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Tina Chanter, editor

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Thinking after Irigaray

Edited by

MARY C. RAWLINSON

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TOWARD A FEMINIST EPISTEMOLOGY OF SOUND

Refiguring Waves in Audio-Technical Discourse

Tara Rodgers

In recent years, scholarly activity in the field of sound studies has surged, concerned with the historical and cultural bases of sound and listening, the interrelations of science and technology with music and sound-based communications, and the relationships of sound to philosophical thought (Stadler 2010; Keeling and Kun 2011; Chow and Steintrager 2011; Sterne 2012; Pinch and Bijsterveld 2012). At the time of this writing, this rapidly expanding, interdisciplinary field has yet to offer sustained engagements of feminist theory. Feminist theorists have published extensively on visual cultures and technologies, but attention to sound has been rare; notable exceptions include Kaja Silverman's study of the female voice in psychoanalysis and cinema (1988) and Ruth Salvaggio's examination of the sounds of language in feminist theory (1999). Much work remains to be done to identify and amplify the presence of sound, and kindred refrains of voice, silence, vibration, and noise, within histories of feminist theory and philosophy. This essay is a small part of that project. I use Luce Irigaray's "The 'Mechanics' of Fluids" (1985) to examine the aesthetics and politics of the sound wave, which is a central figure in Western sonic epistemologies. Such novel juxtapositions of feminist theories and audio-technical discourses can both extend cultural histories of sound and music and reveal promising affinities between feminisms and the sonic.

Over many decades, the figure of the sound wave has spanned many communities of musical and audio-technical practice to become a kind of

"metaphor we live by" (Lakoff and Johnson 1980). The wave is a fundamental concept in digital audio and recording textbooks (Roads 1996, 14–16; Huber and Runstein 1997, 23–28). Its cyclical form is an iconic image that appears on countless audio technologies, from hardware synthesizer interfaces to software editing environments. There are also vestiges of maritime voyage in the language that describes the structure of our ears (canals), and our technologies for working with audio (channels on a mixer).

More than merely abstract or poetic concepts, wave metaphors and maritime themes are integral to audio-technical designs and are materialized in music technologies. For example, the technological possibility of synthesizing sound has roots in scientific observations of water waves and desires to navigate waters by predicting wave shapes and patterns. One of the first documented technologies to be called a *synthesizer* was Lord Kelvin's mechanical device to predict the tides, which was developed in the 1870s and influenced subsequent musical instruments that generated sound electronically (Miller 1937, 110–11). A full century later, synthesizers introduced to a mass market in the 1970s were given names like *Voyager* and *Odyssey* (by the Moog and ARP companies, respectively). The ARP *Odyssey* was celebrated in its owner's manual as "the ultimate musical trip" (ARP 1976). Its patch book, a compendium of diagrams that show users how to make sounds, included instructions for synthesizing the roaring sounds of "Mayday at Sea" (ARP 1981). Wave metaphors and maritime themes are so ubiquitous in the language and designs of contemporary audio technologies that they have largely escaped critical attention.

This essay investigates the cultural roots of the sound wave metaphor. It accounts for its articulation to visualist logics of scientific objectivity, in which knowledge and power are consolidated in the subject position of a detached or distant observer. By analyzing "the narrative character of cultural representations [. . .] the stories built in to the representational process itself" (Clifford 1986, 100), I identify a "network of analogies" that converged in epistemologies of electronic sound around the turn of the twentieth century (Foucault 1994, xi). These include analogies between sound, electricity, and water waves; between fluidity and female corporealities; and between maritime voyage, scientific and colonialist enterprise, and the consolidation of an archetypal white, Western, male subjectivity.

I survey uses of wave metaphors and maritime themes in late-nineteenth and early-twentieth century texts that were foundational to the fields of acoustics and electroacoustics. These texts were written by experimenters who formulated key theories of sound in the 1860s and '70s, including Hermann von Helmholtz, John Tyndall, and Lord Rayleigh, and by another generation of writers and acousticians who reworked and further popularized these ideas in the first half of the twentieth century (Miller 1937 [1916];

Lamb 1960 [1925]; Barton 1926; Jeans 1937). These authors established a logic of controlling sound waves that persists in contemporary audio-technical discourse. In my formulation of this concept of *audio-technical discourse*, the term *discourse* references "a way of knowledge, a background of assumptions and agreements about how reality is to be interpreted and expressed, supported by paradigmatic metaphors, techniques, and technologies" (Edwards 1996, 34). The modifier *audio-technical* encompasses a range of social actors and institutions invested in the technologically mediated production of knowledge about sound, across such fields as music-making, acoustics research and engineering, and electronics hobbyist cultures.

I turn to Luce Irigaray's writings to show how the physical properties of sound waves have been aligned with the connotations of fluidity and excess associated with female bodies throughout Western history and philosophy. For acoustics experimenters, to analyze sound meant to experience the pleasure and danger of unruly waves, and to seek their control from a distanced perspective. Both the objectified material of sound and the subject position of the acoustics researcher were routinely gendered in audio-technical discourse. Through themes of maritime voyage, the experiential navigation and technological control of sound waves were articulated to colonialist paradigms of racial exoticism and conquest. The imagined physical "space" of the sound wave became both a gendered and racialized space (Ahmed 2006, 111–12) that mirrored colonialist narratives: a particle/subject voyaged out, experienced affective encounters, and returned home to a state of rest. An epistemology of electronic sound was thus built on the perspective and advancement of an archetypal white, Western, male subject, so that the technological control of sound waves became a symbolic containment of gendered and racialized excess. I conclude by suggesting that feminist epistemologies of sound might begin from perspectives within the waves, attending to the politics of human and nonhuman encounters and interconnections, rather than privileging and perpetuating Enlightenment paradigms of detachment, domination, and control.

