Swimming in space: exploring spatial sound through underwater experience

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Working with the IKO icosahedral loudspeaker changes one's spatial sound composition practice. Upon first hearing the IKO at ZKM[1] in 2017, I was instantly beguiled. I developed a myopic focus. I attended courses and a summer school, in order to work with it. I had the good fortune that the lead of my then research centre[2] secured funds to buy an IKO, knowing of my ongoing obsession. I'm still grateful for that. Despite years of working with it, it eludes me in many ways. I sense it always will, and that is in large part why I'm captivated.

One of the ways in which it escapes my grappling, is with a certain nullifying effect on my ability to articulate the impact it has, on both practice and listening (mine and other people's). I've definitely tried. My best efforts have led me into abstractions and analogies which approach expression, yet remain elusive, somehow always substantially out of reach.

Snorkelling recently, I considered how submersion in the ocean transforms and reconfigures my experience of the world: my multi-modal perception of the underwater environment; awareness of my body through my sensoria; the trajectories available to my body, as well as the trajectories of the other-than-human life around me; the very way I move, and am moved. It struck me that this experience could be explored to help articulate the spatial experience of working with and listening to, the IKO. This text explores water as a milieu through which a persistently abstract theorisation of spatiality can become entangled with a persistently concrete approach to spatial sound practice. This mixing up of mediums – water and sound – opens up non-terrestrial ways of conceptualising and articulating space.

> *Perhaps more than any other element, water is a complete poetic reality*
> Bachelard (1983, p. 15)

Watery poetic reality might help us to think about sound as space, due to its ability to traverse the embodied and the metaphoric. Poems work on us in ways which are

[1] Center for Art and Media Karlsruhe https://zkm.de/en/zkm-digital

[2] SOUND/IMAGE Research Centre https://www.gre.ac.uk/research/groups/sound-image

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true to subjective experience and yet remain mysterious, ripe with possibility. These potentials, rather than seeming discrete or disordered, cohere. They retain depth in their illumination, as well as diversity and directness in the ways they reach out to speak to us. They are often experienced with an interiority which belies their origins. Poetic reality indeed.

Underwater, I enter a much deeper three-dimensionality than the kind which is terrestrially available. Above water, I am constrained by gravity and a medium (air) that cannot hold and support me. I am bound to a limited range of movement. Below water, I am tangibly resisted and carried by the medium. It holds me up, particularly in highly saline water, like that in Greece where I recently found myself suspended. Held. Connected to water in a way that blurred the boundaries of the structure that is me – my surfaces and substances – and a structure that is not me, the water. My interiority is heightened. In part because my usually dominant vision as well as my hearing, are compromised. This creates a presence of body which can be either serene or disturbing, depending on both context and one's state of mind.

Such interiority does not, however, engender isolation. I am connected to other structures, also held by the water. other-than-human life forms of various shapes and sizes, carried and moved around, as am I. In this hydrological choreography, I consider the kinds of 'others' I want to move towards or away from. Those that could leak into my inner cavities, viscera and liquids: microorganisms; effluent; sediment. Some benign, some undoubtedly not. Those that provide interest to me: kelp gardens; shoreline rocks; schools of fish. Some accessible, some resolutely not. These structures, these others which are not me, can easily circumnavigate my field of view. Yet I inevitably consider their presence. Why? Not being the choreographer myself, I am inescapably part of a movement within which I have limited agency. Considering the trajectories of others is an act inherent in the dance. Do I do the same for my habitual medium, air?

Generally, no. Is it because I move in substantially different ways in air? As with waking as opposed to dream states, my airy movements are generally immediate and relatively precise, whilst my watery movements are temporally delayed and more approximate. There is a temporal distinction between air and water which allows me to quickly change my trajectory in relation to others, who may in turn change their trajectories. Air that would bring exhaust fumes or hyacinth scent to me, can just as quickly dissipate them. If I need to catch something, or avoid being hit by someone, I can quickly predict my odds of success, and move accordingly. The familiarity of weightedness in air aids this predictive ability, and frees us from much of the physical effort of movement, associated with being underwater. As humans, our predictive success increases our agency, and consequently reduces the salience of events. Unfortunately by doing so, it also reduces our conscious engagement with the medium. Our agency inadvertently permits us to disregard others, and ignore the interconnectedness of a system, in which the medium is both conduit and participant. Air does have the capacity to move us, but water has far more capacity for many involved in the dance. Part of this capacity is a subjective movement from the cognitive to the affective.

In water, both the presence of body and sense of touch are heightened. Audition, relatively compromised, undergoes a shift in character. The vibrations of sound are

transferred through the water, into me. Water holds both the sounds and me, in an act of transduction. This in turn allows me to sink into a relaxed state.

