Many Makings: Entangling Publics, Participation and Things in a Complex Collaborative Context

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ABSTRACT
Empirical sociological and critical-reflective accounts of technology in action show how the design, development and use of interactive systems involves complex, changing configurations between participants, materials and the objects of design. Such observations make many rationalistic and normative accounts of design highly problematic (e.g. that design is essentially problem solving). Our work goes beyond such critical points and investigates practical strategies for managing complex projects that do justice to the entangled character of practice whilst enabling a high level of creative productivity. We report on a long-term collaboration between micro-businesses, artists, researchers, their institutions and their publics to create media, installations, performances, and participatory workshops. We document the range of design work that we were able to achieve and discuss a number of the challenges we encountered. We conclude by critically discussing several orientations to design research against our emerging image of design as 'many makings'.

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Participation, creativity, things, publics, making, design.

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous;

INTRODUCTION
Diverse researchers and makers are increasingly drawing on art and design traditions to inform their contributions to the creation and conceptualization of digital artefacts. This influence can be noted not so much in the high quality with which artefacts are finished but more profoundly in terms of how the research process unfolds, how varied materialities are articulated, and how users (or perhaps more appositely, publics) are engaged with. For some writers [e.g. 4], this amounts to a Third Wave of HCI and presents radical challenges to existing research methods and what counts as the accumulation of knowledge [16]. For many researchers, design-led research can offer no less than a reorganization of the relationships between theory and practice, knowledge and value, doing and thinking.

To underline the strong implications of design-led work, Gaver [16], Bowers [6] and Ehn [10], to give just three examples, draw on contributions to the philosophy of science and the sociology of science and technology [e.g. 1, 13] to point to the entangled character of creative work, where any element (human or non-human) can come to have agency in complex configurations or 'networks' (cf. Latour [23]) in ways which can challenge traditional strictures for 'method' or standards for knowledge.

In a similar vein, [28] draw on Ingold's [19] anthropological writings to query concerns (e.g. in HCI) for the production of commodity-like, technological 'objects'. Instead, they advocate a concern for what they call 'data-things', where artefacts are tied to the conditions of their making and, through this, come to have value and personal significance for their users. To speak of 'things' (sometimes capitalised as 'Things') or 'networks' or 'entanglements' (see Barad [1]) or 'meshworks' (see Ingold [19]) is to draw attention to the embeddedness of artefacts in the complex socio-material conditions of their making and to resist simplistic ideas of technologies, their capacities and effects.

Acknowledging the complex entangled nature of design work is one thing, however it is another to do design in ways that attempt to capitalise on these observations in characteristic, idiomatic ways. Put differently, it is one thing to draw on empirical studies of science and technology and contributions to philosophy *critically* or *analytically*, it is another to go beyond such understandings and *prospectively* and *productively* formulate and enact new ways of doing. Social studies of technology (like Latour's [24] on proposals for a rapid transport system or Pinch and Bijker's [30] on the social construction of the bicycle) document the work of designers, engineers and technologists who are not themselves informed by the same sociological and philosophical positions as those who study them. But we are so informed. So a challenge emerges to formulate reflexively mindful ways of working which regard the contingent entanglements we find ourselves enmeshed in as a set of creative resources for design, rather than constraints on creativity or obstacles to be overcome.

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In a series of related works [e.g. 3], Binder, Ehn, Wagner, de Michelis, and their colleagues have offered a programmatic presentation of what they call 'design Things'. For these writers, a shift of perspective is required from 'projects' with their typical logics of 'analysis', 'design', 'construction' and 'implementation' to *infrastructuring*, where, instead, a bringing together of a collective of human and non-human elements is variably, flexibly and "performatively staged" [5, p104]. Design Things are seen to emerge in such stagings and be available to multiple publics and hence participate in controversies as 'matters of concern' [cf. 23] get debated. For Björgvinsson et al. [5], such a perspective extends traditional ideas of Participatory Design (as the range of agencies who could count as 'participants' or as 'stakeholders' is enlarged both practically and ontologically) as well as extending the temporality of both design and use. Björgvinsson et al. describe work conducted at Malmö Living Labs, founded in 2007 "to explore how subcultures could be enhanced with new media". The authors characterise themselves as in "a continuous match-making process" bringing together various participants to try out new media possibilities and, through this, to form more concerted project-like activity. In one example discussed in [5], a collaborative project emerged between a grassroots hip-hop community, a design organisation, the local public transport administrators and their contractors around a proposal for a 'Bluetooth bus'.

Prospecting Portfolios

Our work adds to this emerging corpus of studies which are mindful of contemporary work in the sociology of science and technology (and allied philosophical developments, e.g. [18]) and seeks to conceive of the entangled, materially heterogeneous, multiplicitous character of practice as a rich set of resources for design, rather than a complexity to be managed and overcome. We will shortly describe a long-term engagement we have had with a range of different actors which has been very flexibly thematised around joint concerns for history, urban life, and interaction with sound. This was the frame for our 'infrastructuring' [5]. To help us progress, we staged these activities by reflecting on a recent contribution to the design literature.

Bowers and Gaver [6, 14] proposed Annotated Portfolios as a way to communicate the summative implications of a collection of related design work by charting the similarities and differences within the collection—its patterns of family resemblance—in order to speak to the concerns of various publics (including research communities). For these writers, the annotations and the artefacts they annotate have an entangled, indexical, mutually informing character. Bowers [6] thinks of Annotated Portfolios as an approach to documenting design research which is mindful of the entangled character of design, and resists forms of abstract 'scientistic' theorising which designers might find alien.

An Annotated Portfolio, however, is a summative affair. In the available published examples [e.g. 6, 14], an Annotated Portfolio is made on the basis of already complete work. While its orientation is consistent with the entangled image of design that we have been working with, it does not alone give us the prospective and productive orientation that we are seeking. Accordingly, we asked ourselves how we might *prospectively* and *productively* derive inspiration from the concept of an Annotated Portfolio. We can anticipate that our infrastructuring work (in the sense of [5]) will lead to a range of related emerging things. Indeed, the fact that work can be analysed as a portfolio recognises its supra-project, infrastructural character. How, then, might we orient our work so as to promote its potential portfolio character and the salience of its sense-making annotations (to us, to our collaborators, to the research communities we participate in, etc.)? At the outset of our work, we did not have definitive answers to this question but we sought a way of working: which encouraged emerging family resemblances; which looked for connections, resonances and affinities and did not force any total integration; which accepted that the sense and significance of what was made was an immanent, emergent affair and could be considered from multiple perspectives; and which encouraged multiple material forms and performative formats so as to maximise the possibilities for use, further design or appropriation. In the next section, we describe how we put these orientations to work in a complex collaborative setting.