SOUND WAVES AS FLUID DISTURBANCES AND MARITIME FRONTIERS

Analogies between sound and water waves were widespread beginning in ancient times, offering a convenient way for observers to visualize the otherwise elusive phenomena of sound (Helmholtz 1954, 26). Perhaps the most enduring analogy of this sort is between the effects of throwing a stone into a pool of water and the propagation of sound waves in air. This is a recurring example in acoustics and physics texts (Hunt 1978, 23–24, 27; see also Helmholtz 1954, 9–10; Jones 1898, 236; Huber and Runstein 1997, 23–24).

Ancient analogies between sound and water waves were bolstered by early modern experiments that demonstrated the oscillatory motions of air resulting from musical sounds, and the diffraction of sounds around corners, both of which are phenomena also associated with water waves. Mathematical theories of sound waves began with Isaac Newton's *Principia* (1686), and wave equations for describing sound propagation were further refined by Euler, Lagrange, and others in the eighteenth century (Pierce 1989, 3–6). Sound and water wave analogies also took hold in a nineteenth-century context in which knowledge of sound was driven by the ability of experimenters to visualize its effects (Sterne 2003, 44–45). Late-nineteenth-century writers such as Helmholtz and James Jeans extended the wave metaphor by describing sound with florid analogies to such things as whirlpools, steamboats, and ships, particularly when addressing their work to a popular readership (Jeans 1937, 3, 56, 124–25; Helmholtz 1954, 26).

Ideas for the generation and control of electronic sound waves emerged in a Euro-American cultural context at the turn of the twentieth century; wave metaphors and references to fascination with the sea abounded (Helmreich 2009, 15, 34–35). Sound and electricity were both understood as fluid media and were conceptually linked to each other through water-wave metaphors and associated terms such as *current*, *channel*, and *flow*. Heinrich Hertz's research on electromagnetic waves in the 1880s used these metaphoric associations, and his work informed the analogies that subsequent generations of acoustics researchers drew between sounds and electrical signals (Thompson 2002, 34, 61, 96). Additionally, emerging networks of hydroelectric power in the United States linked water waves to large-scale systems for moving electrical currents. Hydroelectric power symbolized the simultaneous control of water and electrical waves and was considered by many to be a necessary and inevitable manifestation of technological progress (Hughes 1983, 106–7, 135–39).

Concurrently, scientists were developing a universal theory of light, heat, and sound that would define all of them in terms of motion. By the 1920s, it was popularly understood that waves and particles in wave motion comprised everything in the universe (Beer 1996, 298). Around the same time, wave-particle duality emerged as a central concept in quantum physics, suggesting that all energy and matter exhibited properties of both waves and particles (Ponomarev 1993, 111). This concept permeated contemporaneous descriptions of sound waves. In audio-technical discourse, particles and waves were like the characters and setting of a story, the figures and the ground; particles represented bodies in varying stages of orderly or disorderly motion and rest, and waves signified the cause or manner of the particles' displacement and/or the environment through which they moved.

In acoustics texts, sound was characterized by wave *motion* (often illustrated as simple harmonic motion) and wave *propagation*. Both of these concepts manifested a scientific ordering of space and regulation of movement. D. C. Miller, a physicist who would later become president of the Acoustical Society of America, wrote, "Simple harmonic motion has several evident features: it takes place in a straight line [the middle of which is the position of rest of the particle]; it is vibratory, moving to and fro; it is periodic, repeating its movements regularly; there are instants of rest at the two extremes of the movement" (Miller 1937, 6). Sound entailed a journey of vibrating particles back and forth, whereby contact with other particles initiated wave propagation: "the continuous passing onward from point to point in an elastic medium of a periodic vibration [. . .] produce a series of waves following each other at regular intervals" (Ibid., 13–14). The imagined space of simple harmonic motion was one of formal constraint, in which motion took place in a "straight line" within "very narrow limits" (Helmholtz 1954, 8). As such, it was an orderly pattern bounded by states of rest, with particles ever at risk of disturbance.

Authors of acoustics texts typically defined sound as fluid disturbances of an idealized state of rest. Sound waves instigated the physical displacement of male subjects, and corollary sensory impressions and affects. Miller wrote: "These *disturbances of all kinds*, as they exist in the air around a sounding body, constitute sound waves" (Miller 1937, 5; emphasis added). Tyndall told of "sources of disturbance" and the "shock and jostle of the sonorous waves" (Tyndall 1869, 254, 81–82). Barton described sound as an "external physical disturbance" that excited and stimulated the auditory nerves in the ear (Barton 1926, 1). States of rest were an idealized norm against which these auditory disturbances were measured: "If there were complete rest and immobility, there would be complete silence" (Euclid, 330–275 BCE, cited in Hunt 1978, 17; see also Lamb 1960, 103). This logic has remained largely unchanged. A 1990 textbook summarized that simple wave motion entailed a journey of particles outward and back, and wave propagation consisted of "A *disturbance* [. . .] passed along from point to point as the wave propagates [. . .] [while] the medium *reverts to its undisturbed state* after the wave has passed" (Rossing 1990, 33, emphasis added).

