



Edited by Stefanie Hessler

Tidalectics
Imagining an oceanic worldview
through art and science

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Radio Ocean

Stefan Helmreich

Ocean waves travel at a range of frequencies and, like radio waves, can be sorted along a spectrum from short to medium to long, from whitecaps to swells to surges. While *radio-*, the combining form of the Latin *radius* (beam), in 1913 gave its name to the wireless travel of electromagnetic waves carrying sound, its sense as “ray,” “ray-like,” or “by means of radiant energy” might as easily, in an alternative history of science, have come to encompass ocean waves, which, like radio waves, also radiate energy. Stretching the frequency band beyond the 3 kHz to 300 GHz of the conventional radio spectrum to include everything from 10 Hz sea-surface ripples to those 10-5 Hz waves of the daily ocean tides, ocean waves might have been imagined as kinds of radio waves. Thinking across the electromagnetic and the watery, we might have come to think of the ocean as a radio broadcasting waves.

Maybe we already can. Ocean scientists tell us that waves, generated by sun and wind, propagate across the ocean at a range of speeds, transmit energy to open sea and landed shore, and thereby relay information about calms and storms close and distant. When waves break, the energy they carry crash-shifts from the aquatic into the sonic—into the sounds of plunging, surging, spilling—like electromagnetic waves arriving at a radio receiver, demodulating to become audio. Whether we can decode the messages sent to us by Radio Ocean may be another story—though at least in the later months of 2017, when Hurricanes Harvey, Irma, José, and Maria sent punishing waves crashing into fragile Atlantic coastlines and livelihoods, the communiqués of the waves were not so difficult to decipher. In September 2017 seismometers employed to detect earthquakes picked up the sounds of crashing waves heralding the arrival of Hurricane Irma.¹ If the ocean is a radio, the program now being transmitted to many parts of the world seems to be one that tells of the onrushing effects of climate change.

Radio Ocean has many precursors in works of poetry, literature, music, sound art, and science that seek to ventriloquize, mimic, measure, or record waves speaking, singing, sounding, and noising.² The waves of this sea of language, song, and number oscillate, telling at one moment of eternal returns (waves arriving, over and over), at another of irreversible change (waves washing away the past). The term *tidalectics*, as the poet Kamau Brathwaite theorizes it, refuses the usual resolution of the dialectic (thesis, antithesis, synthesis), turning instead to the back-and-forths of watery flux, to the churn of pasts and futures stirring into one another.³ Radio Ocean’s *tidalectics* transmit messages from pasts and presents colonial (waves that take shape in ports carved

by imperial travel, waves that variously wash over or reveal the sunken agony of the Middle Passage), military and industrial (waves that carry the legacies of Cold War and contemporary nuclear radiation), and transnational (waves that carry tourists, exiles, and refugees across surf that is alternately enticing, promising, or deadly). Radio Ocean carries dispatches, too, from futures arriving with the Anthropocene or Capitalocene (waves that move with the winds of human-made climate change, waves that come to life in a newly melted and opened-up Arctic Ocean). How these messages are received depends, to be sure, on where listeners are—at the shore, on a boat, under the waves, at the bottom of the sea—at which frequencies and on which channels they are listening, and on whether they are hearing through ears, cochlear implants, hydrophones, pressure sensors, the internet....

Before ocean waves were imagined as possible, like light or radio or sound waves, analytically to array into a spectrum⁴—and before it was possible to listen to breaking waves for acoustic signs of their dissipative energy⁵—the meaning of ocean-wave sound often found contemplation in poetry, with waves pressed to speak of loss and longing, of distance and death. Listening for a moment to the provincial sounds of English-language offerings, one would have heard of “many-voicèd waves” (Percy Bysshe Shelley), the “sullen moaning wave” (Lewis Carroll), “barking waves” (John Milton), “the murmurous noise of waves” (John Keats), “thundering waves” (Charlotte Brontë), and “the ghostly sound of waves rustling like grass in a low wind” (Derek Walcott). Waves speaking, sighing, sounding. The “bleat, the bark, bellow, and roar” of the “waves that beat on heaven’s shore” (William Blake) would (and may still) be sounds rolling from the human to the animal to the plant to the mineral to the elemental to the perhaps indecipherable. (Check out the “Ker plotch ... pish rip plosh ... Sho, Shoosh, flut, / ravad, tapavada pow, / coof, loof, roof” of Jack Kerouac’s “Sea: Sounds of the Pacific Ocean at Big Sur.”) Beyond poetry, one would have heard (and still can hear) the everyday onomatopoeics (again in the parochial but still polyglot English) that have waves whispering, hissing, roaring, sizzling, cracking, and drumming.