This article tackles two strands of thought. In the first, spatial sound in its practical, conceptual and aesthetic dimensions, is considered. In the second, the bodily experience of submersion into water is explored. These strands are not woven together in a prematurely tight arrangement. This is in order to preserve the liminal possibilities currently between them; the relations which emerge when they are considered as distinct, and yet placed on the page together, in a montage of sorts. This text seeks to be generative, not to define or identify solid, causal relations. Indeed to do so would be absurd, given the mutable nature of water, and the spatially complex nature of the IKO.

What is the IKO?

The IKO is a loudspeaker array, comprising 20 highly engineered beam-forming speaker drivers. These work via direct and reflected sound. Unlike most 'outside in' loudspeaker rigs, which tend to be fixed in position to walls and ceilings, the IKO is an 'inside-out' array, and can travel. This is one of the things which makes it unique, as it can be taken into diverse settings, bringing to life the distinct material properties of each space. The reflected sound bounces off ceilings, floors, wall surfaces, and so on. It can be further aided with the use of reflector panels.

> *The way* [the IKO] *actively engages the acoustics of the room seamlessly blends physical and sonic spaces. You don't feel that you're playing back music in a space. The space itself becomes part of the music.*
> Knight-Hill (2021, online)

The spatial sound reproduction of the IKO is distinctive, and impressive. It has to be heard to be believed (no, really, it does). It delivers defined spatial automation and gestures. It offers distance gradients in its spatialisation (not just in one's source materials, but in the phantom sound sources in the room). It creates a physically arresting, visceral experience. Sound space penetrates us.

As such, the IKO is a distinct figure within the world of spatial sound. And uncommon, with only a handful of IKOs in existence worldwide at present. However, in spite of the time I've spent with it at the centre, and during a 5 month artistic residency in Graz (its birthplace) I am still confounded when I try to describe its ways. Sometimes, as in the previous paragraph, I stumble back into language which takes the IKO's precision engineering as referent. I don't want to take these elements as syntactical foundations, however. They are glaringly incomplete, though have the assumed gravity of objectivity, of definitive totality. The subjective experience, the affective impact of the IKO to which I wish to give voice meanwhile, remains fecund but frustratingly abstract. Communication (between practitioners or with publics) is challenging. How then to balance out the limits of precision with the (at times unrealised) promises of inexactitude? How to balance such convergence and divergence in a way which does not ossify at the speed of sound? A way which does not become an aural anecdote, with progressively less life between story and storyteller? The liquid world of submersion provides this possibility. Not only as a medium of articulation, but of thought. The phenomenologically watery is familiar enough, yet uncommon enough, to balance these apparently competing impulses. At the very least, it contributes to a field which is under-theorised. So too, can it elicit flushes of ideas, associations and imaginings for other fields. We all have corporeal, lived connections to water. A thesis

which does not define and claim authority over a rigid domain of knowledge, can instead precipitate onto-epistemological movement in those to whom it flows. That is the kind of fluid, dynamic theory which can reach around, between and within us, in transformative waves.

The theorisation of spatial sound phenomena

Spatial phenomena has of course been variously described by scholars and practitioners in an assortment of contextual frames, some more material (physicists range from Newton to Mach) and some more immaterial[3] (for example, Lefebvre's (1991) socially produced spaces or Massey's (2008, 2013) idealisations of, communities of, ethical questions about, and perceptions of space and place).

There are challenges in presenting ideas about complex, often abstracted, phenomena. Whilst these phenomena are experienced sensorily (we after all necessarily navigate space as bodies in the world), they somehow also defy our ability to grasp them. No doubt the multi-temporal nature of spatial phenomena[4] which leads into every direction at once, is not best dealt with by our culturally and historically contingent (but taken-for-granted) framing of time. This framing essentialises time as sequential, as proceeding in one direction (irrespective of quantum physics, which tells us otherwise). Our framing discretises space, placing the temporal into a position of relative privilege. To consider spatial phenomena, their movements and relations, we must freeze the frame. We cannot logically process multiple relations (the objects, the relations between objects, the movements in these, and so on) in parallel. Multiprocessing is a seductive myth. Better to impose consequential lines across isolated components and have some chance of prediction. Except, spatial phenomena do not concede to our desire for perceptual congruence. At best we have a Gestalt 'gist' of spatiality. We fill in the gaps. It's more efficient, and lets us progress, in some sense. Even if such progression is based upon a coherence which is – at best – partially true. Emphatic assertions of the objective qualities and properties of space, may be proportionate reactions against the unavoidable *subjectivity* of space. That said, where does this conflict of interests get us, as practitioners?

Based upon the literature, and upon the conversations I have had with practitioners (as well as my own direct experience) a dearth of practically coherent, yet conceptually and aesthetically generative, expositions is evident, concerning the aesthetics of spatial sound. Cartesian conceptions of space do not assist us so much in this

[3] The term 'immaterial' here doesn't suggest a separation between the concrete and abstract, nor that the description of more immaterial spaces aren't also tangible. The distinction here serves to underline the pragmatic needs of spatial sound practitioners, in physically realising their artistic ideas with digital, acoustic and electronic means.