Sounds took the form of fluid disturbances as external phenomena and interiorized sensory experiences. Helmholtz wrote of sound waves in the "atmospheric ocean" (Helmholtz 1954, 10), and Frederick Hunt opened his history of acoustics similarly with the observation: "Man lives in an uneasy ocean of air continually agitated by the disturbances called sound waves" (Hunt 1978, 1). Many other acoustics texts drew parallels between the motion of sound waves in the world and the vibrations of fluids within

the ear canal, which were understood as "synchronous with those originating at the external source in the atmosphere" (Barton 1926, 341). Jeans conjured a most vibrant analogy of sound and water waves that transposed the turbulent fluidity of the sounding world onto the interior of the subject: "Sound reaches our ears in the form of waves which have travelled through the surrounding air, much as waves travel over the surface of a sea or river; some of these waves travel down the inch-long backwater formed by the auditory canal, and finally encounter the ear-drum, which forms a barrier at the far end" (Jeans 1937, 6–7). The ear was a destination of sound waves, one that "accepts [. . .] all the strife and struggle and confusion" of vibratory motion in the surrounding environment (Tyndall 1869, 82). It was also an orifice or border that opened onto an interior, labyrinthine structure; in one author's description, the tympanic membrane was the point at which sound waves crossed over from the exterior to the interior world, the "frontier between physics and physiology" (Lamb 1960, 1).

Structures within the ear (solids, fluids, and membranes) were depicted as a terrain of interconnected parts through which vibrations "travel" (Barton 1926, 335–43). The term *ear canal* itself evoked a channel of water for navigation, an arm of the sea. Francis Bacon's *Sylva Sylvarum* (1626) contained one of the first applications of the term *canal* (derived from channel, a waterway for boats) to a pipe for amplifying sound, as well as to tubular structures within the body, such as the ear canal (OED, "canal"). Like twentieth-century biotechnology discourses that transposed tropes of outer-space travel to "inner space" representations of immune systems (Haraway 1991, 221–25), Bacon and followers imagined formal structures of the ear in relation to symbols of maritime voyages drawn from concurrent scientific and colonialist exploration projects. Themes of maritime voyage symbolized the promise of scientific exploration to conquer the unknowable, fluid landscapes of sound waves in the furthest reaches of the world and the innermost spaces of the ear, and these metaphors have persisted in audio-technical discourse (Stevens et al. 1965, 42).

Like sound waves in the "uneasy ocean of air" that man encounters in the exterior world, the movements of fluids inside the ear threatened the subject's sense of balance: "They are [. . .] responsible for the giddiness we feel after spinning round too often or too rapidly, and for [. . .] the even less agreeable sensations we experience when we are on a small ship in a turbulent sea" (Jeans 1937, 3). Helmholtz likewise noted the different types of feelings generated by waves, and their relationship to a sense of order: "Water in motion, as in cascades or sea waves, has an effect in some respects similar to music. How long and how often can we sit and look at the waves rolling in to shore! Their rhythmic motion, perpetually varied in detail, produces a peculiar feeling of pleasant repose or weariness,

and the impression of a mighty orderly life, finely linked together [. . .] Small undulations, on the other hand, on small surfaces of water, follow one another too rapidly, and disturb rather than please" (Helmholtz 1954, 251). Sound waves could provoke feelings of stimulation and pleasure, but ultimately required the male subject to establish balance and control—to return to shore, a home state of repose, the foundation of an orderly life.

Technical descriptions of sound waves were often narrated as allegories of maritime travel, in which fluid disturbances transported male subjects and generated surprising or pleasurable feelings until these subjects returned "home" to a position of rest or balance. This discourse is consistent with colonialist narratives in which a white, Western, male subject voyages out in pursuit of scientific discovery, engages in affective contacts with racially exoticized others, and returns home having gained knowledge and material resources from conquest. As bell hooks has written, the longings for pleasure and danger that are associated with encounters with otherness have "led the white west to sustain a romantic fantasy for the 'primitive' and the concrete search for a real primitive paradise, whether that location be a country or a body, a dark continent or dark flesh" (hooks 2006, 370). The seemingly natural wave motion and affective experience of sound—a voyage of particles outward and back, and the corollary transportation of a white, male voyager to a pleasurable sensory experience and back to a state of rest—enables imperialist and masculinist ideologies to circulate in audio-technical discourse as natural and inevitable. In her influential work in feminist musicology, Susan McClary has argued that tonal music is "narratively conceived" so that musical structures are tonally resolved by a symbolic journey through, and conquest of, "Other" musical keys, and through the containment of "feminine" themes within dominant, "masculine" ones (McClary 1991, 155–56). There are similar stakes in textbook definitions of sound waves as oscillations between disturbance and rest. Sound waves, as fluid disturbances, are figurations of alterity and desire, and their management through technological control is a symbolic containment of gendered and racialized excess.

Luce Irigaray's work is especially useful for examining the construction of gendered and sexualized embodiment in audio-technical figurations of sound waves. In her essay "The 'Mechanics' of Fluids," Irigaray claims that feminized fluids are "a physical reality that continues to resist adequate symbolization and/or that signifies the powerlessness of logic to incorporate in its writing all the characteristic features of nature." Fluids are often envisaged in an ideal state "so as to keep it/them from jamming the works of the theoretical machine" (Irigaray 1985, 106–7). Authors of acoustics texts figured sound waves as unruly disruptions in need of containment, especially as they passed through the fluid media of water or air. While theories about

sound were immersed, so to speak, in water analogies, the behavior of sound in actual water proved difficult to measure. Tyndall, Rayleigh, and Barton all expressed the difficulty of representing the behavior of sound in water, except in ideal terms. Tyndall noted that mathematical theories often deal "solely with the propagation of sound [. . .] in an *ideal fluid*, which unites all the properties *hypothetically*" (Tyndall 1869, 324). He concluded that "The velocity of sound in liquids may be determined theoretically" (Ibid., 37). Rayleigh devoted no fewer than thirteen chapters of *The Theory of Sound* to explicating acoustic radiation in fluid media, including air and water. In the introduction to the book, Robert Bruce Lindsay observed, "This is by far the most difficult part of the subject matter of acoustics and has remained so to the present time" (Rayleigh 1945, xxviii). Barton likewise concluded that motion from the propagation of sound in water waves was "more complicated" than its movement through a coil or cord (Barton 1926, 8).