What has the noise of waves meant? The literary theorist John Melillo has argued that the sound of waves crashing and dissipating has been enrolled into philosophical puzzlings through the meaning of noise. He points to a passage on ocean-wave noise in Gottfried Wilhelm Leibniz’s *New Essays on Human Understanding* (1704): “To hear this noise as we do, we must hear the parts which make up this whole, that is the noise of each wave, although each of these little noises makes itself known only when combined confusedly with all the others, and would not be noticed if the wave which made it were by itself.”⁶ In other words, the sonic phenomenology of the breaking wave is relational, made by a perceiving (and hearing!) subject who is a live player in making manifest

and meaningful the noises of waves as “wave sound”—progressive, repetitive, dissipative, tidalectic—at all.

What have such wave listeners been listening for?
Maybe music.

The music of sublime reverie: Consider romantic composers’ attempts texturally and formally to represent the timbre and relentless arrival of ocean waves. Listen to Felix Mendelssohn’s 1830–32 Hebrides Overture, op. 26; Camille Saint-Saëns’s 1875 *Le déluge*, op. 45; the second movement of Claude Debussy’s 1905 *La mer*, “Jeux de vagues”; or the third movement of Maurice Ravel’s *Miroirs*, “Une barque sur l’océan,” also from 1905. In the evocation of waves in such music, writes the musicologist David B. Knight, “an essential character ... is of increasing and then decreasing swell. This is conveyed by both a sense of rhythm and increasing and decreasing volume.”⁷ These are waves to be contemplated in an attitude of rapt intellectual and emotional attention—sometimes imagining oneself above the water, sometimes at the surface, sometimes below.

The music of mathematical and abstract appreciation: Consider mid- to late twentieth-century electronic music’s emphases on the periodicity—though sometimes also drift and aperiodicity—of ocean waves, as in the work of R. Murray Schafer, who, in his 1978 String Quartet no. 2, *Waves*, offers: “dynamic, undulating wave patterns, the rhythm and structure of which are based on his analysis of wave patterns off both the Pacific and Atlantic coasts of Canada. Incorporated into his music is his discovery that the duration from crest to crest is between six and eleven seconds. To ensure that performers get his meaning, Schafer has written into the musicians’ scores the varying wavelengths. As a result, when played, a fascinating musical seascape emerges that reflects an appreciation for the irregular regularity of the sea.”⁸ Or take the Fluxus composer Takehisa Kosugi’s 1975 “Wave Code #E-1,” in which Kosugi repeats the word “wave” into an echo chamber, offering an embodied cyborg enactment of voice, machine, and electricity. By sending the word “wave” through machines that format the sound for and within the physics of reverb and delay, Kosugi’s piece underscores the way the notion of the wave partakes at once of the physically enunciated and the analytically captured.⁹ And then there is Tristan Murail’s 1995 *Le partage des eaux*, which tasks a traditional orchestra with playing a score based on “the spectral analysis of a breaking wave,” with the result that “strangely coloured and strangely coherent harmonic-timbres”¹⁰ collapse over one another, suggesting (to me) ocean waves made of some kind of glittering liquid metal created by melting down strings, woodwinds, and brass.

The electric music of the Black Atlantic: Consider the bassy submarine soundscapes of Jamaican dub, created in such sites as Lee “Scratch” Perry’s

Kingston studio, known as the Black Ark. (Compare that with Miami bass, with low-end vibrations that Dave Tomkins has theorized through the Rossby whistle, the ultra-low sound of the basin of the Caribbean Sea, resonating.)¹¹ David Toop suggests that “sonar transmit pulses, reverberations and echoes of underwater echo ranging and bioacoustics” constitute the “nearest approximation to dub.”¹² Or listen to the Detroit techno outfit Drexciya, whose sonic works conjure an imagined and unsettling underwater world created and sounded by the mutated descendants of African captives thrown overboard during the Middle Passage, whose alien music haunts a Black Atlantis. Tracks like “Wavejumper”—“You must face the power of the black wave of Lardossa, before you can become a Drexciyan Wavejumper”—become uncanny messages from waves as both acknowledged and unacknowledged graves.