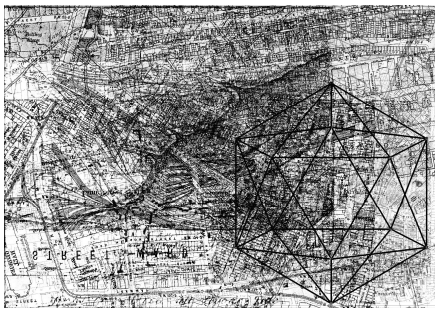

Figure 1: Promotional image for *Sound Spaces.*

SOUND SPACES: A CREATIVE COLLABORATION

We now describe *Sound Spaces,* a creative collaboration of which we have been part, to explore how such complex projects can be accomplished in ways which are mindful of the literatures, concerns and orientations to design and its things, publics and entanglements that we draw upon.

Sound Spaces was part of a four-year research programme within *The Creative Exchange* (CX) investigating how collaboration with arts and humanities academics can connect with small to medium enterprises (SMEs) in the creative and cultural industries. This wider programme has largely been undertaken via shorter (six-month, typically) collaborative projects between SMEs, academics and doctoral researchers. To enable such collaborations, CX's sponsor (the UK's Arts & Humanities Research Council) provided funding to release participants from their typical academic or business responsibilities and hence spend time on activities related to research.

Although *Sound Spaces* was funded in this manner, the formation of the collaborations we discuss cannot be ascribed to CX alone. And indeed, *Sound Spaces*' character rather differs from the project-oriented, goal-oriented character of much CX work. Further, specifying distinct start and end dates for *Sound Spaces* is difficult as the relationships and creative enquiries within it extend before and after any nominal project period. Rather, as is often the case with our endeavours, there were several concerns, relationships and opportunities that developed and entangled over time, and from which a number of collaborative projects emerged and were undertaken.

To describe *Sound Spaces* we shall characterise 'many concerns' that came into correspondence, 'many happenings' that enabled this correspondence and through which the creative collaboration was accomplished, and the 'many things' that were produced throughout. These descriptions cover a two-year period, with much of the creative work occurring during the last six months (and ongoingly at the time of writing). We begin by introducing the collaborating organisations and individuals.

Participants and Their Many Concerns

Sound Spaces was a collaboration between the authors (JB, SB, TS) at Newcastle University, the Foundation for Arts and Creative Technology (FACT), and microbusiness Kinicho. FACT is a non-profit media arts centre based in Liverpool (Merseyside, UK) seeking to engage the public through exhibitions, film, and participatory art and technology workshops. RM is FACT's research and innovation manager and was the main collaborator in *Sound Spaces*, although other FACT staff and volunteers became involved in some activities. Kinicho is principally SK a music producer, sound recording engineer, and composer who set up Kinicho ('kinetic audio') as a microbusiness within FACT. MW is a Musicologist also based at Newcastle University who, as we shall see, also had a formative role in the collaboration though was, perhaps, not so implicated in the making activities we engaged in.

However, it is important to recognise that *Sound Spaces* came into existence in the context of a mesh of prior relationships between the participants, and beyond into their own networks. In addition, all parties were bringing concerns to the collaboration, which in some cases involved long-standing preoccupations and accumulations of skill and achievement. All of these affairs 'pre-configure' the kinds of infrastructures that the collaboration might explore. Let us give a flavour of this.

Prior Relationships

FACT and Newcastle University were previously connected through earlier collaborations between FACT and the Culture Lab research group. FACT were also familiar with CX through previous collaborations with other partners in the programme. FACT also brought existing relationships with their publics. Kinicho/SK is part of a network of creative microbusiness and SMEs associated with FACT. Through this, SK has developed relationships with international artists through technical and creative support on their commissions. SK also brings a network of contacts from his work in music and sound recording.

Interactive Systems and Heritage

SB and JB had previously been involved in a research project involving the design of a mobile app for a heritage site. MW was interested in how virtual and augmented reality (VR, AR) could be used to visualise 'disappeared heritage sites.' When the possibility of a collaboration with FACT began to emerge, MW became enthused that some key sites in the city might be specifically interrogated.

Creative Practices

Collaborators brought their own creative practices and interests to the work. SK had a long-term interest in spatialised sound, including building systems to support the production of spatial sound recordings. This included his development of the Icosahedron Sound System (henceforth the Icosahedron) – an array of 20 loudspeakers and associated software that enables playback and spatial mixing in the third order ambisonics encoding format [12].

TS is an artist and musician interested in the materiality of sound and the relationship between maker and material. Drawing inspiration from acoustic ecology and electro-acoustic composition, his methods include field recording, synthesized sounds and live electronics, providing a wide scope for creative diversity. TS has actively engaged with people, places, archives and technologies as sources of creative material.

JB, in addition to being a design researcher, works as a musician and sound artist, creating sound installations and improvised performances with a mix of materials from digital sound processing, through electronic sound synthesis to self-made acoustic and amplified instruments. For JB, *Sound Spaces* was an opportunity for him to artistically combine these concerns with TS's interests in acoustic ecology and field recording while extending previous collaborations the two of them had done.

In particular, JB and TS have worked together on a number of projects formulating strategies for 'public making' [e.g. 36] where all the nuances of this phrase are intended: making in public, making with the public and, in some sense, making new kinds of publics for creative work. JB was concerned to bring this method of working to the complex collaborative context that was emerging.

SB is a designer-researcher whose initial involvement with TS and JB was to facilitate the collaboration with FACT. As the collaboration developed, SB was able to integrate his parallel skills and interests in photography, notably recent experiments with spherical panoramic photography. MW also brought creative interests as an improviser and performer of early keyboard music and song, and as director of vocal ensembles.