According to Irigaray, "historically the properties of fluids have been abandoned to the feminine" (Irigaray 1985, 116). These properties include formlessness and uncontrollability, which threaten the coherence of subject and object as distinct entities, and also hold connotations of abjection (Young 2005, 81; see also Grosz 1994, 195). As Iris Marion Young explains: "The point is that a metaphysics of self-identical objects has clear ties to the domination of nature in which the domination of women has been implicated because culture has projected onto [women] identification with the abject body" (Young 2005, 81). Elizabeth Grosz elaborates on this idea by examining Irigaray's essay alongside Mary Douglas's *Purity and Danger*: "[W]hat is disturbing about the viscous or the fluid is its refusal to conform to the laws governing [. . .] the solid and the self-identical, its otherness to the notion of an entity—the very notion that governs our self-representations and understanding of the body. It is not that female sexuality is like, resembles, an inherently horrifying viscosity. Rather, it is the production of an order that renders female sexuality and corporeality marginal, indeterminate, and viscous that constitutes the sticky and the viscous with all their [. . .] horrifying connotations" (Grosz 1994, 195).

The analogy between sound and water waves in acoustics texts articulates sound to the connotations of formlessness and unknowability that historically have been associated with female sexuality and corporeality, and to the horrors of submersion and dissolution that threaten the coherence and dominance of the male subject. In nineteenth-century Euro-American culture, "the life-taking and life-giving ocean [. . .] embodied a dualistic femininity, alternately maternal and witchlike [. . .] [It] had become a master symbol of the sublime, of the awesomely beautiful and terrifying, of the natural that exists on such an overwhelming scale" (Helmreich 2009, 15). Likewise, in audio-technical discourse, feminized waves were both form-

giving—enabling the very possibility of sound—and perpetually in excess of formal representation.

Actual sound waves were difficult to represent, and were knowable primarily through analogy to visual tropes and inexact mathematical formulae. But the movement of particles in wave motion and propagation provided a vehicle for authors of acoustics texts to imagine male, homosocial interactions. Tyndall, for example, narrated and performed a description of simple harmonic motion by personifying the particles as boys: "I have here five young assistants [. . .] placed in a row, one behind the other, each boy's hands resting against the back of the boy in front of him [. . .] I suddenly push A, A pushes B, and regains his upright position [. . .] We could thus transmit a push through a row of a hundred boys, each particular boy, however, only swaying to and fro" (Tyndall 1869, 5). Even such simple contacts were not without consequence. The boy at the end of the line "is thrown forward. Had he been standing on the edge of a precipice, he would have fallen over; had he stood in contact with a window, he would have broken the glass" (Ibid.). The causes of such troublesome impacts were the fluid and feminized disturbances of sound waves. A 1965 *Life* magazine illustrated book about sound includes a similar picture designed for another historical moment, in which moving particles are rendered as "little men" doing industrious "work"—colliding and transferring energy in a lonely crowd of midcentury mass culture, itself a feminized cultural space against which white, middle-class American men sought to fortify their masculinity (Stevens et al. 1965, 11; Waksman 2004, 677–78). These examples further illustrate how audio-technical representations are condensations of worlds, in which social differences are produced and naturalized in the purportedly neutral, physical properties of sound.

OBJECTIVE PERSPECTIVES, MARITIME ADVENTURES, AND THE PRODUCTION OF A SONIC EPISTEMOLOGY

Audio-technical descriptions of sound waves follow logics of scientific rationality in which knowledge and power are consolidated through practices of detached observation (Haraway 1988, 581; Daston 1992). Many accounts in acoustics texts set up a *mise-en-scène* for the observer to establish such a perspective. Tyndall positioned himself as a leisurely traveler: "In travelling recently in the coupé of a French railway carriage I had occasion to place a bottle half filled with water on one of the little coupé tables. It was interesting to observe it. At times it would be quite still; at times it would oscillate violently" (Tyndall 1869, 101). And, to measure complex patterns of wave propagation: "From a boat in Cowes Harbour, in moderate weather, I have often watched the masts and ropes of the ships, as mirrored in the water"

(Ibid., 253). In another example, Tyndall is a rugged adventurer who scaled heights for a clearer perspective over the water (Ibid., 19–20). Helmholtz also wrote of taking a certain pleasure in observing complex wave patterns from a lofty perspective: “[A] great multitude of different systems of waves mutually overtopping and crossing each other [. . .] is best seen on the surface of the sea, viewed from a lofty cliff [. . .] I must own that whenever I attentively observe this spectacle it awakens in me a peculiar kind of intellectual pleasure” (Helmholtz 1954, 26). Helmholtz’s pleasure came specifically from the sense that the imagined behavior of sound waves was rendered visible in his observations of the sea from a comfortable distance. In all the above examples, the observer makes a claim to truth about the behavior of sound by assuming a detached perspective from unpredictable waves: calmly viewing a shaky glass on the table, perching on a boat to view the water, advancing to a cliff far above the sea. Indeed, to touch or fall into the waves would compromise the male subject’s objective position and signal a loss of control.

Despite the need for an objective distance to properly observe the waves, authors of acoustics texts also expressed a desire for contact with sound and water waves in order to be challenged and to overcome unpredictabilities with demonstrations of mastery. Like the mythic seafarer Odysseus, whom Max Horkheimer and Theodor Adorno theorize as the prototypical bourgeois subject, the sonic experimenter “achieves estrangement from nature by abandoning himself to nature, trying his strength against it in all his adventures” (Horkheimer and Adorno 2002, 38). For example, to measure the velocity of sound in water, experimenters literally set out across the waves. This may seem merely practical in the context of scientific experiment, but when read as part of a narrative tableau that takes shape across multiple acoustics texts, it becomes something closer to a ritualistic performance of an archetypal male subjectivity. Leonardo da Vinci dipped one end of a tube in the water and placed the other end to his ear, awaiting a response; Colladon and Sturm, in an 1826 experiment, embarked on a boat, struck a bell, and waited for the sound to reach their colleagues; Tyndall’s companions shouted out to him across a glacier, assessing the effect of the weather on the speed of sound (Hunt 1978, 76; Rayleigh 1945, Vol. I, 3; Tyndall 1869, 19–20).

