Submarine Sounds

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Anthropologist of sound Stefan Helmreich listens to the immersive noiseworld of the three-person Alvin submarine

I am sinking into the sea, crouching inside the three-person research submersible Alvin on a dive to the ocean floor. The snug seven-foot diameter of the spherical titanium interior is awash in the metallic pings of distant sonar devices, the occasional echoes of telephone voices from the research vessel Atlantis (our surface mothership), and the quiet pop music percolating through Alvin's sound system. These bleeping, burbling, babbling sounds reinforce the feeling of immersion. Submerging into the ocean seamlessly merges with a sense of submerging into sound – and into a distinctively watery soundscape. How did the domain that Jacques Cousteau once named "the silent world" become so sonorous? How did the underwater realm become audible to human ears? One answer comes through querying the multiple meanings of immersion: as a descent into liquid, as an absorption of mind and body in some activity, and as an engulfment within sound. It's also helpful to consider Alvin and its occupants a cyborg, a combination of the organic and machine, kept in tune and on track through visual, audio, and tactile feedback.

At 400 metres down, more than two kilometres above our destination – the seafloor volcanoes of the Juan de Fuca Ridge, in the eastern Pacific Ocean – the pilot, Bruce, switches off Alvin's exterior lights, leaving the outside inky black. We continue to *sound* – to dive into and investigate, to fathom – the deep. Such sounding employs devices, like sonar (*so*und *na*vigation and *r*anging), that, in a confusing pun, capture and transmit sound (sound as 'fathoming' has its moorings in the Old English 'sund', 'sea', while 'sound' as 'vibration' reaches back to Old English 'swinn', 'melody'). We hear a 9 kHz tracking pulse sent from Alvin to Atlantis every three seconds, a 9.5 kHz response from Atlantis, and a steady metronome of 'pings' from transponders dispatched to the seafloor by Atlantis in advance of dives. Even though Bruce jokes that the prattle of pings can be an "acoustic will-o'-the-wisp", for him, these echoes are warp and weft of a reassuring soundscape. "Without them, it'd be too quiet," he adds. Far from being noise as irrelevant information — much less noise as direct line to the word's etymological anchor in the Latin 'nausea' — the pings secure a sense that the sub is somewhere rather than nowhere, cradled in a web of sound rather than lost in a featureless void.

This is, of necessity, an artificial soundscape. Humans cannot

experience the underwater realm as a soundscape unless and until prosthetic technologies are made available to the naked ear. Consider a skin diver: the sensation of floating in a three-dimensional net of sound is not available to people actually submerged in water. It is nearly impossible for humans to use underwater acoustic vibration to locate themselves in space. Sound waves travel four times faster in water than in air. And human eardrums are too similar in density to water to provide the resistance that can interrupt many underwater vibrations so they can be translated into tympanic movement (sound) in the ears; lots of vibrations pass right through our bodies. For humans, underwater sound is largely registered by bones in the skull, which allow enough impedance for vibrational motion to be rendered into bodily resonances. Moreover, conduction of sound by bone directly to the inner ear confounds any difference in signals received by left and right ears, making it impossible to compose a stereo image. Unaided human ears perceive underwater sound as omniphonic: coming from all directions at once (and, because of sound's seemingly instantaneous arrival, often as emanating from within one's own body). For humans, the underwater world does not have the textured spatiality of a soundscape. Think of it as a zone of sonic immanence and intensity: a sound state. Alvin, maintained at one atmosphere of pressure in its interior, can only deliver to its passengers a sense of an exterior soundscape because of devices that permit listening across media – from water over into air environments. For humans, fashioning an underwater soundscape requires a process known as transduction: the translation of vibrations — the conversion of signals — from one medium into another. Transduction can be accomplished using hydrophones – usually made of ceramic or other material sufficiently denser than water to allow underwater vibrations to be intercepted. Hydrophonic signals must then be transported into a dryer medium for apprehension by human ears. The very possibility of imagining oneself immersed in a submarine soundscape depends upon transduction (as composers such as Michael Redolfi know all too well; his Sonic Waters, recorded – and sometimes played back – underwater, at such venues as the Scripps Institution for Oceanography in La Jolla, California, is full of spatializing sleights of sound). Without the mediation of transduction, the very notion of an 'underwater soundscape' simply wouldn't exist at all.

Such transduced soundscapes, or 'soundedscapes', have something fugitive about them. Turbulence can produce fluctuating amplitudes, frequency-smearing effects, and blobs of reverberation that make directionality very difficult to discern. Water waves – which form and even collide underwater, where liquid layers of different temperatures

meet – also change the contours of vibration. Closer listening cannot help when these factors pile up. But none of us in Alvin, not even the pilot, needs to listen to the sounds of sonar closely. Onboard computers convert transponder and sonar signals into visual displays. If listening to sonar on Alvin has been delegated to machines, the result is that passengers now hear in a much more diffuse, less disciplined way than, say, World War Two submariners, who listened attentively through headphones. Earlier generations of submarine pilots needed to be keen auditors of sonar, and it was through such listening that the crackling of crustaceans, the snapping of shrimps and the singing of whales were first disclosed. Scientists no longer think the deep a quiet, meditative space, a silent world.

This is not to say that sound inside subs is no longer present. But sound is now heard differently. If it is made audible at all, sound is passively heard rather than actively listened to. Sound from outside Alvin becomes a buoy for our perception of floating presence, located at the fringes of consciousness. Because we do not need to work at the boundary between self and sound – that is, because we do not have to be actively aware of transducing – the boundary becomes imperceptible, inaudible; we become immersed, absorbed.
But it is not all Ambient Techno inside Alvin's interior air pocket. As we descend, a classic rock soundtrack accompanies us from Bruce's MP3 player. Inside Alvin, playing music creates a sense of absorption in the interior space of the sub – but because it mingles with the transduced soundscape of the outside, the effect is to feel at once inside a bubble and porously immersed in a wider world. The pings and pongs create an echoing sense of being in a landscape that extends beyond the confines of the sphere: one reason few people become claustrophobic in this tight space.

There is yet another soundscape in the sub: that of the speech of passengers. Geologist John Delaney tells me to look out of the window as we near the bottom. I take a blurry picture of a hydrothermal vent spire. I speak into one of the sub's tape recorders. Not all speech is evanescent in this sphere. That our dive is documented for later playback on tape and DVD makes clear that Alvin is a recording studio. This is not surprising; one of Alvin's previous chief engineers had substantial audio experience, making sound systems for such artists as Steely Dan and Joni Mitchell. By the 1970s, recording studios had become places that were standardized; they had become sites of signal routing, monitoring, controlled feedback – control and communications systems, like Alvin: transduction machines promising immersion in sound. When we arrive at the seafloor, Bruce turns on

the lights of the sub, illuminating the rocky landscape around us. The 300 atmospheres weighing on the sub outside are impossible to imagine. Outside, decapod crustaceans scrabble slowly around. If, as Coil put it back in 1999 in “The Sea Priestess”, such “spider-crabs crackle like Wimshurst mechanicals”, I cannot tell. There is something strangely silent again, about the bottom of the sea.

Stefan Helmreich is a Professor of Anthropology at MIT. His book Alien Ocean: Anthropological Voyages In Microbial Seas is published by University Of California Press. This article reports on Alvin dive #4020, 1 June 2004 (for more on Alvin, see see http://www.whoi.edu/page.do?pid=8422). Helmreich also works in sound. His CD, Xerophonics: Copying Machine Music (Seeland 524) was reviewed in THE WIRE 229.