The music of environmental audit: Consider sound-art recordings of the noises of waves—from the riverine sounds of Annea Lockwood’s field recordings (e.g., “A Sound Map of the Hudson River,” from 1989—though also, more recently and linguistically, her 2017 “Water and Memory,” which enjoins singers to voice “words for water, for ocean, for waves, from Hindi, Thai, Hungarian, and Hebrew”)¹³ to the hydrophonic recordings of Jana Winderen, including her 2017 piece for *Tidalectics*, *bára* (Norse for “wave”), which is activated by tides in Trieste, Italy. In the trajectory from sublime music to documentary recordings, ocean waves get taken out of the water and, with the rise of electronic composition, treated as abstractions,¹⁴ only to then, with the rise of sound art, be submerged and audited from within the materiality of water. Winderen’s work in particular has presented underwater sound as a form for thinking through climate change as well as the transforming textures of the realms within which aquatic creatures live.

The program that Radio Ocean is airing now, then, is not a symbolist reverie but maybe ... a documentary ... about oceans. And waves are carriers and subjects of this program.

Meanwhile—and no wonder—ocean-wave scientists themselves have been listening. They have been listening to the sound of waves breaking to determine how they fall apart, leaving acoustic signatures of waves’ decoalescence.¹⁵ They have been asking how noise in the sea can be created by waves. They have, for a while now, been coming up with provisional answers: “Much of the noise in the deep open sea seems to be due to the impact of wavelets and collapse of cavities trapped just below the surface when wave crests break to form ‘white horses.’ As soon as the temporary reduction of pressure forming the cavity is over, it collapses, producing a pressure change of a type such as to give the continuous spectrum proper to ‘cavitation,’ of level decreasing by 6 dB per octave.”¹⁶ How and whether ocean-wave breaking can be audited for climatological information is probably an open question, though it may be possible to infer changes in water temperature from patterns of whitecap formation in the open sea¹⁷ as well

as from patterns of waves beneath the sea surface, which—emerging at the interfaces of density, salinity, and temperature—can be discerned through hydrophonic listening.¹⁸ There is also a story to be heard in the lives of creatures that live underwater, from crustaceans to fish to, of course, cetaceans, which are hearing a different Radio Ocean than they did decades ago, one filled with industrial and military noise.¹⁹

To end, let me switch stations, tuning to a piece that’s been playing on internet radio of late, a composition that brings together poetry, music, and so about waves and what they might prefigure. The first track of *Paradiso*, a 201 album by Chino Amobi, opens with the austere and electric voice of Elysia Crampton, the Latinx/Aymara experimental composer, reciting and revising Edgar Allan Poe’s “The City in the Sea” over the rumbling roll of crashing sea waves. The waves summon a sinister sound world, one doubled in Crampton’s recitation, which tells of an abandoned city by the sea. We hear that the desolate city sits at the waterline:

There open temples—open graves
Are on a level with the waves—

Though we also learn that the surrounding sea is unsettlingly still:

For no ripples curl, alas!
Along that wilderness of glass—
No swellings hint that winds may be
Upon a far-off happier sea.

But then, a wind rises:

But lo, a stir is in the air!
The wave! there is a ripple there!

.....

The waves have now a redder glow—
The very hours are breathing low—
And when, amid no earthly moans,
Down, down that town shall settle hence,
Hell, from a thousand thrones,
Shall do it reverence.

The city sinks into a hellish sea beneath the waves. The waves of this Radio Ocean drown it out.