Storms and treacherous waters functioned as impediments to these observers’ communications (Tyndall 1869, 19–20), and conversely, the ability to hear faraway sounds most clearly was associated with calm waves, days when “the sea was of glassy smoothness” (Rayleigh 1945, Vol. II, 137). Such depictions of turbulent waves as impediments to male subject formation recycle themes in the Judeo-Christian tradition, notably the stories of creation, Noah’s ark, Jonah and the great fish, in which the enveloping waves

must recede, by the power of the creator, for the advancement of the male subject, the proliferation of species, and the progress of civilization. The deep historical time and narrative arcs of technoscience are indeed characterized by Christian paradigms of figuration and fulfillment, where a first event or person signifies the second, and the second is understood to fulfill the first (Haraway 1997, 9–10). Biblical and audio-technical creation myths—from the genesis of species to the electronic synthesis of sounds—thus anticipate and reference one another, signifying the promises of progress and salvation for faithful subjects of technoscience.

Desires for calm and controlled waves were also evident in the uses of mediating instruments to incorporate sound waves into communication systems. In several experiments recounted in acoustics texts, tubes and other solids represented mechanisms to contain and channel sound waves against the formless excess of the surrounding fluid medium. In Colladon and Sturm’s experiment, the unintelligibility of sounds in water was resolved by recourse to the solid medium of the tube. The listener on Lake Geneva “[applied] his ear to a tube carried beneath the surface” (Rayleigh 1945, Vol. I, 3). Rayleigh concluded that to communicate sound from air to water or water to air, “a beam of wood, or a metallic wire, acts like a speaking tube, conveying sounds to considerable distances with very little loss” (Rayleigh 1945, vol. II, 89). And to transmit sound across fluid media, “the most effective of all is a tube-like enclosure, which *prevents spreading altogether*” (Rayleigh 1945, Vol. I, 3, emphasis added). To interpret these examples we can turn again to Irigaray, who argues that the “reabsorption of fluid in a solidified form” is necessary for its intelligibility in a phallic economy (Irigaray 1985, 111). Young similarly describes a Western cultural imperative by which the perceived fluidity or indeterminacy of female body parts, especially the breasts, is solidified by technologies of constraint, such as clothing and surgery (Young 2005; Grosz 1994, 205). Nineteenth-century sonic experimenters’ uses of tubes to preserve their voices from diffusion in the immersive sea were significant in that they anticipated methods for guarding against loss in subsequent techniques of sound reproduction, where “loss” was the perceived degradation in quality of the audio signal as it passes through a medium (Sterne 2003, 215–86). The relevance of the work of Irigaray, Young, and Grosz in this context marks the importance of rereading histories of familiar audio-technical processes with attention to the ways that social differences, such as notions of gendered embodiment, are figured in discourse and built into technological designs.

In tandem with efforts to channel unruly sound waves through mediating instruments, voyages across waves were associated in audio-technical discourse with the acquisition of scientific knowledge about sound. Francis Bacon appears as a kind of patriarchal figure and interlocutor across many

acoustics texts and electronic music histories via an oft-cited passage from *New Atlantis*: "We have also sound-houses, where we practise and demonstrate all sounds and their generation [. . .] We represent small sounds as great and deep; likewise great sounds, extenuate and sharp; we make divers tremblings and warblings of sounds [. . .] We represent and imitate all articulate sounds and letters, and the voices and notes of beasts and birds" (Bacon 1952, 213). Variations on this passage are cited as a sort of manifesto in the Columbia-Princeton's Electronic Music Studio's review of their activities in the late 1950s (*Preliminary Report* 1957, n.d., 4) and positioned as a foundational moment for modern sonic experimentation in many electronic music histories and textbooks (Chadabe 1997, 3; Jenkins and Smith 1975, 146; Deutsch 1976, v). Twentieth-century inventors, composers, and educators used the *New Atlantis* citation to situate their work within a history and mythos of scientific experiment that signified, at once, both rationality and adventure. They attached their endeavors to the promise held out by this famous tale of technological utopia: that the establishment of dedicated studios ("sound-houses") would foster knowledge and mastery of new technologies for producing any sound imaginable through the application of scientific inquiry.

The fictional form of maritime travel narrative, in *New Atlantis* as elsewhere, has long been articulated to the advancement of scientific knowledge through colonial conquest (Albanese 1990, 506; Solomon 1998, 162). Bacon's philosophical program, including *New Atlantis*, has been criticized for sanctioning colonial agendas, a patriarchal organization of society, and domination of nature expressed through a language of physical coercion and rape (Merchant 1980; Park 2006). The recurrent invocations of *New Atlantis* in audio-technical discourse keep alive the notion that creative work in sound is akin to maritime adventure and discovery, where individual success and distinction come with domination and conquest. For example, in a romantic account of the promise of music and electricity, composer Carlos Chavez claimed, "[A]n analysis of our present artistic situation and its expressive potentialities must begin with [. . .] a retrospective study of the development of art in relation to man's domination of physical means [. . .] Only by their study may we obtain a much-needed perspective on the present, just as a mariner, to confirm his route, must first ascertain his position on the vastness of the ocean" (Chavez 1937, 16). D. C. Miller characterized discoveries in music and science as a process in which the "indefatigable discoverer may be able to push forward into unknown regions, and [. . .] be thrilled with the desire for their possession" (Miller 1937, 263). The allegory of simple harmonic motion (in which particles voyage out and return home) also worked to naturalize these tales of seafaring used to describe the acquisition of scientific knowledge about sound.