[4] In 'singular' time we can follow a particular trajectory of phenomena through space. This privileges the temporal. If we instead privilege space, there is a simultaneity of trajectories and phenomena which outpace our temporal processing, making us able to consider the spatial only if we 'freeze' time. Really, space is 'multi-temporal'. It is our tendency to sequentially process our experience that makes it seem otherwise.

task. Undoubtedly they do make certain things achievable. However, aesthetics are (presumably) part of the tacit knowledge which sound practitioners embody, yet can struggle to articulate.

Immaterial articulations of space, as political, social, ethnographic or anthropogenic – whilst hugely valuable – do not help practitioners move forward with the tangible demands of working to spatialise sound in their work. Conceptually, such ideas may act to underpin one's context, yet the ways in which these are translated to plugin interfaces and loudspeaker decoders, remain tangential. Perhaps that is as it should be. Perhaps though, a closer relationship could be formed, to advance the practice of spatial sound aesthetics. Certainly, one of the obstacles to this closer coupling is the allure of immateriality – where we can 'deal' with spatiality whilst remaining untethered to its material realisation. But this leaves us without agency, according to Barrett –

> *…in composition, if we are to successfully embody these ideas [of agency] we need an accurate spatial recreation rather than an interpretation.*
> Barrett (2010, p. 7)

However our concepts of the real are built around expectation, individual and shared. Therefore they need not be built around what is 'objectively' realistic. If those working in spatial sound establish a kind of 'virtual realism'[5], through setting our expectations about sound, possibilities unfold. We can become untethered (at least in part) from realism. Perhaps more importantly, such an approach extends agency and affords plurality of voices.

A question now arises – how do practitioners free themselves of their own conditioned, habitual expectations, in order to stretch into the aesthetic possibilities of the medium which is spatial sound? Could watery experience help expand practitioner expectations into wider possibilities? Could it do this by emulsifying the immaterial and material, the subjective and objective qualities of space, and contribute to a de-polarisation between them? Certainly, the relative absence of theories which are of practical benefit, calls for such contributions, and for quixotic responses. So why think through water, towards such a theory?

Earthy articulations are inadequate for describing phenomena which are not simply earthy in nature – those such as spatial sound. Whilst sound is certainly material and affective (Voegelin, 2014), it also exceeds these dimensions, as illustrated by the disparate attempts to find ways of describing its spatial qualities in both empirical work (e.g. Rumsey 2002; Berg, 2006) and practitioner (subjective) accounts (e.g. Truax 2012; Normandeau 2009; Stankievech 2007). The interplay of its multiple aspects is by nature beyond empiricism, with its narrow field of vision. And yet when making work, we need a certain groundedness in the material reality of our experience. Somehow space and spatiality ask that we transcend this material, encumbering weight. That we

[5] by instantiating a self-contained integrity (consistency) to a piece of work, a virtually real world can be established. The internal integrity of the work ('virtual realism') can be more or less differentiated from 'external' objective experience.

feel and think in substantially different ways. The very specialisms which increase our expertise in one field or another, limit our ability to deal with spatiality. And so, memories of the medium of water enter my awareness when I strive to outpace my weighted, material experience. The lived experience of being in my body (not in my studio, on my digital audio workstation, nor at my screen) and *being* in my body (in the manner water affords) enables a grappling with spatiality which circumvents existing perspectives and opens up a world of possibilities. These feel freer, more interesting, and somehow coherent despite the diversity of their potentials. As Bachelard notes –

> *A poetics of water, despite the variety of ways in which it is presented to our eyes, is bound to have unity. Water should suggest to the poet a new obligation: the unity of the element. Lacking this unity of the element, material imagination remains unsatisfied, and formal imagination is insufficient for drawing together dissimilar features. The work lacks life because it lacks substance.*
> Bachelard (1983, p15-16)

The substances we encounter, and the ways in which we conceptualise them, suffer from terrestrial biases. Thus we bind sound to the earth more than to the air, because it reflects our own experience. As bodies on the land, we are subjected to certain physical forces, forces which sound is free from to a far greater degree (such as gravity, a fundamental aspect of our existence). Our naming conventions reflect these biases. Jue cites the name 'sea-cucumber' or expressions such as "I'm feeling down" as obvious examples of this (Jue 2022, 29:38). What would a creature buoyed up by the ocean make of such expressions and associations (Jue, 2022, 30:00)? Hall's (1966) fourspheres of social distance (the intimate being the closest, followed by the personal, the conversational and finally the public sphere, see Brown 2001), is an example of this terrestrial bias. This doesn't make terrestrial thinking redundant, just limited when we want to think *sonically*. Further, terrestrial life, unlike underwater life, is more reliant on visual perception, which tends to dominate discussions relative to the sonic. As Idhe points out in discussing auditory experience, we use –