Many Happenings

Let us now give an account of the key 'happenings' through which *Sound Spaces* emerged, began to take its form as an activity potentially fundable within the CX programme, and was in its various ways enacted.

JB visited FACT in May 2014 to create an installation with a colleague, and again in January 2015 in connection with an installation by two of his students. These visits afforded conversations with FACT's Director and RM, through which JB developed a concern for renewing the relationship between his research group at Culture Lab and FACT. During conversations with RM, the opportunity arose for JB and TS to contribute to FACT's forthcoming *Build Your Own* programme of public engagement activities. In subsequent email correspondence, JB proposed a public making activity [36] structured around "creating a fictional map of Liverpool based on the sonic affinities of places within the city: SoundLines – one part leyline, one part songline," and RM introduced affinities with SK/Kinicho's work on spatialised sound.

Around this time, SB co-designed a heritage site-specific pervasive game and, with JB, conducted an interaction analysis of the game in use. Prompted by a news article on this work, MW met with SB in August 2014 to explore possible collaborations around his interest in visualising the non-extant aspects of heritage sites. In response to this meeting, a loose collective of researchers, including the authors, met several times to investigate potential collaborations. These meetings explored how concerns developed in the game project (enriching experience in heritage sites) and from MW (visualising 'disappeared heritage') might be combined with each researcher's own practices and concerns. Arising from this a commitment to explore affinities between our work developed, beginning with a field visit to St. Mary's Abbey in York later in December as an example of a disappeared heritage sites.

The opportunities at FACT and our explorations with MW came into correspondence in early 2015 when, in regular meetings with TS, SB and MW, JB introduced the possibility of framing a collaboration around work in Liverpool, which we subsequently discussed via JB's SoundLines proposal and MW's suggested focus on Lutyens' epic but unrealised design for Liverpool's Roman Catholic Cathedral (as a 'disappeared site'). JB further developed the SoundLines proposal in correspondence with RM during this time, and the collaboration was somewhat formalised via a meeting between RM, SK, MW and the authors at FACT in May 2015, and the production and submission of an internal proposal for funding to CX. Through these discussions, work at FACT was planned to consist of a public making workshop called *SoundLines* to generate material for an initial installation, which would then be developed over subsequent months for a more complete public exhibition and performance event. Much of the ensuing communications between ourselves, SK and RM focussed on the practical organisation of these activities. During these conversations we proposed inviting other creative practitioners to participate in the workshop or to use and respond to the recordings and interactive pieces as they emerged. Artist-designer Tom Schofield of Culture Lab joined us for SoundLines, and SK and RM involved Philip Jeck in the performance event and Lauren Moffatt in presenting new work in relation to a specific Liverpool site.

The focus on Lutyens' cathedral was dropped due to practical difficulties accessing a large-scale model of it at Liverpool Museum. However, through further activities with MW, we continued our exploration of shared concerns, including disappeared heritage. Notably, in July 2015, we visited Fotheringhay – a village with historic links to Mary Queen of Scots and Richard III, and the site of The Church of St. Mary and All Saints where MW was giving an organ performance with a choir. Whilst there, we made audio recordings and photographs around the village, the church and of the performance. During this trip, SB mocked-up how a disappeared site (Fotheringhay Castle) might be visualised using a panoramic photograph layered with an illustration of the castle from the site's information board.

Figure 2: *SoundLines* public making workshop.

The most creatively intense period of the collaboration began in August 2015 (with the four-day *SoundLines* public making workshop at FACT, which first brought together SK and the authors for collective creative work) and ran up to October 2015 when selected pieces were developed for public exhibition and performance at FACT. Several strands of work were developed during this period (as we review below under 'Many Things'), and activities between the workshop and exhibition principally dealt with the further development of work for public presentation. This included SK's construction of a larger Icosahedron, JB and TS's development of material to present within it, our development of alternative constructions for presenting work, and an additional young person's workshop at FACT ran by SB and TS to gather material for one piece.

The October event did not mark the end of the collaboration, and we have continued to develop from the work exhibited. In October, JB and TS recorded in a gallery-sized Icosahedron (built by SK for a concurrent installation) and work has begun on releasing album of material in third order ambisonics. SB and TS produced a

layered visual and audio evocation of Liverpool's Old Dock as a disappeared heritage site. Through continuing conversations with FACT and Kinicho, we are planning how our collective work may be further developed, including sharing our work and inviting others to share theirs via an online resource (http://www.soundspaces.xyz).

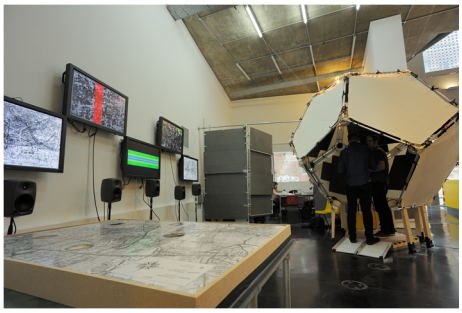

Figure 3: *SoundMap, SoundLines* and the Icosahedron.

Many Things

Throughout the project we created various devices, gathered material from a variety of environments and explored the concept of sound lines and spaces through an active and pragmatic process. Our work was carried out in a number of different locations including a workshop/maker-space within the premises of FACT, and also involved field visits to sites of relevant interest around the Liverpool area, as well as a public exhibition space and a performance venue. We adopted a flexible approach and made our work practically suitable to the places where we were conducting our activities and the publics we were engaging with. In this sense the making process and the presentation of things made were inherently interconnected. All of the material gathered throughout was shared openly with each collaborator, allowing open access to all the tools and resources to encourage collaboration and re-appropriation of the shared material. We describe several of our pieces here to give an impression of the diversity of this work. Details of further things that emerged during our activities are available online (http://www.soundspaces.xyz).