On one level, these were expressions of how particular natural philosophers, experimenters, and composers imagined themselves and their projects in specific cultural and historical contexts. In an essay on the influence of scientific discourses on literary modernism, Gillian Beer links wave theory to a typically modernist account of bombardment of the senses. Concepts of the ocean, or as Nietzsche described it, the "sea of forces flowing and rushing together," were key modernist tropes that cut across cultural fields (Beer 1996, 313). But technical narratives of sound also take on a timeless quality. Cited and retold in multiple generations of technical literature, and informed by ancient and early modern observations and myths such as the *New Atlantis*, their message seems inevitable: that sound, now as ever, is to be experienced and known through the bold traversal and rational management of turbulent waves.

REFIGURING SOUND WAVES THROUGH ALLEGORIES OF INTERCONNECTION

How might we consider sound waves differently, as a means for generating feminist theories as well as alternative histories of audio cultures? Donna Haraway developed the concepts of situated knowledges and partial perspectives as a way for feminists to reclaim the sensory powers of vision from that "conquering gaze from nowhere." This refers to the consolidation of knowledge and power in those "unmarked positions of Man and White" that have characterized practices of scientific objectivity (Haraway 1988, 581). Haraway proposed that feminist forms of objectivity are those that recognize all knowledge claims as partial, and as culturally and historically located. In a litany of questions that exposed the many contingencies of scientific objectivity ("How to see? Where to see from? What limits to vision?"), she asked, "What other sensory powers do we wish to cultivate besides vision?" (Ibid., 587). As I have shown, dominant epistemologies of sound have followed a consolidation of vision, knowledge, and power that is typical of Western technoscientific cultures. However, sound waves also offer ways of imagining situated knowledges and partial perspectives that depart from merely visual senses and metaphors, in part by signaling contingent and open-ended processes of touch and movement. While feminists have rightly criticized the use of oceanographic wave metaphors to construct restrictive, generational models of feminism (Spigel 2004, 1211–12; Garrison 2005, 240–43), I contend that sound waves (and/as ocean waves) can be productive metaphors for feminist orientations to knowledge, communication, and technology.

In one modernist trajectory, acousticians devised visual representations of sound waves in order to predict, control, and recreate them. Virginia

Woolf offered another way forward in her experimental novel *The Waves* (1931), which employed sound and water wave metaphors to emphasize oceanic communality (Beer 1996, 315). In a similar vein, in 1975, science fiction writer Ursula K. Le Guin produced a radically different version of *New Atlantis* than Bacon's utopia of the same name. Le Guin's story is a dystopic account of the American West Coast transformed by floods and destroyed by pollution, overpopulation, depletion of natural resources, and excessive government control. Because of these transformations, the North American continent is sinking and an ancient civilization is rising from the ocean. The story is told from alternating perspectives of a woman on the sinking continent and a communal voice of the ocean people (Cummins 1993, 166–67). Le Guin writes, "Where did they come from, those dim, slow, vast tides? [. . .] We could not understand that; we could only feel their touch against us, but in straining our sense to guess their origin and end, we became aware of [. . .] something out there in the darkness of the great currents: sounds [. . .] Sound is a fragile thing, a tremor, as delicate as life itself" (Le Guin 1975, 74).

In this and other passages, Le Guin uses sound and ocean wave metaphors allegorically, but in a different way than the examples in foundational acoustics texts. Le Guin's characters strain their ears to hear lessons from history; the touch of waves across distant shores signifies both the traversal of time (by symbolizing a connection between past, present, and future) and the traversal of space (by characterizing encounters across difference by way of mutual exchange rather than domination). Waves represent the politics of encounter and contingencies of mutual contact rather than a disturbance or medium of conquest.

The age-old analogy of the stone thrown into a pool of water is typically told in audio-technical discourse from the perspective of a distant viewer who observes the patterns of waves. We might alternatively adopt perspectives of being carried by, moved with, or submerged under the waves. Woolf wrote of the delirious sensations of being moved by sounds across the water: "The sound of the chorus came across the water and I felt leap up that old impulse [. . .] to be tossed up and down on the roar of almost senseless merriment, sentiment, triumph, desire" (Woolf 1931, 150). This subject position within the waves, far from being detached and controlling, is characterized by being affected by, and connected to, modes of experience beyond the boundaries of oneself.

Movements across waves also evoke processes of making new futures. As Paul Gilroy and bell hooks have shown, diasporic journeys across water—whether forced or chosen, temporary or ongoing—resist containment in Euro- and Afrocentric nationalist paradigms; the Atlantic Ocean is a complex "system of cultural exchanges" (Gilroy 1993, 14). Indeed, for many dia-

sporic and queer subjects, "home" is neither a fixed origin nor a destination, but rather a feeling of "affectual yearning [that catalyzes] a homemaking that does not settle" (Casid 2005, xvi–xvii; hooks 1995). Instead of the common description of simple harmonic motion as a masculinist and colonialist allegory in which particles/subjects voyage out, experience disruptive pleasure and danger, and return home, we can imagine sound waves as a metaphor for subjects in ongoing states of transformation and transduction. This latter formulation is akin to Irigaray's description of female sexuality as characterized by "'dissipatory' structures, which function through exchanges with the exterior world [. . .] and which are not organized to seek equilibrium but rather to cross thresholds" (Irigaray 1993, 124). Here I depart from Irigaray to emphasize that such modes of sexualized embodiment and desire need not be essentially female. Nonetheless, Irigaray's work is useful for critiquing how gender and sexuality reside within sonic epistemologies, especially in the unmarked position of white, Western, male observer, and the unruly sound waves in his perceived domain.