> *…an abundance of (visually) spatial terms. Sounds are "movements," there is "up" or "high" and "down" or "low," and so forth […] in musical theory and musical training the conceptual scheme is again one dominated by visual metaphor.*
> Idhe (2007, p. 219)

Idhe claims that "the field space of visual imagination is similar in structure to the field space of auditory perceptionand not to the field space of visual perception" (2007, p208). In his illustration of this point, he describes how he can visually imagine a horse galloping behind him, but cannot visually perceive the horse behind him. Thus, the visual imagination can take auditory perception as its spatial correlate more than visual perception. So auditory space is imaginatively rich in visual realms too. Idhe's real point is that our imagination exceeds the structural foundations of what we perceive – it extends beyond them into subjectivities which are richer than metaphors,

at least visual metaphors. Such phenomenological metaphors, are deficient relative to the phenomena themselves. Water, like sound, moves in waves. Its inherent instability is what elevates it above the frames of visual thought and metaphor.

Notions of space also suffer from assumed objectivity, which disembodies us and displaces affect. Who experiences space like this? We may view it in a (presumed to be neutral) technology: a spatial sound software GUI presents us with Cartesian or Euclidean constructs. Similarly to the historical contingency of materials (Ingold, 2007), those of space (Shields, 2013) and its idealisation (Blomberg and Thiering 2017) are largely unaccounted for. Without recognition of these necessarily reductive frames of reference, we may essentialise space, accept needless limitations on our ideas, and further propagate historically hierarchical knowledge structures. We may also continue to reproduce gendered epistemes centred around isolationist (versus ecological) approaches, as well as to devalue the body's place in knowledge-production. We could rather translate a lived experience of space, to the graphical representation of space. Not the other way around. Space begins –

> *…from meas the zero point or degree zero of spatiality. I do not see it according to itsexterior envelope, I live in it from the inside; I am immersed in it. After allthe world is all around me, not in front of me."*
> (Merleau-Ponty 1964, p. 178)

In this way, Merleau-Pontypoints out that one is not *in* space, but that space combines with, and includes, them. Each is deeply co-constitutive. So too with sound. These two topics (interconnected as they are) are well suited as means of exploring one another. Yet each compounds the complexity of the other. Considering them together is a challenging task. We need some way of propping open the poetics of this undertaking, whilst attending to the pragmatics of the sensible. Given that "psychic life is founded upon corporeity" (Husserl 1970, p. 271) we must attend to matter, if we wish to advance engagement with spatial sound.

> *Reception [of acousmatic music] can behampered by an inability to enter acousmatic space-form as a tangible construct*
> Barrett (2010, p. 1)

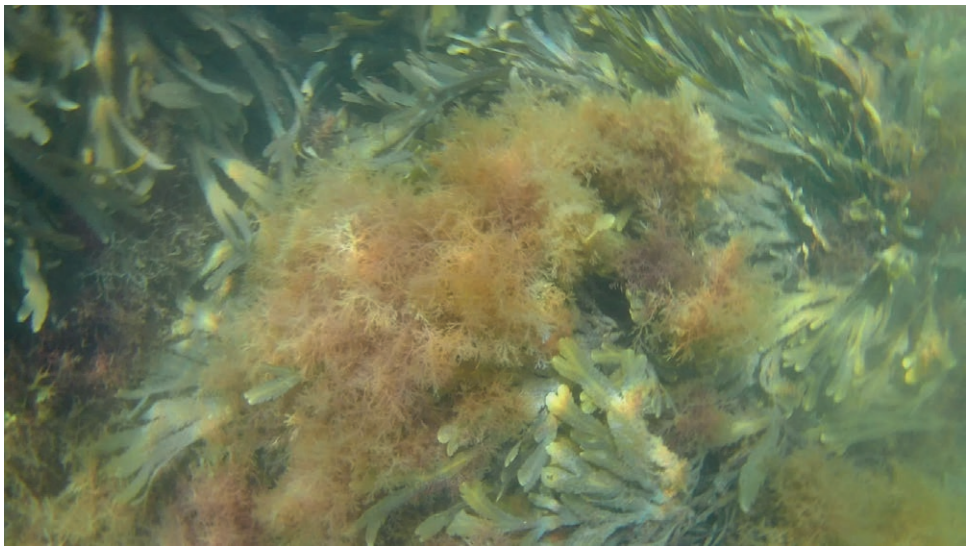
Watery approaches to theorising phenomena

> *…the ocean is not just another space*
> Jue (2022, 27:46)