Development of the Icosahedron Sound System

SK had previously built a version of his Icosahedron for listening to and mixing third order ambisonic recordings [12]. This array of 20 loudspeakers, placed at the vertices of a dodecahedron, was rebuilt twice during our collaboration – in August, replacing the cane structure with longer aluminium poles and upgrading the amplification; and, in October, a bigger version with larger loudspeakers and metal frame, acoustic dampening and a floor-mounted sub-bass transducer. The Icosahedron was used to playback recorded and composed materials where users were able to 'place' sounds in space, specifically using height (vertical plane), rotational (horizontal plane) and distance (close and far) dimensions. We came to regard the Icosahedron as being exhibited in three different modes. Mode One involved playing fixed media pieces composed using materials and data gathered during our field trips (e.g. *Unfoldings I*). Mode Two enabled participants to directly interact with the sonic space using an iPad running Lemur and connected through Open Sound Control (OSC) which allows the dimensional parameters to be manipulated. Mode Three presented participants with spherical photographs of various environments visited during our time together, which they could navigate using their own smart phones, with their physical movement directly informing the sound design and spatial diffusion. As well as providing a listening space, the Icosahedron added a sculptural visual form which some of our later work drew influence from.

Figure 4: Icosahedron (early version) and field recording.

Impulse Response Readings

We took impulse response (IR) readings within the various sites we visited as a way of capturing their sonic signature. This was done by setting up a sound-field microphone in a central location and playing a sine sweep using a portable speaker back into the space covering every frequency within the human hearing range [32]. These IRs were then taken back to the workshop space, processed and played back within the Icosahedron. Using this technique one could stand within the ambisonic array and excite the IR by speaking into a microphone, giving the user the impression they were making sound within the referenced space.

Extended Field Recordings

During our visits to the Liverpool locations we explored the environments with a diverse collection of listening equipment. We extracted sonic material from our visits using contact microphones, electromagnetic coils, air pressure microphones, radio transmitters, a Raudive diode receiver of the sort sometimes used by researchers into electronic voice phenomena, and a circuit made by artist Martin Howse (the Detektor) which frequency shifts infra- and ultra-sonic electromagnetic radiation into the audible range. Our explorations were serendipitous—approaching places with an openness for listening and chance. Collected material was then taken back to our workspace, experimented with in multiple ways and offered as a material that anyone in the group could use.

Photography

Approaching this in very much the same way as our audio recording activities, we encouraged the photography of the locations in a variety of ways. Most participants had phones that were capable of taking photographs but we also had a number of handheld cameras that people were free to use.

During the August *SoundLines* workshop, the visual material was shown in the working space using projectors and made available through a shared online folder.

GPS Traces

As well as recording audio and visual material from our field visits GPS data was also collected using the iPhone application 'Track'. Taking inspiration from the self-archivist Jacek Smolicki [39], each day was 'tracked' and these traces were distilled into minimal lines, keeping only positioning data and ridding it of all other metadata. Each day was shown as a different image and simply presented as a black line on a white background. An ANS style synthesizer [38] was built in Pure Data and used as a way of generating sound from the images. In this construction each pixel line related to a different oscillator. The gain of each oscillator was controlled by the grey value of each pixel. The image was scanned vertically and then changed to another day's image at random.

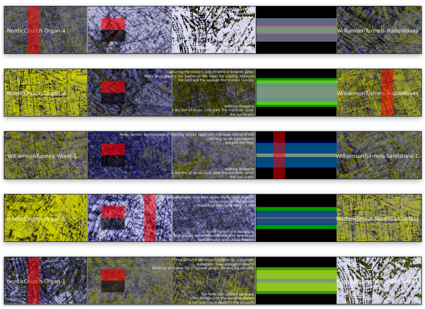

Figure 5: Images from the 5-screen version of *SoundLines*.

SoundLines

During the course of the August *SoundLines* workshop, JB devoted much attention to making a piece which embodied a creative concept of a 'sound line'. The sonic component of this piece involved cross-fading between recordings made at one site in the city to recordings made at another. As the cross-fade took place the recordings were transformed by algorithms coded in Pure Data into more noisy, drone-like, pulsing or crackling forms of themselves. In this way, as the piece unfolded the listener was 'transported' between locations and in and out of more sonically abstracted forms. In JB's creative conceit, these more abstracted forms were imaginings of the hidden 'sound lines' connecting the two locations. A visual projection showed the relative locations of the sites, the lines connecting them, and the current position of the cross-fade against a background created by collaging historical maps of the city. For the October exhibition, JB further developed the piece to work over a multi-channel loudspeaker system and five HD monitors.

Mini Media Players

Using Arduinos, SD cards, electronics and small speakers participants were invited to build a minimal media player which could play back some of our recorded materials. The media players were very simple and used a single button to play and stop one MP3 loaded on the SD card. Once a few devices had been created we placed the various players around the space. These lo-fi devices were fitted with small speakers so a strong sense of locality was present when all played together. It also offered a nice contrast against the other higher fidelity, multi-channel sound works.

Spherical Photographs

Spherical photographs were created using a camera mounted on a tripod with a two-axis panoramic head. Nineteen images were made using an 18mm lens on a FX-format Nikon DSLR: two rows of eight images at 45 degree yaw (rotation) intervals and +/- 30 degree pitch, a single zenith image, and two nadir images (one hand-held for later removal of the tripod in Adobe Photoshop). Images were stitched into a single rectilinear spherical projection image using PT Gui Pro. Marzipano (marzipano.net) was used to create interactive versions of spherical images that could be viewed using standard web browsers. Marzipano code was then adapted for viewing panoramas according to mobile device orientation and other novel interactions as described earlier in the Icosahedron section.

A Bundle of Laughs (Compositions with iPad)

After introducing a variety of recording technologies to our participants, [a mother and son] wanted to record a specific collection of sounds that meant something personal to them and their relationship to Liverpool. They were lent two handheld audio recorders and went out and visited specific geographic locations where they recorded, for example, children laughing. After recording they brought these sounds back and shared them with the rest of the group. Using the iPad application 'Samplr' they manipulated the sounds and created a collage composition.

