

## DRAWING SOUNDS

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### **ABSTRACT**

What new perspectives might sonic thinking bring to design education? In this paper the authors describe a workshop, '*Swapping Senses*', supported by practitioners from sonic arts, music/voice and interior architecture, which reinterprets the psychoacoustic dimensions of sound. Recognising that the sonic realm is as important as the visual, the authors describe a process in which the eventual outcome is aural, rather than pictorial. Parallels are drawn with engineering and psychoacoustic aspects of products, and we define architecture as 'product prototype'. The paper offers an alternative and pedagogic counterpoint to data driven metrics and acoustics formulae applied to products and engineering analysis. The workshop allows student teams to experimenting over three weeks with sound in field trips, develop 'aural' observation skills, (an *aural eye*), and work with sound recording tools and software, (CuBASE). Experimenting with the sonic medium helps students re-assess dependency on visual outputs, develop spatially attuned sonic awareness of place, and extend the visual role of the CAD /IT lab into the territory of soundscapes. This exploration of sound helps students analytical and contextual framing of site, and encourages empathy for the sensory experience of users of design, and illustrates links with *multi-modal design*, the emerging field of *soundscapes*, and *experience design*.

*Keywords: soundscapes, multi modal, sensorial, CAD, empathy*

### 1 INTRODUCTION

Much of design education, remains rooted in the visual, rather than the sensorial or multi modal [1]. Many disciplines communicate through drawing, often seeking to enliven this by animation walk-throughs and bolted on sound bites. Whilst digital modelling and drawing offers a common currency from engineering to architecture, it is nevertheless a sensorially limited medium, frequently coded, exclusive (e.g. orthographic drawings), or predictable in its format, content and presentation. Products and environments inevitably have an sonic dimension, but the images we produce are effectively mute documents which seldom convey the actual aural impact and experience of those products, spaces and places. Designers need to become skilful in predicting the sensorial and experiential impact of the products, engineering and environments they create, and this requires a shift from visual dependency toward a sensorial re-reading and experimentation of design involving the sonic realm. Whilst the sonic aspects of products such as mobile phones, car interiors, architectural ironmongery or lawn mower may be pre-empted through jury panels, metrics and psychoacoustic strategies, what might be the sonic experience of an engineered bridge or building? How might we bring these issues into undergraduate education? *Swapping*

*Senses*, suggests a first step toward sensorial thinking for undergraduate design students. Thinking aurally within visual disciplines can invoke pause and reflection within the design process, helping students to reflect in action and challenge assumptions on digital skills, visual dependency and in this context, alludes to themes of slow design (2), and was as an aural CAD experience created to shift students into thinking critically about the fuller potential of digital skills whilst offering a counterpoint to previous lectures in sound and acoustics at Dundee. The workshop sought to explore what Kane describes as a *play ethic*, and offered eight student teams over a three week period, tasks which embraced risk and risked failure [3][4]. The workshop may be positioned conceptually with soundscapes studies at RMIT, Royal Melbourne Institute, in what Harvey described as *the aural eye*, describing how sonic experience can be considered alongside other visual /spatial /object /temporal contexts of architecture, products and engineering. Soundscapes represents an emerging interdisciplinary field in which a listener-centric and sensorially oriented design process challenges the ocular-centric, CAD obsessed nature of design education. Such projects allows educators to experiment with the acoustic potential of many CAD programmes, some open sourced, (Audigy), others inexpensive, (CuBASE), and affords interdisciplinary teams space to investigate the coincidences between design disciplines of art, design and architecture [5]. In our workshop *Swapping Senses*, students were invited to respond and represent a site visit and to explore sound beyond familiar metrics, decibels and reverberation times, and to explore sound as media, subject matter and presentation outcome through investigation, recording and editing of a soundscape based on a field trip. Such workshops relate directly to practice where Architects integrate the sonic through inclusive design principles to engage users, particularly for severely mentally and physically disabled users, areas for community dance and other contexts [6]. Similarly, product specialists have, for some years, been developing tools which evaluate and correlate between SQ, Sound Quality, users satisfaction, and products. An important factor in engineering has been the refinement of subjective perception techniques developed through psychoacoustic data collection. Psychoacoustics, which is a term applied equally, though more fluidly, by contemporary composers such as Steve Reich, sound artists, and engineers. Jury testing is a tool of psychoacoustics, in which users associate sounds of products with characteristics. Loudness scales and loudness tones developed in the US by Fletcher and Munson, and Churcher and King in the UK, led to computational algorithms metrics which, whilst precise also were context dependent, and helped predict human perceptions of sound and loudness, such as tests on human reaction to the invasive sound of aircraft measured in PNdB, Perceived Noise Decibels and Noise Exposure Forecasting techniques. Lyon points out that this concern for environmental and invasive impact of noise failed to predict public reaction to sonic booms, and suggests products have sound dimensions; *magnitude*, *annoyance values*, *amenity values* and *information content*, defined as SQ, Sound Quality, or the objective / subjective perceptual human response to the 'sound' of a product. Lyon suggests that SQ is the response of people to product sound and not metrics dependent. Sound perception are context and environment dependent: in industrial design and in architecture the sonic quality of a cheap car door, inexpensive hotel door closing, or the interior of cars, reveals how perceptive users are in distinguishing between quality products from poor quality goods. Similarly, new products which initially seek to emulate market leaders, (such as digital cameras simulating sonic shutters of 35 mm SLR cameras), suggest that some product sounds imitate existing sonic notes of market leaders, but new products which have no precedent in which to emulate, given time, can emit unfamiliar product