Jue asserts that oceanic spaces are characterised by a "whole other level of affect" (Jue 2022, 30:44). Why wouldn't we then extend the affectivity of water to sound – both are three-dimensional spaces of ephemerality. Gibson (1979) described a 'medium' as one of the three components of inhabited environments (the other two being substances and surfaces). As terrestrial creatures, humans usually encounter the medium of air, not water. Our ways of expressing ideas, including those about our embodied experience, derive from milieu-specific habits (Jue, 2020). Consequently, these are where our language (and thus our ways of articulating and conceptualising phenomena) are drawn from. There are material (not to mention ethical) limitations to milieu-specific thinking. Any specificity in thinking, by definition focuses us in a certain direction, thereby excluding others. If, as Gibson suggests, a medium affords us movement and perception, changing the medium through which we interact and thus think, affords changed movements and perceptions. For sound, this frees our experience from a mental cul-de-sac, where thinking too often leads our sense of material reality, and instead allows us to enter the materiality of sound directly, through our bodies. As felt. In water. This offers up ways of thinking. We don't impose our preexistent notions onto watery thoughts (thoughts which, like the medium itself, struggle to maintain fixed forms). We avoid the "*premise that as the embodiments of mental representations, or as stable elements in systems of signification, things have already solidified or precipitated out from the generative fluxes of the medium that gave birth to them*" (Ingold 2007, p. 5). Might water help free us from the relative fixity of material cultures, so that we may approach sound (perhaps even more solid material realities) with more responsiveness, with fewer preconceptions? Though Ingold discusses the terrestrial medium of air, his ideas are easily transferred into liquid worlds –

> *…materials* […] *are the active constituents of a world-in-formation. Wherever life is going on, they are relentlessly on the move – flowing, scraping, mixing and mutating. The existence of all living organisms is caught up in this ceaseless respiratory and metabolic interchange between their bodily substances and the fluxes of the medium*
> Ingold (2011, p. 28)

Water is a material medium in perpetual flux. It is unfamiliar enough to focus our attention on the present. It is not the only medium which can affect this. A recent flurry of snow in London changed adults into children, tobogganing down hills



in Greenwich park and constructing gargantuan snowmen. Eye contact among park visitors palpably increased. The novel (and undeniably fun) medium of snow, freed people from the habitual, into the re-creational.

Water also affords a bodily experience of being at once interior (my body, my breath, my movement) and exterior (the medium surrounding me, the horizon where water meets air, the horizon where water meets land). This quality is shared by sound –

> *…the indefiniteness of auditory space proceeds inboth directions – it extends indefinitely from me but it also "invades" mybeing*
> Idhe (2007, p. 207)

Almost outer space-like, water calls for three-dimensional movement, and grants a certain weightlessness. Is there something in my corporeality that recognises the water as life-giving? As threatening? As a pre-birth memory or a present-moment assemblage of interchange?

Bachelard argues that our abilities to express ideas are founded upon materiality, upon embodied experience, and being in the world. He links language to water as a form of such materiality –

> *the voices of water are hardly metaphoric at all; that the language of the waters is a direct poetic reality […] human language has a liquid quality, a flow in its overall effect, water in its consonants. I shall show that this liquidity causes a special psychic excitement that, in itself, evokes images of water.*
> Bachelard (1983, p. 15)

Metaphors are allies in our expressive efforts, even when – as Bachelard asserts – water is more direct than metaphoric. This is because it carries in it powerful symbolism

and a "varied repertoire of emotional, cultural, and sensual associations" (MacLeod 2013, p1). Water, suggest Chen, MacLeod, and Neimanis, is a "particularly potent linguistic ingredient" (2013, p. 10). Our memories – including pre and post-birth, as well as individual and collective memories – of water can help us harness a certain linguistic imagination surrounding these personal and cultural associations –

> *Language emerges from corporeal experience.* […] *Waters add very particular nuances and associations to the concepts they help to signify, and symbolic meanings of waters accumulate from both personal and collective experiences.*
> Chen, MacLeod and Neimanis (2013, p. 10)

Fluid spatiality is both metaphor and analogy. Such conceptual-linguistic devices provide scaffolding for our attention, thinking, actions and interactions, thus "dictating what is perceived and what remains invisible" (Chen, MacLeod and Neimanis 2013, p. 11). The authors suggest that it also acknowledges the other-than-human, material influence on human thinking and languaging. Water thus potentially rebalances the ecological as well as the corporeal. Its metaphoric and direct qualities contribute a lot here because –

> *… metaphor is a phenomenon of the poetic soul. It is also a phenomenon of nature, a projection of human nature on universal nature.*
> Bachelard (1983, p.183)

Our watery bodies often respond to water in ways which attest to its restorative powers. There is a certain catharsis, cleansing and presence of being brought about by being in contact with water (even limited contact, such as washing one's hands or feet). Can we translate some of this power to the medium of sound, which has similarly restorative, cathartic and emotionally resonant affects?