SoundMap

Developing from *A Bundle of Laughs*, [mother and son] suggested relocating their manipulated recordings by giving them the sonic character of the places we had visited. This was achieved by convolving the manipulated recordings using the IRs of the sites we had visited, playing them back through the Icosahedron, and recording the result onto personalisable audio greetings cards. Further, photographs [son] had taken of the sites were used as images on the cards. Alongside this, JB and SB experimented with visualisations of Liverpool through layers of maps and connected the locations visited to plot imaginary sound lines across the city. We presented these ideas together as a *SoundMap* in two materialisations: first, in August, as a map projected onto a table with the greetings cards placed on the relevant locations; secondly, in October, as a printed map mounted onto a wooden board and placed onto a stand, with audio transducers mounted underneath relevant locations playing back sound relating to that place. Some of the sounds were also processed through the relevant IRs to create a convolution reverb [32] effect.

Ship Horn Syntheziser

One of the participants to the August workshop brought a collection of sound files digitising a 1966 album entitled

The Ships Of The Mersey (Liverpool's river). JB worked with him to create a software synthesizer in Pure Data that would analyse sound input (e.g. to a microphone) and output a sound texture comprised of sound grains derived from the ship horn recordings that was as closely matched in sound spectrum as possible. The technique enabled any input to the software to be echoed with ship horn sound. In this way, the field recordings collected could be 'timbre-stamped' with the sounds of (now lost) ship horns—a rather poignant ghostly effect. Additionally, to much amusement, as participants sang into a microphone, their efforts were rudely accompanied by foghorns and other ship signals.

Concatenative Synthesis

As we built up a large collection of recordings from various sources during our activities, we wanted a novel means of navigating this material using computational and algorithmic processes. Drawing on the work done at IRCAM by Diemo Schwartz [35] we used concatenative synthesis as a way of making sonic connections in our corpus through, for example, creating a 2D space mapping frequency on one axis, amplitude on the other. After loading our corpus, sounds could be navigated using an iPad with, e.g., the top left corner of the space highest in frequency and volume. We then used this method in the Icosahedron as a way of navigating the library but also positioning sound within the ambisonic field.

Figure 6: Layers of the Old Dock screenshot.

Layers of the Old Dock

This piece used spherical panoramic photographs of Liverpool's Old Dock and the leisure and retail complex now above it, overlaid with archive material (paintings, photographs, posters and text) relating to its historical links with slavery and child migration, and contemporary images and sound recordings to create a layered presentation of the many meanings of this place. The media were explored using mobile phones and tablets (in line with Mode Three Icosahedron, above), by extending the Marzipano code to add functionality such as 'gaze spots' where holding the device still on a specific viewpoint moves between layers.

IR ASAP (Impulse Response As Soon As Possible)

After building up a library of IRs from the various locations we decided to use this material to create a different work. When de-convolving the IRs the sound sweep can be distilled to a simple percussive slap with a reverberance characteristic of the space. These sounds offered a very simple impression of what the environments we visited were like. An algorithmic composition in Pure Data played back the collection of IRs randomly with a speed that could be varied to create different sonic textures. At its fastest this was a noise, as it slowed various percussive elements also came through, and at its slowest the program played reverberant impacts (the IRs) separated by long silences.

Sound Spaces Performance

During the October exhibition, there was an evening of performance within the gallery-sized Icosahedron. JB and TS made an improvised performance together, while sound artist Philip Jeck also performed on the loudspeaker system with his sound material including TS's location recordings. The event was sold-out several days in advance.

For their performance, JB and TS made performable versions of some of their devices and software. For example, the software behind JB's *SoundLines* installation was modified so that the loading of new files, the cross-fades and the mixing in of different processed forms of the location recordings could be made by hand from a MIDI fader box in addition to programmatically.

A performable version of the Mode Three spherical photograph interactive was also developed by SB to accompany JB and TS's performance, and displayed across three large screen projections. The Marzipano code was further developed to enable keyboard control of scene, rotation direction and speed, and roll. In addition, JB wrote a series of short haiku-like texts, one associated with each of the locations visited, which were included in the projected material. Each text contained oblique references to the history of the site, our activity there and various associations which had occurred to participants as they worked with us. TS's GPS traces were also incorporated into the performed visual material.

FIVE THREADS

We have given an account of how *Sound Spaces* emerged through many collaborative happenings in which the concerns of multiple participants were articulated while many things were made. In this section, let us draw out five 'threads', topics of interest which emerged in the collaborative encounters we have described, and discuss how we worked in relation to them. We analyse:

- how work was facilitated by a flexible thematic
- how creative work was marked by emergent gatherings as topics of interest formed and things were created in ad hoc collaborative relationships
- how autonomous and collaborative work intertwined
- how making spaces were practically organised as publicly-oriented ecologies
- the kinds of severe challenge work organised in this fashion can face.

Thematising

At an early stage of discussions with FACT, JB offered the formulation of a 'sound line' as a creative concept to

thematise collaborative activities. Indeed, this, in the form of *SoundLines,* named both the August 2015 workshop and JB's installation piece. At the beginning of the August workshop, JB presented the concept as a "tongue-in-cheek mythology… the idea is that Liverpool is not organised in neighbourhoods or along streets or in different kinds of buildings. These are only the outside form. The inner, secret form of Liverpool is made up of flows of energy along sound lines. It is our job in this workshop to make recordings and to build devices which capture these sound lines and keep them alive. Much as it is claimed that aboriginal Australians need to sing the song lines of their ancestors to keep the world in existence, we need to work out the sound lines of Liverpool to stop it being destroyed".

While tongue-in-cheek, this concept was intended to give an imaginative provocation to participants to the workshop, while also helping them conceive experimental devices. For some of the participants, the references to Bruce Chatwin's writings and to some of the esoteric activities of local artist Bill Drummond were clear, while others could take the concept as they wished, and indeed were free to ignore it.

The theme of sound lines provided a kind of "minimal structuring element, an MSE" as JB put it, giving just enough sense to what was going on while allowing a lot of freedom of interpretation and action. The room in FACT where the workshop took place was depicted as a laboratory for sound line mapping, with the Icosahedron one of its most treasured pieces of apparatus. Several of the pieces developed made use of the notion in some way. [Mother] and [son] thought of laughter in their recordings as a spontaneous response made as the children sensed the energy of the sound lines. Several of the extended field recording techniques could be related to the notion and a sound map could be made plotting these imaginary lines.