sounds which gradually gains acceptability. An intermediate strategy between a metric analysis and a perceptive judgement is ASR, Acoustic Sensory Profiles, and used an interdisciplinary audience of tuned-in specialists, musicians, psychoacousticians, recording engineers to respond to house hold products and natural non- product sounds to evaluate each sound using a lexicon of sonic terms to determine the best Acoustic Sensory Profile matched with the best physical metrics but Lyon suggests that there are limitations in sound metric space too..."*We can in fact record very precisely what is presented to our ears. But the cognitive processes that convert sounds to feelings and intelligence are not captured by calculations*". This need to embrace the subjective reaction to sound and challenge date driven reliance on objective sound metrics, allowed the authors to bring relevance into the *Swapping Sense* workshop by reassuring students that, whilst there were no metrics, there were merits in exploring broader aspects of sound. In keeping with the experimental approach the authors involved a choir master and classical musician to undertake a one day workshop in which students were exposed to the *listening* of, but not the analytical description of, a wide range of music: effectively, feeling the music. This feeling approach to designing stems from Pallasmaa, "*Sight isolates, whereas sound incorporates; vision is directional, sound is omni-directional. The sense of sight implies exteriority, whereas sound creates an experience of interiority. I regard an object, but sound approaches me; the eye reaches, but the ear receives. Buildings do not react to our gaze, but they do return our sound back to our ears*" [7]. The act of listening is the result of training mental perception, requiring focus and effort in filtering, sifting and attuning. The irony is that this training of focus (much like the mental visual process of design in selecting from a range of materials, ideas and solutions) is frequently missing from design education.

## 2 SWAPPING SENSES

The authors conceived *Swapping Senses* in response to an increasing need from to students to communicate their designs with more than just the conventional plans, perspectives and models, and realise visual projects in parallel with various other media. The conceptual sibling of this is film, but film is considered incomplete without its vital associate, sound. Students, having little training in film and no training in sound, present visual projects that, while demonstrating considerable proficiency and subtlety, take no account of the sonic content, or worse, apply inappropriate music as an afterthought. The workshops nurtured creativity and expand student understanding of the holistic nature of design thinking [7]. Knight-Mudie, generalising a cultural belief in the divorce of body and mind, particularly in the educational context, suggests that: "...*reason has been thought to be abstract and transcendent, independent of the limitations of the body, perceptual system and nervous system*" [12]. Educators need to incorporate issues of body and mind within our students educational experience. *Swapping Senses* can be positioned within spatial imagination research by Rendel at the Bartlett [9], and collaborative interactive research by Coyne in Edinburgh, [10] which examines the metaphor of *tuning* in relation to the transitory experiences we have from *non-spaces* of mobile shoppers and urban nomads. Coyne's work involves intimate artefacts from architecture, digital technologies and performance. However, the role of the imagination in *Swapping Senses* was to make connections that fed back into the interpreter modules, modifying the parameters by which they filter, even as they perceive. Conceptual rational and physical experiences, feeding into and informing each other are part of one process then, for educators to exploit. The implications that may be considered include: firstly, that perception and experience of physical design is multi-sensory; secondly, that

an individual's experience is always contextual- what Proust called *involuntary memory* and its recollection, and that these *memory triggers* can be as diverse as the individuals themselves. Finally, multi-sensory product branding plays an important part of product development.