Our bodies, being largely composed of water (somewhere in the range of 60 – 90%) serve as material media (Neimanis 2012). When we place these bodies into a larger watery body we form a correspondence between them, much in the way that we form correspondences in sounding bodies, when we place our bodies into an environment with the IKO. Our bodies are sensitive to sound. They produce their own soundings. They contain air, materials and resonant cavities which amplify, absorb and respond to sound.

Barrett discusses personal agency in spatial sound practice, that is "the imaginer's own involvement in what is being imagined" (2010, p6). Describing how listeners connect to spatial sound through various cues including the acoustic, psychoacoustic, material and social, Barrett asserts that these cues act as basis for a projection of the self into the time-space experience of spatial sound. An act of creative consciousness, this demonstrates listener agency. Watery movement requires even more assertive projection. Water is more resistant than air, it slows us down and suspends us (Jue, 2021). As a result, we become more aware of the passing of time and events, and move ourselves with more energy, intensity of effort, and presence of mind. Such effects are well placed to cultivate a sense of spatiality, distinct from the one we experience on land.

Concerns with watery approaches

Watery approaches have been critiqued, and brief mention of that here is appropriate, lest we imagine there are no concerns with their forms seeping into shared idioms. The use of watery terminology can act to legitimise nefarious practices, systems and structures. We hear of the 'flow of capital', of 'liquidity' and the 'trickle-down effect' – phrases which belie exploitation, domination and inequities of the human and other-than-human kind (MacLeod, 2013). Important then to keep in mind that a medium, even one of inherent flux, is not neutral in its application.

My underwater experience

In the water, I am freed from habitus. I am connected to my limbs and my breath and the medium of water, as material. As moving. As multiple. These aspects act on me – and I on them – simultaneously. Where does the me that is watery, and the watery medium which is not me, locate its fissures of distinction? I press against the saline buoyancy of the ocean, and it presses against me. Our fluid bodies meet in ways which feel overwhelming at times. I doubt my ability to surface whilst freediving in an enclosed space. I lose sense of time whilst clumsily following marine creatures, and latently realise: I should breathe. Some part of me reacts – I am not in my native world. Yet I too am multiple. Some parts of me feel an abiding peacefulness. There are depths within me which respond to the water as if a heavy aching, some old longing, has been met. I feel viscerally held, and therefore at home, in this underwater world. The pressure of the water like viscous swaddlingI forget my need to breathe *because* of these relationships to the water. Its pluralities meeting my own. My pluralities meeting one another with intimacy, immanence, vulnerability and an innocent joy borne of play.

Playfulness is key in my underwater experience. I dive and swim for my own pleasure of course. This maintains said playful disposition. But so too the novelty of the medium (relative to the terrestrial) and the embodiment if offers, combine to create a sense of freedom in exploration. This is a kind of freedom unavailable to me, even in my best moments, on land. Land is where I have dwelled perpetually since birth. It's where my thinking, moving and knowing originates. I cannot shake myself free of a lifetime of such references, try as I might (and I don't always try). Water's playfulness meanwhile, reawakens a childlike curiosity in me.

The comparatively alien range of underwater life fuels this curiosity. I am enchanted. What world have I entered? Why is no-one else here, no-one who looks like me? I am suspended in a world which is clearly ill-suited for my abilities, one in which the inhabitants effortlessly escape my attentions. Clumsy as a child, I accept my lack of efficacy without expectation or indignance. My expertise is absent. My wonder is ignited.

I prefer to dive and snorkel alone, in order to further foster this secret other-worldliness. Being a solo 'other' in this world affords me respite from above-water acoustic stress. To underline – this is due to my being 'other'. Acoustic pollution for marine inhabitants is a very real and increasingly problematic concern, and one which is – as with other underwater environmental concerns – given scant attention.

As I move around to discover and interact with the inhabitants of this world, to feel seaweed fronds against my skin, to approach fish (keen to avoid my lumbering mass), I begin to dance. The unified orchestration of movement created by the medium itself, connects my movement to the wider environment, to currents, to the effects of these on underwater flora and fauna. Dance is variously defined as rhythmic movement of the body, expressive of ideas or emotions (such as delight). A release of energy. Being underwater is all of those things. The pace is legato. I move more slowly in liquid worlds than earthbound ones. Yet the slowness of watery experience prevents

my mental rapidity from disconnecting from my sensual actuality. I notice that the qualities of dance are present. Tidal environments are by nature rhythmic. The waters move me as I move in them. Boundaries blurred, we move in unified ways and waves. Synchronised undulation. My navigation, my exploration of this world is expressive in ways which are unlike my corporeal expressions on land. The expression is affective as a result, consciously experienced and felt. How could this *not* be dance?

