present day
  - a collaboration, experimental playground and halfway house of work with Nick Rothwell a.k.a. Cassiel - composer, performer, software architect, programmer and sound designer

- **blog.lewissykes.info** - '07-present day
  - my ongoing musings on sound, music, art and technology - increasingly in Processing and Arduino

- **Builds on my existing work in exploring:**
  - acoustic and visual interplay;
  - real-time interaction with virtual systems;
  - modelling real-world physics;
  - haptic and minimalist user interfaces.
My Art Practice

- **MA Hypermedia Studies** - '99-'00
  - 2HYPM03 - Interactive Media Design
    Groovatron - experiments with visual feedback

- **iRrealists/Dublab All Stars** - '01-'05
  - experimental interactive audiovisual works and visualisation for live performance - in Flash & Director

- **The Sancho Plan** - '05-'08
  - a progressive audiovisual collective who explore the realtime interaction between music and video

- **Monomatic** - '07-present day
  - a collaboration, experimental playground and halfway house of work with Nick Rothwell a.k.a. Cassiel - composer, performer, software architect, programmer and sound designer

- **blog.lewissykes.info** - '07-present day
  - my ongoing musings on sound, music, art and technology - increasingly in Processing and Arduino

- Builds on my existing work in exploring:
  - acoustic and visual interplay;
  - real-time interaction with virtual systems;
  - modelling real-world physics;
  - haptic and minimalist user interfaces.
My Art Practice

- **MA Hypermedia Studies - '99-'00**
  - 2HYPM03 - Interactive Media Design
  - *Groovatron* - experiments with visual feedback

- **iRiealists/Dublab All Stars - '01-'05**
  - experimental interactive audiovisual works and visualisation for live performance - in Flash & Director

- **The Sancho Plan - '05-'08**
  - a progressive audiovisual collective who explore the realtime interaction between music and video

- **Monomatic - '07-present day**
  - a collaboration, experimental playground and halfway house of work with Nick Rothwell a.k.a. Cassiel - composer, performer, software architect, programmer and sound designer

- **blog.lewissykes.info - '07-present day**
  - my ongoing musings on sound, music, art and technology - increasingly in Processing and Arduino

- Builds on my existing work in exploring:
  - acoustic and visual interplay;
  - real-time interaction with virtual systems;
  - modelling real-world physics;
  - haptic and minimalist user interfaces.
My Inspiration & Motivation

- Art Practice

- Art Theory
  - "acoustic and visual interplay as it has developed and has been artistically analysed and treated since the early 20th century."
  - "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
My Inspiration & Motivation

- Art Practice

- Art Theory
  - "acoustic and visual interplay as it has developed and has been artistically analysed and treated since the early 20th century."
  - "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
Why Cymatics?

- **Cymatics** was pioneered by the Swiss scientist Dr. Hans Jenny, who published his first volume of *Cymatics - A Study of Wave Phenomena and Vibration* in 1967 and the second in 1972 - the year he died.

These works are a written and photographic documentation of the effects of sound vibrations on fluids, powders and liquid paste in which Jenny concluded, “This is not an unregulated chaos; it is a dynamic but ordered pattern.”
Why Cymatics?

- Cymatics was pioneered by the Swiss scientist Dr. Hans Jenny, who published his first volume of *Cymatics - A Study of Wave Phenomena and Vibration* in 1967 and the second in 1972 - the year he died.

These works are a written and photographic documentation of the effects of sound vibrations on fluids, powders and liquid paste in which Jenny concluded, “*This is not an unregulated chaos; it is a dynamic but ordered pattern.*”
Why Cymatics?

- Cymatics was pioneered by the Swiss scientist Dr. Hans Jenny, who published his first volume of *Cymatics - A Study of Wave Phenomena and Vibration* in 1967 and the second in 1972 - the year he died.

These works are a written and photographic documentation of the effects of sound vibrations on fluids, powders and liquid paste in which Jenny concluded, “This is not an unregulated chaos; it is a dynamic but ordered pattern.”

“The tonoscope was constructed to make the human voice visible without any electronic apparatus as an intermediate link. This yielded the amazing possibility of being able to see the physical image of the vowel, tone or song a human being produced directly. Not only could you hear a melody - you could see it.”
The Device

• I plan to build a minimalist and sonically responsive analogue tonoscope - a refined ‘objet d’art’ inspired in its design by high end audiophile turntables.