Emergent Gatherings

We worked in a fashion to be responsive to emerging interests and potential connections between things as they developed. TS had brought, as a 'raw' material to the August workshop, a series of greetings cards which could have recordings stored on them and would be played back as the card was opened. In the light of a series of discussions, SB and [son] had had about photography, SB proposed that he and [son] photograph sites where the children's laughter recordings were made and put those recordings on the cards. In this way, a simple collaborative connection was made between SB, TS and [son].

This is a simple example of a spirit of connectivity that we honoured throughout in making things. When SK saw the map being made by [mother], [son] and SB, he became interested in whether a map-like interface could be made, running on an iPad, to mix between recordings and reverberant spaces in the Icosahedron. When SK overheard the crackling sounds JB was creating based on the field recordings he had made, SK asked for a recording of these to help demonstrate sound localisation in the Icosahedron. Building on this, JB later made a more extended click-based composition for playing as a fixed media (Mode One) piece in the sound system as part of the October exhibition.

Observing the desirability of making *things* rather than aiming for the creation of finished functional objects kept us open to such emergent gatherings of interest, activity and materials. While JB's crackling sounds were part of his 'divining' of the sound lines of Liverpool for the purposes of his work, there was no trouble making them also useful demonstration material for SK. The IR readings were also appropriated by TS for his composition *IR ASAP* in a manner that would not have been possible if the recordings had been hidden in a 'black boxed' technology for multi-channel reverberation effects.

In addition, our workshop avoided a pedagogical approach. We considered, but ultimately did not conduct, any skills acquisition sessions nor give any introductions to matters such as ambisonic recording and reproduction techniques. In this way, we feel we kept our participants and ourselves more open to seeing affinities of concern and possibilities for co-making—any pedagogy was done as required, on the fly and in response to the needs of emergent work.

Autonomous Work

We have noted many examples of workshop participants collaborating with ourselves and each other on the production of things. Notably, however, there were strong incidents of work being done autonomously by a single individual. For example, JB made both versions of his *SoundLines* piece largely on his own. However, this was not the only activity he was involved in during the workshop and he made himself available to others during the published workshop hours (e.g. to make the *Ship Horn Synthesizer*, to go on field recording trips, amongst other shared activities). Indeed, the majority of JB's single-handed work on *SoundLines* was done in his hotel room late at night or early in the morning. In that respect, JB's autonomous work was done with making himself available to others in mind. In addition, he saw *SoundLines* as a piece to act as an environment or "spine" which would facilitate others incorporating their work within the workshop. It would give *one* way of working within the setting and realising the concept of a sound line which others could latch onto or make alternatives to. In addition, he felt that the different organisation of sound, space and mapping relationships that this piece offered would open up "a bigger sound space design space" when counterposed with the Icosahedron with its emphasis on acoustic virtuality.

We have discussed JB's orientation to his work as it is an example of something typical in this collaboration. The existence of autonomous work does not lie in any straightforward contradiction to collaborative work. Indeed, some things might be done autonomously in order to allow richer collaborative possibilities overall or to keep design spaces open which might otherwise be foreclosed.

Making Spaces and Public Ecologies

We were concerned to give our work a characteristic presence within the FACT environment. In both the August workshop and the October exhibition, we were working within locations that the public could freely access. It was important, then, that there was something to engage the passer-by. JB modified his projection of collaged maps so that 'SoundLines' clearly entitled it and could be read as a link into the whole (eponymous) workshop and was likely to be the most eye-catching first thing someone would see entering the workshop space. An attempt was made to distinguish different areas in the room so ongoing creative work could coexist alongside, yet be separate from, things which were provisionally and relatively more 'finished'. A 'public face' existed so that casual visitors could encounter things that might engage them and get an overview of what was going on. The 'raw' stuff of making was also on show, alongside reference literature, inspirational materials, sketches, proposals, to-do lists, and so forth.

The principle of having a number of related, yet separate, things coexisting in a shared space was carried forward into the October exhibition [also see 36]. We conceived that a number of differently organised things should be presented together (the Icosahedron, *SoundMap* and *SoundLines*) permitting visitors to compare and contrast the different ways the three things engaged with sound and the city.

Unsolved Issues

It cannot be denied that *Sound Spaces* was and is a considerable challenge for us. We pride ourselves on being multi-skilled individuals but we had to be on our best form to make sure that we could mobilise the right knowledge at the right time to keep things going, "keeping all our balls in the air" as JB put it. Giving people autonomous 'rest times' was sometimes necessary for them to recover. It also has to be admitted that our way of conducting a creative workshop was not suited to all who signed up. Some were expecting a more pedagogical format. Some others could not attend each day and somewhat lost the momentum from one visit to another. While our preference for ad hoc planning suited these contingencies, we were still challenged by the sudden announcement that the UK Parliament's Shadow Minister for Culture would make a visit the following morning and that FACT wished to show our work as indicative of the kinds of collaborations the institution engenders.

DISCUSSION: MANY MAKINGS

Sound Spaces was creatively productive—many things were indeed made—and the work produced research insights and engaged collaborators and other publics in the development of these insights, as we shall note below. Of course not all of the avenues have led directly to explicit insights and further work. For example, the idea of sonically imagining Lutyens' unfinished cathedral is itself unfinished. The potential for an installation based around a multiplicity of mini-media players has not yet been explored, and the raucous *Ship Horn Synthesizer* awaits a concert debut. Our point here is not that some making was successful whilst others were not, rather that particular value was derived from a *federation* of makings. In *Sound Spaces*, collaboration occurred through co-existing creative work and, through this, gatherings around topics of interest, things and their making. Practice was often autonomous, but was conducted in such a manner as to afford *federations* to arise between collaborators, other participants, and our creative work. This is counter to many typical thinkings about collaboration that seek to develop collective action towards common goals. Like Bjögvinsson et al. [5], our ultimate design politics is one which is much more open to genuine and persistent difference existing between people than many traditions of Participatory Design recognise: see [5] on the political perspective of Mouffe's agonistics [27] and compare also with McCarthy and Wright's [26] citation of Rancière's concept of dissensus [31].