Linking underwater experience with spatial sound

Spatial sound as created by the IKO, is freed from habitus. No loudspeaker array has been created like the IKO. No array sounds like the IKO. It appeared in the spatial sound ecosystem without precedent (this is not strictly true, many arrays based on similar principles have been prototyped, but none developed into a commercially available system). The IKO was developed over many years inside the lab, whilst simultaneously and iteratively being toured for installations, concerts and performances. In this way, ecologically valid design-input was accounted for, as part of its evolution. This makes it unique. The novelty of the medium (spatial sound, specifically from the IKO) means that the world it creates is non-native to all (at least, at the present time). This begets a freedom of discovery and sense of wonder, an enchantment (in that one gives oneself permission to be enchanted). Such aspects are not usually available in the highly codified spatial sound systems of academia. We may talk of 'playing' our compositions in conventional settings, but the 'play' is ironically serious. Perhaps such academic systems are an equivalent of the terrestrial domain.

If worlds are always "intersubjective, the shared space of ahistorical community with a particular culture that uses a common languageand a common description of reality" (Heelan 1989, p. 10) does the IKO place us into a void? The world one enters with the IKO is alien. Without history, community, dialect and convention. Yet rather than confound us, it enlivens.

In the IKO, there exists a comparatively foreign range of spatial sound affordances. The 'secret' other-worldliness created by this instrument, rare and new as it is, has not yet been colonised. Similarly, water remains largely uncolonised. Both are more emergent, more personally vital, as a result. With both the water and the IKO, my relationship to time fades as my relationship to space is foregrounded.

Add to this the lack of efficacy one faces when working with the IKO in varied environments (there is uncertainty and risk involved in creating work in one space to perform it in another, due to the way the IKO interacts with the material characteristics of spaces) and the heightening of the emergent is clear. The futility of control in such circumstances induces humility; one accepts ones limits as would a child. Or an adult, underwater. Expertise absent, it is possible to be awed by the medium, and its ability to orchestrate all around and within in. This has correlation with the pulsing movement of the ocean. Such naivety, and its de-centring of the human subject as the site of onto-epistemology, into a melee of conceptual polysemy, is not only appropriate for sound and for space (see Blomberg and Thiering, 2017), but is utterly enlivening.

> *Materials shift from the traditional and expected to something that requires attention*
> Kelly (2018, online)

The heightened embodimen**t** of sound as reproduced by the IKO in combination with an environment's material structures, surfaces and occupiers (human or other-than-human) feels watery. My sensoria tell me I am in relation to all things in the environment, through the medium of sound. These heterogenous elements emerge temporarily as subjective unity. I am connected, a relation which is affected by, and affects other elements within the assemblage, as I am with the medium of water.

> *Thinking with water encourages relational thinking* […] *Water is a matter of relation and connection. Waters literally flow between and within bodies, across space and through time, in a planetary circulation system that challenges pretensions to discrete individuality [..] water is a deep source of plurality and potential, as bodies share and connect through their common waters.*
> Chen, MacLeod and Neimanis (2013, p. 12)

This relational quality pervades my experience with the IKO. Where does the sound have its edge with me? Where is the separation? If my body absorbs and occludes, it is part of the composition as experienced by me, and as somewhat distinctly experienced by other listening bodies. The IKO activates elements in the environment – of which I am one. Its multitudes meet my own with an intimacy that places me into direct contact with the sound, and the environment. Such pluralities remain distinct, yet subjectively unified.

I move around to discover the medium, its world and inhabitants. This connects my rhythms and bodily gestures to those created by the medium itself. I enter into a unified orchestration of movement created by the medium itself. Energy is released, reflected, absorbed and met with more energy. The IKO's sound acts on me as I act on it. Its impact is felt. Its imaging is perceived by my sensoria as *in direct relationship* to the body that is me.

Godøy (2010, 2006)describes how human mental activity is intimately linked with sensations of movement. The orchestrated movements of the IKO and its relations, provoke thoughts via affect in me. Like the water, it acts on me, and consequently awakens my imagination.

Water as transducer

Being held, supported, resisted and met by the pressure of water is a kind of transduction. Is there a distinction between sounds which penetrate viscera, and water which presses against it? The idea of a watery 'transductive ethnography' has been discussed by Helmreich as a way of making "explicit the technical structures and social practices of sounding, hearing, and listening …" (Helmreich, 2007, p. 1). The value for such an approach is borne of the way in which –

> *…for humans, underwater sound is largely registered by bones in the skull, which allow enough resistance – impedance, to use the technical term – for vibrational motion to be rendered into residences in the body.*
> Helmreich (2007, p. 4)

These embodied residencies are transductions – the altering or converting of a signal from one medium to another structure, says Helmreich. These transductions creates matter and meaning, simultaneously. As the IKO acts on me and I on it, its affect is meaningful. My pulse is slowed, my presence heightened, and I am returned to my body, to the environment, to the sound.