One final example that frames the ocean as a vibrant, communicative medium and metaphor for distributed communities is Nigel Thrift's vivid comparison of whale societies to global communication networks: "The latest research on bioacoustics shows that whales appear to use 'singing' as a means of communicating over thousands of miles of ocean [. . .] 'being with' other whales might mean communicating with whales who might be hundreds of miles away" (Thrift 2006, 142). Thrift goes on to discuss how "the world of whales intersects with the worlds of others" through the medium of the ocean, including its various prey, the multinational whaling industry, and environmental protection organizations. He suggests that human societies have reached a similar capacity in employing communication networks to "live with distant others" on a vast scale (Ibid., 142–43). In other words, the things that humans draw near also enroll us in interconnected, consequential, and unequal relations with unseen others who are far away. Anna Tsing refers to such distributed relationships in terms of friction: "the grip of worldly encounter" through which global connections of science, capitalism, and politics unfold (Tsing 2004, 1).

Le Guin hinted at the stakes of such interconnections in her figuration of sound as "a fragile thing [. . .] as delicate as life itself" (Le Guin 1975, 74). To take seriously this evocative analogy between sounds and forms of life—as fleeting, overlapping, and ever in transformation—requires that we further dismantle the subject position of detached and knowing observer that persists in audio-technical discourse, and recognize ourselves amid the currents, always provisionally defined in relation to other humans, species, things, and environments. The above passages, including Irigaray's insights on fluidity and dissipatory structures, provide ways forward for crafting a feminist epistemol-

ogy of sound that can attend to the ethical implications of such relations and encounters rather than perpetuate values of domination and control.

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REFERENCES

- Ahmed, Sara. *Queer Phenomenology: Orientations, Objects, Others*. Durham, NC: Duke University Press, 2006.
- Albanese, Denise. "The New Atlantis and the Uses of Utopia." *ELH* 57 (1990): 503–28.
- ARP Instruments, Inc. *ARP Odyssey Owner's Manual*. 2nd ed. 1976. <http://www.arpodyssey.com/oddyman.html> (accessed 6 September 2010).
- . *ARP Odyssey Patch Book*. 1981. <http://www.arpodyssey.com/oddympatch.html> (accessed 6 September 2010).
- Bacon, Sir Francis. "New Atlantis." In *Advancement of Learning, Novum Organum, New Atlantis*. Great Books of the Western World. Vol. 30. Edited by R. M. Hutchins. Chicago: Encyclopedia Britannica, 1952.
- Barton, Edwin Henry. *A Text-book on Sound*. London: Macmillan, 1926.
- Beer, Gillian. *Open Fields: Science in Cultural Encounter*. Oxford, UK: Oxford University Press, 1996.
- Books of Genesis and Jonah. *New American Bible*. Nashville, TN: Thomas Nelson, Publishers, 1971.
- Casid, Jill H. *Sowing Empire: Landscape and Colonization*. Minneapolis: University of Minnesota Press, 2005.
- Chadabe, Joel. *Electric Sound: The Past and Promise of Electronic Music*. Upper Saddle River, NJ: Prentice Hall, 1997.
- Chavez, Carlos. *Toward a New Music: Music and Electricity*. New York: W.W. Norton, 1937.
- Chow, Rey, and James Steintrager, eds. *The Sense of Sound*. Special issue, *differences: a Journal of Feminist Cultural Studies* 22, nos. 2–3 (2011).
- Clifford, James. "On Ethnographic Allegory." In *Writing Culture: The Poetics and Politics of Ethnography*, edited by George E. Marcus and James Clifford, 98–121. Berkeley: University of California Press, 1986.
- Cummins, Elizabeth. *Understanding Ursula K. Le Guin*. Revised ed. Columbia: University of South Carolina Press, 1993.
- Daston, Lorraine. "Objectivity and the Escape from Perspective." *Social Studies of Science* 22, no. 4 (1992): 597–618.
- Deutsch, Herbert A. *Synthesis: An Introduction to the History, Theory and Practice of Electronic Music*. Port Washington, NY: Alfred Pub. Co., 1972.
- Edwards, Paul N. *The Closed World: Computers and the Politics of Discourse in Cold War America*. Cambridge, MA: MIT Press, 1996.
- Foucault, Michel. *The Order of Things: An Archaeology of the Human Sciences*. New York: Vintage Books, 1994.
- Garrison, Ednie Kaeh. "Are We on a Wavelength Yet? On Feminist Oceanography, Radios, and Third Wave Feminism." In *Different Wavelengths: Studies of the Contemporary Women's Movement*, edited by Jo Reger, 237–56. New York: Routledge, 2005.
- Gilroy, Paul. *The Black Atlantic: Modernity and Double Consciousness*. Cambridge, MA: Harvard University Press, 1993.
- Grosz, Elizabeth A. *Volatile Bodies: Toward a Corporeal Feminism*. Bloomington: Indiana University Press, 1994.
- Haraway, Donna J. "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective." *Feminist Studies* 14, no. 3 (1988): 575–99.
- . *Simians, Cyborgs, and Women: The Reinvention of Nature*. New York: Routledge, 1991.
- . *Modest_Witness@Second_Millennium.FemaleMan_Meets_OncoMouse: Feminism and Technoscience*. New York: Routledge, 2008.
- Helmholtz, Hermann von. *On the Sensations of Tone as a Physiological Basis for the Theory of Music*. New York: Dover, 1954.
- Helmreich, Stefan. *Alien Ocean: Anthropological Voyages in Microbial Seas*. Berkeley: University of California Press, 2009.
- hooks, bell. *Art on My Mind: Visual Politics*. New York: New Press, 1995.
- . "Eating the Other: Desire and Resistance." In *Media and Cultural Studies: Key Works*, edited by Meenakshi Gigi Durham and Douglas M. Kellner. Malden, MA: Blackwell, 2006.
- Horkheimer, Max, and Theodor W. Adorno. *Dialectic of Enlightenment: Philosophical Fragments*. Redwood City, CA: Stanford University Press, 2002.
- Huber, David Miles, and Robert E. Runstein. *Modern Recording Techniques*. Boston: Focal Press/Elsevier, 1997.
- Hughes, Thomas Parke. *Networks of Power: Electrification in Western Society, 1880–1930*. Baltimore, MD: Johns Hopkins University Press, 1983.
- Hunt, Frederick V. *Origins in Acoustics: The Science of Sound from Antiquity to the Age of Newton*. New Haven, CT: Yale University Press, 1978.
- Irigaray, Luce. "The 'Mechanics' of Fluids." *This Sex Which Is Not One*. Translated by Catherine Porter with Carolyn Burke. Ithaca, NY: Cornell University Press, 1985.
- . *An Ethics of Sexual Difference*. Translated by Carolyn Burke and Gillian C. Gill. Ithaca, NY: Cornell University Press, 1993.