We suggest a shift from seeing collaborative work as interactions between fixed elements (problems, roles/responsibilities/skills, objects/functions/uses), to investigating the dynamic and entangled character of these elements themselves. This shift emphasises how each of these elements are *made* and, below, we offer examples of the senses of such making in *Sound Spaces*. It is through correspondence between these many makings, and the design things [3] made, that collaboration is accomplished. The particular shifts we developed in *Sound Spaces* can make such correspondence possible and we hope can be further enacted and elaborated in the work of others.

From Problems to Problematisations

It is commonplace in many fields, particularly those influenced by cognitive science, to regard design as a species of problem solving [e.g. 37]. However, our work in *Sound Spaces* resisted fixed or advance formulations of problems and instead sought to responsively develop work that both problematised existing assumptions and suggested alternative problem-framings (cf. [9], [34]).

Early in the collaboration, SK and RM had particular ideas of how material might be recorded and presented in the Icosahedron. Emphasis was placed on precise capture of IRs, the representational value of IRs, and on minimising external sound interference with the Icosahedron. These views changed during the project as we used IRs as sonic materials in their own right, composed a fixed media piece for the Icosahedron that reconceptualised it as a 20 mono-channel playback system, and developed an exhibition where the Icosahedron was alongside pieces that presented spatialised sound in alternative and complementary ways (*SoundLines*, *SoundMap*). Similarly, our extended field recording techniques problematised recording as being solely to do with representational accuracy and contributes to debates as to what field recording is or may be.

Collaborators had particular conceptions of how images might be used in the work. In MW's early conversations with us he discussed the use of images to recreate disappeared sites as virtual spaces. Through SB's

experiments at Fotheringhay and subsequently, we explored how illustrations and photomontage could augment panoramic photographs of heritage sites. And through the *Layers of the Old Dock* we developed a means of engaging with place that moved beyond VR and AR to what we have begun to refer to as 'layered ontologies'.

Similarly SK, RM (and indeed SB) were initially unsure if and how spherical photographs could be presented and not distract from the auditory experience of the Icosahedron. Yet, building versions of the spherical photographs that could be explored by moving a mobile device around as a 'peephole' [8] prompted us to explore how such interactions could be used inside the Icosahedron and, later, how spherical photography projections might be performed. In each of these cases, our work proceeded not by formulating solutions to problems but by critically examining the formulation of problems and exploring alternative problematisations instead or in juxtaposition.

From Roles to Enrolments

We described how institutions and individuals came to our collaboration with particular concerns. In addition, some of the participants we picked up along the way may have come with prior expectations of their particular roles in our collaborative work. Yet it is important not to overstate the nature of these 'roles' or to think that concerns or 'interests' were not malleable in the face of things being made.

[Son and mother] arrived expecting to be taught specific skills and much of their early interactions with us concerned asking to know more about, e.g., audio field recording and spherical photography. We resisted simply providing information on technologies and techniques and instead invited them to be part of our creative practices (e.g. making field recordings and photographs). Throughout our interactions we aimed to encourage participants to develop their own creative projects and from their early recording of children's laughter [son and mother] produced *Bundle of Laughs*, which they then suggested combining with their photographs in the first version of the *SoundMap*. Through this making, [son and mother] became active practitioners developing their own ideas and things together with a sense of their skills and interests.

Our problematisations of ambisonic sound rendering and the act of recording went hand in hand with enrolling SK as a creative collaborator, rather than, as he had been treated before, a technician able to realise creative work to an artist's specification. While MW came to the collaboration initially as an academic musicologist with an interest in sonic heritage, he became a composer of material for the Icosahedron and a performer at the August workshop within it. For his part, JB's initial scepticism regarding ambisonics and his preference for loudspeakers "as point sculptural objects" was transformed once he had concertedly worked on the *Unfoldings II* performance and appreciated the possibilities. Following Latour [23], we suggest a shift of perspective from roles (with interests) to the mobile, multi-lateral process of enrolment (and interest translation). We can also put this point another way: making things makes people and their interests.

From Objects to Things and Ecologies

Much of our activity throughout the project, and during the public making particularly, demonstrated a concern for creating environments in which *federations of creative work* could develop. We have argued that maintaining a thing-like character for what is worked on facilitates flexible federation and coexistence, whereas finished functional objects would tend to mandate technical integration or perhaps the acceptance of an incontrovertible cover story which one needed to buy into [e.g. 2]. In our case, rather, we offer a loose suggestive theme that provides the ground for relationships between things.

Our work was also undertaken with a concern as to how our own and others' making could fit within existing ecologies and develop new ones. Through being present and making in public, we created environments to "fire imaginations," encourage participants' federation around creative work and develop their own creative autonomy. All of this was performed in an environment where the relatively made coexisted with the unmade, the amateur with the professional, and the digital with other materialities.

From Projects to Federations, Portfolios and Infrastructures

At the outset, we reviewed Bjögvinsson et al.'s [5] argument that a concern for 'design Things' goes hand in hand with a shift in perspective from projects to considering the entangled infrastructures from which projects might (or might not) emerge. We started our *Sound Spaces* collaboration with the intention to prospectively anticipate the emergence of a portfolio of related work to engender the emergence of a family (or a federation) of related things. A number of terminologies are in play here, and this is welcome, but all are pointing to alternative rationalities for making: ones which do not prioritise the object-commodity of much design work and which, in a reflexively open and mindful fashion, work with strategies for an extended sense of collaborative creativity. *There can be many makings.* Of things, problematisations, identities, interests, ecologies, infrastructures, portfolios, federations. Models of making which privilege the design of object-commodities, or which work with fixed notions of user-consumers and their capabilities or desires, obscure the possibility of richer pictures for how design research can itself build creatively.

There can be many makings. At a time when research value is increasing instrumentalised as impact and design value is increasingly productised, emphasising this seems to us like a very valuable thing to do.