### 3 MEMORY TRIGGERS

Working on the premise that memory triggers are activated between a minimum of two senses (that is, information from one sense in the present triggers a past sensory memory, or complement of memories, summoning an experiential impression), only one *additional* sense is required to alter perception and modify habitual responses. Moreover, the temptation to work with the whole complement of senses, while admirable, increases the risk of a drift in focus of practice, may confuse students/audiences/users/participants and offers a very wide pallet of options for sensory investigation. *Swapping Senses* was conceived as a way of promoting understanding of involuntary memory, unlocking a general perception of design and a specific perception of the physical site. Because of the challenging nature of introducing students to a medium out-with their experience, methods were considered to avoid confusion. Students had to negotiate certain dilemmas: the contradiction of drawing sounds. Staff reassured students by relating the task to concepts familiar to interior design students, such as *site analysis*. Collecting sounds was seen as collecting *sample materials* – albeit audio samples, and students were encouraged to think critically on sound and its relevance to practice, whilst noticing that whilst sound may not be expressed physically, neither can light or colour- each vital devices in the design of interior architectural environments. Students received basic software tuition to understand the mechanics of sound recording and manipulation, along with training in hardware. The project also allowed the authors to introduce the concept of *memory triggers* and *psychoacoustics*, (the phenomenon of phantom notes and melodies perceived by a listener – as employed by experimental composer Steve Reich in his musical compositions such as *Six Pianos* [11]). The phenomenon of psychoacoustics in digital audio theory, while linked, is not considered relevant to students at this stage though general concepts were discussed. Students were unfamiliar with sonic concepts out-with notions of decibels and reverberation in rooms, and were immediately challenged to compare their social engagement with contemporary music, to their weak understanding of sound. The process demanded that students were placed in small groups to first investigate a site, collect *audio samples*, then pairs to develop and edit together an audio response, and finally to produce an *auditory presentation*. A site-specific brief also reinforces the notion of *soundscape composition*, where audio taken from a specific place or context is used to modify the environmental experience of the listener [5]. Students were asked to consider the language they use to describe experience (the majority of which is often based on visual metaphor), and to be alert to the broad sensorial contexts, (usually absent from their traditional visual perspective). From the moment they begin their site investigation students are encouraged to recognise the vital mental tuning required to listen. It is silence, as much as noise, which matters.

### 4 SCULPTING SOUND

Training in the manipulation of sound was delivered, initially with open source software *Audacity*, then from year two, *CuBASE*, both non-linear editing software packages. Non-linear audio editing skills are transferable to the video packages used to compose rendered animations across a very wide sector of architecture, engineering and product

design. Crucially, both provide a visual representation of recorded sound, (akin to onomatopoeia in text), expressed in amplitude and time, so that the student was in a position to predict to audio output when altering their arrangements in real time. Initially, many students sought to visual sculpt their sound samples, but it was hoped that after hearing the effects of arranging their samples and altering the context, a sense of timing, texture and ambience would emerge. This tendency to *sculpt sound*, can be compared to the musical concept of octave equivalence, such as Schoenberg's atonal compositions, where the listener hears the same pitch of note differently depending on its context in the register. Curiously, this fascination with classical music and design is also evident in the Architecture work of Steven Holl who sought to sculpt architecture in response to the synaesthetic composer Bella Bartok. In the first year, students worked entirely in the audio realm, though were able to apply limit visual elements, though all students were asked to keep a record of thought processes and ideas in sketch-books. Students began to use the visual content they had recorded along with the audio (still and moving images). For a number of students, audio recording was achieved using the microphone input of video cameras, so that the resolution for many was closer to that of a short film than a purely audio response. However, some projects included work that had no visual content at all, including one piece of music. One student group, struggling with their recorded material, utilised the notion of using the absence of sound as the basis for their response, presented through headphones with a booklet of visual hints, which unfolded and refolded by the audience/participant. The experimental composer Steve Roden describes this as *Lowercase Sound*, where the subtle insinuation of sound and in particular, the silences around them are deliberately evoked. From a historical context, the *Swapping Sounds* workshop relates to other team exchanges and creative collaborations; for example, the paintings of Schoenberg and his influence on Kandinsky; the musical transcripts of John Cage; the phenomenon of synaesthesia; the experimental architecture and installation of Daniel Libeskind; the sound work of international installation artists Dalziel and Scullion. If, as Knight-Mudie suggests, the body and mind are to be considered extensions of one another, the conceptual (mental) parallel of the physical (body), sound and vision should no longer be limited to a metaphor term but be interconnected elements of value to visual design disciplines. The aim of *Swapping Senses* was not to encourage learning of this metaphor, but the extension of *practice*. Here sound is not the parallel of design; it *is* the design and practice. Schoenberg's octave equivalence for music, (where the tonal significance of repeated notes is altered by its notated context), can be used to add meaning to acoustics, sound and reverberation, previously delivered in rather abstract lectures. Although there are practical restrictions on how and where students could realise their final outcome, (for example, outcomes had to be presented to the whole group in some form), the brief affords free interpretation of expression. This has lead to a variety of installations, listening posts, multimedia projections and speakers, small screen and headphones, performances, construction of booths. The core of the project was to open the mind to be as aware of the sensorial possibilities of design and develop acoustic grammar.

## 5 CONCLUSION

*Swapping Senses* offers an alternative to data driven acoustics metrics which enhances students' sensorial, creative and mental processes. It develops spatial imagination through experimentation with sonic software, and offers a counterpoint to visual output. The sonic metaphor of *tuning* develops the *aural eye*, and aids reflection and

observation. It enables deeper engagement of sound, manipulated using open source software, and challenges students' expectations of how and in what manner they engage with the digital in the real world.

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