- Jeans, James Hopwood. *Science and Music*. Cambridge, UK: The University Press, 1937.
- Jenkins, John, and Jon Smith. *Electric Music: A Practical Manual*. Bloomington: Indiana University Press, 1975.
- Jones, Daniel Evan. *Elementary Lessons in Heat, Light and Sound*. London: Macmillan, 1898.
- Keeling, Kara, and Josh Kun, eds. *Sound Clash: Listening to American Studies*. Special issue, *American Quarterly* 63, no. 3 (2011).
- Lakoff, George, and Mark Johnson. *Metaphors We Live By*. Chicago: University of Chicago Press, 1980.
- Lamb, Horace. *The Dynamical Theory of Sound*. New York: Dover, 1960.
- Le Guin, Ursula K. "The New Atlantis." In *The New Atlantis and Other Novellas of Science Fiction*, edited by Robert Silverberg. New York: Hawthorn Books, Inc., 1975.
- McClary, Susan. *Feminine Endings: Music, Gender, and Sexuality*. Minneapolis: University of Minnesota Press, 1991.
- Merchant, Carolyn. *The Death of Nature: Women, Ecology, and the Scientific Revolution*. San Francisco: Harper & Row, 1980.
- Miller, Dayton Clarence. *The Science of Musical Sounds*. New York: Macmillan, 1937.
- Oxford English Dictionary Online. 2009. <http://dictionary.oed.com/> (accessed 6 September 2010).
- Park, Katherine. "Women, Gender, and Utopia: The Death of Nature and the Historiography of Early Modern Science." *Isis* 97 (2006): 487–95.
- Pierce, Allan D. *Acoustics: An Introduction to Its Physical Principles and Applications*. Melville, NY: Acoustical Society of America, 1989.
- Pinch, Trevor, and Karin Bijsterveld. *The Oxford Handbook of Sound Studies*. New York: Oxford University Press, 2012.
- Ponomarev, Leonid Ivanovich. *The Quantum Dice*. Philadelphia: Institute of Physics. *A Preliminary Report on the State of Experimental Music*. ca. 1957 (n.d.). New York: Computer Music Center Archive, Columbia University, 1993.
- Rayleigh, John William Strutt. *The Theory of Sound*. London: Macmillan, 1945.
- Roads, Curtis. *The Computer Music Tutorial*. Cambridge, MA: MIT Press, 1996.
- Rossing, Thomas D. *The Science of Sound*. Reading, MA: Addison-Wesley, 1990.
- Salvaggio, Ruth. *The Sounds of Feminist Theory*. Albany: State University of New York Press, 1999.
- Silverman, Kaja. *The Acoustic Mirror: The Female Voice in Psychoanalysis and Cinema*. Bloomington: Indiana University Press, 1988.
- Solomon, Julie Robin. *Objectivity in the Making: Francis Bacon and the Politics of Inquiry*. Baltimore, MD: The Johns Hopkins University Press, 1998.
- Spigel, Lynn. "Theorizing the Bachelorette: 'Waves' of Feminist Media Studies." *Signs* 30, no. 1 (2004): 1209–21.
- Stadler, Gustavus, ed. *The Politics of Recorded Sound*. Special issue, *Social Text* 102 (2010).
- Sterne, Jonathan. *The Audible Past: Cultural Origins of Sound Reproduction*. Durham, NC: Duke University Press, 2003.
- , ed. *The Sound Studies Reader*. London: Routledge, 2012.

- Stevens, S. S., Fred Warshovsky, and the editors of *Life*. *Sound and Hearing*. Life Sciences Library. New York: Time, Inc., 1965.
- Thompson, Emily Ann. *The Soundscape of Modernity: Architectural Acoustics and the Culture of Listening in America, 1900–1933*. Cambridge, MA: MIT Press, 2002.
- Thrift, Nigel. "Space." *Theory, Culture & Society* 23, nos. 2–3 (2006): 139–46.
- Tsing, Anna Lowenhaupt. *Friction: An Ethnography of Global Connection*. Princeton, NJ: Princeton University Press, 2004.
- Tyndall, John. *Sound: A Course of Eight Lectures Delivered at the Royal Institution of Great Britain*. London: Longmans, Green, 1869.
- Waksman, Steve. "Tinkering with Hardcore and Heavy Metal in Southern California." *Social Studies of Science* 34 (2004): 675–702.
- Woolf, Virginia. *The Waves*. New York: Harcourt and Brace, 1931.
- Young, Iris Marion. *On Female Body Experience: "Throwing Like a Girl" and Other Essays*. New York: Oxford University Press, 2005.