• Integrated within it will be an emulated tonoscope that will superimpose meta levels of informational data, interpretative content and artistic representation on to the analogue output.

• In combination they will create a unique augmented device where real and virtual outputs interplay and are artistically analysed and treated.

• Ultimately the device will produce a series of exhibitable works: live performance, installation and film.
The Device

- I plan to build a minimalist and sonically responsive analogue tonoscope - a refined ‘objet d’art’ inspired in its design by high end audiophile turntables.

- Integrated within it will be an emulated tonoscope that will superimpose meta levels of informational data, interpretative content and artistic representation on to the analogue output.

- In combination they will create a unique augmented device where real and virtual outputs interplay and are artistically analysed and treated.

- Ultimately the device will produce a series of exhibitable works: live performance, installation and film.
The Virtual System

- Existing software and creative coding modelling the effects and manifestations of Cymatics:

\[ \omega = \sqrt{\frac{k^2}{L_x^2} + \frac{n^2}{L_y^2}} \]

- Paul Falstad’s *Oscillations & Waves and Acoustics Java Applets*, - more than a dozen simulations of waves and vibrational modes

- I Am The Mighty Jungulator’s *3D Harmonium* - a digital update to the Victorian parlour toy built in MaxMSP

- Graham Wakefield’s *Chladni 2D and Chladni 3D MaxMSP/Jitter* emulators and Chladni in Cosm - an integrated collection of externals and abstractions to assist the construction of navigable, sonified virtual worlds using MaxMSP/Jitter

- Robin Hodgin a.k.a. Flight404 many Processing & Flash experiments exploring ferro/cymatic liquids.

- Karsten Schmidt – Toxi & PostSpectacular - his many interactive art & design works using code as primary design in Java and Processing.
The Virtual System

- Existing software and creative coding modelling the
effects and manifestations of Cymatics:

$$f_{min} \propto \sqrt{V \cdot \rho \cdot \omega^2 \cdot \frac{1}{l_x} + \frac{1}{l_y}}$$

- Paul Falstad’s Oscillations & Waves and Acoustics Java Applets. -
more than a dozen simulations of waves and vibrational modes

- I Am The Mighty Jungulator’s 3D Harmonium - a digital update to
the Victorian parlour toy built in MaxMSP

- Graham Wakefield’s Chladni 2D and Chladni 3D MaxMSP/Jitter
emulators and Chladni in Cosm - an integrated collection of
externals and abstractions to assist the construction of navigable,
sonified virtual worlds using MaxMSP/Jitter

- Robin Hodgin a.k.a. Flight404 many Processing & Flash
experiments exploring ferro/cymatic liquids.

- Karsten Schmidt – Toxi & PostSpectacular - his many interactive
art & design works using code as primary design in Java and
Processing.
‘Open Source’ Research

• I intend to ‘open source’ my accumulated knowledge and insights – 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.

• I plan 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.
‘Open Source’ Research

- I intend to ‘open source’ my accumulated knowledge and insights – 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.

- I plan 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.
‘Open Source’ Research

- I intend to ‘open source’ my accumulated knowledge and insights – 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.

- I plan 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.

[Creative Commons logo]
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. I feel similarly about the Augmented Tonoscope.

I see a strong corollary with the work of early experimental filmmakers and computer artists and their artistic explorations into sound and vision using the technology and mediums of their day.

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 believe 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.
Key Points

• 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. I feel similarly about the Augmented Tonoscope.

• I see a strong corollary with the work of early experimental filmmakers and computer artists and their artistic explorations into sound and vision using the technology and mediums of their day.

• 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 believe 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.
Key Points

- 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. I feel similarly about the Augmented Tonoscope.

- I see a strong corollary with the work of early experimental filmmakers and computer artists and their artistic explorations into sound and vision using the technology and mediums of their day.

- 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 believe 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.
Key Points

- 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. I feel similarly about the Augmented Tonoscope.

- I see a strong corollary with the work of early experimental filmmakers and computer artists and their artistic explorations into sound and vision using the technology and mediums of their day.

- 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 believe 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 Augmented Tonoscope
Towards the Artistic Representation of Modal Wave Phenomena through the Construction of a Hybrid Analogue and Digital Visualisation Device

a PhD practice-led research project by Lewis Sykes