Transduction follows movement in the water. As I swim close to a fish, it moves. I occlude the sun. I create bubbles and small vortexes. This agency and the medium of water as a continuous signal, produces affective transduction. Helmreich asks whether an "anthropology of such a transducer sensing can make explicit the conditions that permit immersion" (Helmreich, 2007 p2). What might it mean, that our perception of a spatial field is felt underwater, unlike vision which doesn't extend outside of its range of sight? What might movement underwater contribute towards phenomenological literacy? Jue urges that we pay attention to the conditions through which we are theorising, and how different forms of objectivity are constructed. She suggests that the water, as an environment, affords unique orientations and unique conditions of interpretation. Consequently, one needs to experience it, something you can't realise when looking at someone else's images in a mediated manner (Jue 2020 p163). She also describes how water's pressure re-characterises one's experiences. Such embodiment-reliant intimacy with watery worlds is helpful for navigating the nuance of spatial sound in general, and the IKO in particular. You need to hear the IKO, you need to be with it, not just hear a binaural render of someone else's work. As "the ocean can help us have humility in how we characterise [our] objectivity" (Jue 2022, 38:06, see also Jue 2020 p22) so the IKO can help us have humility in spatial sound theorising and practice.

Coda

Water is not in utilitarian service to us, something to be exploited as if entirely separate. It is part of an assemblage, with its own affective agency. Any such isolationism points to out-of-date thinking. It is not that we should *use* water to derive value from it (as if taking from it isn't also always taking from ourselves). We can (and of course should) acknowledge our deep connection to, dependence on, and symbiosis with, water. Besides, it remains in excess of any grasping –

> *Water, like space has "a remarkable capacity to resist containments of all kinds – be they the language we use to capture water's materiality, or the dams and dikes we deploy to keep its surges at bay*
> Chen, MacLeod and Neimanis (2013, p. 12)

Instead, we can think *through* water, as we move through it, to find ways to understand our experience of the medium of spatial sound. Whether linguistically, corporeally, or otherwise: this can help us understand spatial sound phenomena, as diverse and complex as they are, with a sense of unity. Rather than being overwhelmed, we can surrender into the overflows of spatiality and simultaneity. We can resist the impulse to temporally or spatially freeze things, so as to form sequential, predictive patterns in our terrestrial minds. Fixations of this nature are by definition limiting. We need not think about mind and matter as in polarity. Water helps us know this. As a medium it is always both mind and matter; complete in itself, offering complete absorption for us. Thinking through the qualities of water we –

> *…can begin to think relationality in increasingly sophisticated ways. We can (cautiously) voice the subtleties of relations that may previously have been ignored, invisible, under-articulated, or unintelligible, at the same time as we realize that full fluency in these languages is beyond our grasp.*
> Chen, MacLeod and Neimanis (2013, p. 13)

Perhaps water uniquely ensures we are 'true to the materials' in "respecting its properties rather than riding roughshod over them" (Ingold 2011, p. 29). In flux, beyond mastery, beyond adherence, water mirrors the qualities of sound as a medium. Water's character changes – at times more salty and buoyant to bodies, at times more visible and lucent to eyes. It presents us with new shades of colours, new depths, new ways of feeling temperature. It filters light, it filters sound. It is peaceful. It is foreboding. It pulls us away from our intended destination, or pushes us along a trajectory that we do desire. There is something about the way it brings me into present, embodied awareness of the environment which makes me feel as though the ocean exists only for me, in this spatio-temporal experience, when I am in it.

The IKO can be installed to be more or less visible (I have experimented with both polarities during performances). It too presents new depths, new ways of sensing sound (yes, really) and new trajectories for our artistry and explorations. It changes the way we create and compose work. It requires us to substantially re-think our process, and this break from habit vivifies our ways of working and thus our work. It is peaceful – its affective character has a calming quality. It is foreboding – there is something about its singularity and unfamiliarity which feels imposing and somewhat threatening, as if it may challenge us in unpredictable or sonically uncomfortable ways. There is something about the deeply relational sound it produces which makes me feel as if it exists just for me, in the moment.

These shared qualities abound, and are not dealt with exhaustively here. The qualities of water and sound, unlike their apparently objective cousins 'properties', are subjective. They exist within us, they exist between us and the medium, as "part of that private view of the world which artists each have within them" (Pye 1968, p. 47). These interior affordances are processual, intimate and generative. The relational affordances communicate shared meaning, whilst preserving the interior affordances. Water's affective materiality grounds such diverse subjectivities and their shared con-

text in the pragmatics of the here/ now/ body. Being phenomenologically unfamiliar (and not a medium through which we have preconceptions about sounding), water is germane for exploring the (somehow still nascent) aesthetic aspects of spatial sound, in particular the unfamiliar, affective IKO.

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