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REFERENCES

1. Karen Barad. 2007. *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter*. Duke University.
2. Steve Benford, Chris Greenhalgh, Andy Crabtree, Martin Flintham, Brendan Walker, Joe Marshall, Boriana Koleva, Stefan Rennick Egglestone, Gabriella Giannachi, Matt Adams, Nick Tandavanitj, and Ju Row Farr. 2013. Performance-Led Research in the Wild. *ACM Trans. Comput.-Hum. Interact.* 20, 3, Article 14 (July 2013), 22 pages.
3. Thomas Binder, Pelle Ehn, Giorgio de Michelis, Per Linde, Giulio Jacucci, and Ina Wagner. 2011. *Design Things,* MIT Press, Cambridge, Massachusetts. □
4. Susanne Bødker. 2006. When second wave HCI meets third wave challenges. In *Proc. NordiCHI '06*, Anders Mørch, Konrad Morgan, Tone Bratteteig, Gautam Ghosh, and Dag Svanaes (Eds.). ACM, New York,1-8.
5. Erling Bjögvinsson, Pelle Ehn, Per-Anders Hillgren. 2012. Design Things and Design Thinking: Contemporary Participatory Design Challenges. DesignIssues: Vol. 28, 101-116.
6. John Bowers. 2012. The logic of annotated portfolios: communicating the value of 'research through design'. In *Proc. DIS '12*. ACM, New York, 68-77.
7. Ko-Le Chen. 2015. GRWM: in the bathroom. In *Proc. British HCI '15.* ACM, New York, 314-314.
8. Peter Dalsgaard and Christian Dindler. 2014. Between theory and practice. In *Proc. CHI '14*, ACM Press, 1635–1644.
9. Kees Dorst. 2011. The core of "design thinking" and its application. *Design Studies* 32, 6: 521–532.
10. Pelle Ehn. 2008. Participation in design things. In *Proc*. *PDC '08*, ACM Press, 92–101.
11. Carolyn Ellis and Arthur Bochner. 2000. Auto-ethnography, personal narrative, reflexivity: researcher as subject. In N. K. Denzin and Y. S. Lincoln (Eds.) Handbook of Qualitative Research, 733-768. Sage, London.
12. Peter Fellgett, 'Ambisonics. Part One. General System Description', Studio Sound, vol. 17 no. 8. 20-22.
13. Paul Feyerabend. 1974. *Against Method.* Verso, London
14. Bill Gaver and John Bowers. 2012. Annotated portfolios. *interactions* 19, 4, 40-49.
15. William Gaver. 2011. Making spaces: how design workbooks work. In *Proc. CHI '11*. ACM, New York, 1551-1560.
16. William Gaver. 2012. What should we expect from research through design? In *Proc. CHI '12*. ACM, New York, 937-946.
17. Connie Golsteijn, Elise van den Hoven, David Frohlich, and Abigail Sellen. 2014. Reflections on craft research *for* and *through* design. In *Proc. NordiCHI'14*. ACM, New York, 421-430.
18. Graham Harman. 2009. *Prince of Networks: Bruno Latour and Metaphysics.* Anamnesis, Melbourne, Australia.
19. Tim Ingold. 2013. *Making: Anthropolgy, Archaeology, Art and Architecture*. Routledge.
20. Rachel Jacobs, Steve Benford, and Ewa Luger. 2015. Behind The Scenes at HCI's Turn to the Arts. In *Proc. CHI EA '15*. ACM, New York, 567-578.
21. Nadine Jarvis, David Cameron, and Andy Boucher. 2012. Attention to detail: annotations of a design process. In *Proc. NordiCHI '12*. ACM, New York, 11-20.
22. Kristina Höök. 2012. A cry for more tech at CHI!. *interactions* 19, 2, 10-11.
23. Bruno Latour. 1993. *We Have Never Been Modern*. Harvard University Press
24. Bruno Latour. 1993. *Aramis, or The Love of Technology*. Harvard University Press
25. Jonas Löwgren. 2011. The need for video in scientific communication. *interactions* 18, 1, 22-25.
26. John McCarthy and Peter Wright. 2015. *Taking [A]part.* MIT Press, Cambridge, Massachusetts.
27. Chantal Mouffe. 2013. *Agonistics.* Verso, London.
28. Bettina Nissen and John Bowers. 2015. Data-Things: Digital Fabrication Situated within Participatory Data Translation Activities. In *Proc. CHI '14*, ACM Press, 2467-2476.
29. James Pierce. 2014. On the presentation and production of design research artifacts in HCI. In *Proc. DIS '14*. ACM, New York, 735-744.
30. Trevor Pinch and Wiebe Bijker. 1987. The social construction of facts and artifacts. In Trevor Pinch, Thomas Hughes and Wiebe Bijker (eds) *The Social Construction of Technological Systems,* MIT Press, Cambridge, Massachusetts.
31. Jacques Rancière. 2010. *Dissensus.* Bloomsbury, London.
32. Cutis Roads. 1996. The Computer Music Tutorial, MIT Press, Cambridge, Massachusetts. 428-431.
33. Chris Rust, Judith Mottram, and Jeremy Till, *AHRC Research Review Practice-Led Research in Art, Design and Architecture.* Arts and Humanities Research Council, (2007).
34. Donald Schön. 1983. *The Reflective Practitioner: How Professionals Think in Action*. Basic Books.

35. Diemo Schwartz. 2013. Interacting with a Corpus of Sounds, Symposium on Sound and Interactivity. Singapore
36. Tim Shaw and John Bowers. 2015. Public Making: Artistic Strategies for Working with Museum Collections, Technologies and Publics. ISEA, Vancouver.
37. Herbert A. Simon. 1996. *The Sciences of the Artificial,* 3rd ed., MIT Press, Cambridge, Massachusetts.
38. Andre Smirnoff. *Sound in Z – Experiments in Sound and Electronic Music in Early 20th Century Russia* (London, Sound and Music, 2013)
39. Jacek Smolicki. 2015. De-totalizing Capture: On Personal Recording and Archiving Practices. ISEA, Vancouver.
40. Jayne Wallace, Joyce S.R. Yee, and Abigail Durrant. 2014. Reflections on a synergistic format for disseminating research through design. In Proc. *CHI EA '14*. ACM, New York, 781-792.
41. Zimmerman J, Stolterman E, and Forlizzi J (2010). An analysis and critique of research through design: toward a formalization of a research approach. DIS 2010, 310-319.
42. DIS 2014 Website. http://dis2014.iat.sfu.ca/index.php/pictorials/ (Accessed 19th September 1015)