The sound of climate change has been, in many science and art venues, the sound of ice melting, calving.²⁰ But we should also listen to storm surges, to waves inundating living cities, towns, and, of course, settlements in low-lying atolls. Whether such sound waves are tidalectic in their comings and goings or are waves of a chaotic future is a live question, a question for which we need to continue to tune in to Radio Ocean. ≈

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- 1) See Alexandra Wilts, "Hurricane Irma Has Become So Strong It's Showing Up on Seismometers Used to Detect Earthquakes," *Independent*, September 5, 2017. Seismometers, of course, also monitor for tsunamis, and there may also be acoustic heralds of these long water waves per C. Cecioni et al., "Tsunami Early Warning System Based on Real-Time Measurements of Hydro-Acoustic Waves," *Procedia Engineering* 70 (2014): 311–20. See also the research-based sound-art installations of Raviv Ganchrow, particularly *Radio Plays Itself* and *Forecast for Shipping* (2012–15), for meditation on radio traveling across water. For analysis of how the space of radio signals was, in early days, likened to an ocean, see Jeffrey Sconce, *Haunted Media: Electronic Presence from Telegraphy to Television* (Durham, NC: Duke University Press, 2000).
- 2) On oceans as media, see Melody Jue, *Wild Blue Media: Thinking through Seawater* (Durham, NC: Duke University Press, forthcoming).
- 3) Elizabeth DeLoughrey, *Routes and Roots: Navigating Caribbean and Pacific Island Literatures* (Honolulu: University of Hawaii Press, 2007).
- 4) For a primary source, see N. F. Barber et al., "A Frequency Analyser Used in the Study of Ocean Waves," *Nature* 158, no. 4010 (September 7, 1946): 329–32. On the history of ocean-wave analysis, see Stefan Helmreich, "Old Waves, New Waves: Changing Objects in Physical Oceanography," in *Fluid Frontiers: New Currents in Marine and Maritime Environmental History*, ed. John Gillis and Franziska Torma (Cambridge: White Horse Press, 2015), 76–88, and David Irvine, "The Role of Spectra in Ocean Wave Physics," in *Oceanographic History: The Pacific and Beyond*, ed. Keith R. Benson and Philip F. Rehbock (Seattle: University of Washington Press, 2002), 378–86.
- 5) Zygmund Kluzek and Alaksandr Lisimenka, "Acoustic Noise Generation under Plunging Breaking Waves," *Oceanologia* 55, no. 4 (2013): 809–36.
- 6) Quoted in John McIlillo, "Breaking Waves and Aurality" (paper, "Periods and Waves: A Conference on Sound and History," Stony Brook University, Stony Brook, NY, April 29–30, 2016).
- 7) David B. Knight, *Landscapes in Music: Space, Place, and Time in the World's Great Music* (Lanham, MD: Rowman & Littlefield, 2006), 58. And compare John Luther Adams's Pulitzer

- Prize-winning 2013 *Become Ocean*, a single-movement orchestral composition made of rising swells and surges of strings, woodwinds, and brass, played over a bed of rippling piano, meant to put listeners in mind of sea-level rise and of ice melting at the poles.
- 8) *Ibid.* And it is, for my taste, a more interesting take on abstraction than a 2012 composition by Alexis Kirke, which uses water waves as material. *Sound-Wave*, an "orchestra of waves," sees Kirke wire a conductor's baton to wave-generating paddles in a research tank at Plymouth University in England. See Kirke's website, <http://www.alexiskirke.com/projects/sound-wave/>.
 - 9) Also in an experimental register, listen to Luigi Nono's 1976 "... sofferte onde serene ..." (... suffering serene waves ...) for piano and tape, crafted, in part, from the recorded sound of bells reflected off of the fog and waves of the canals of Venice, Italy.
 - 10) Note on *Le partage des eaux*, Works, Tristan Murail's website, <http://www.tristanmurail.com/en/oeuvre-fiche.php?cotage=27533>.
 - 11) Dave Tompkins, "Moonlight's Forgotten Frequencies: How Miami Bass, Ocean Waves, and Pirate Radio Shaped the Film," *MTV News*, February 23, 2017, <http://www.mtv.com/news/2985787/moonlight-forgotten-frequencies/>.
 - 12) David Toop, *Ocean of Sound: Aether Talk, Ambient Sound and Imaginary Worlds* (London: Serpent's Tail, 1995), 116; cf. Julian Henriques, "Sonic Dominance and Reggae Sound System Session," in *The Auditory Culture Reader*, ed. Michael Bull and Les Back (Oxford: Berg, 2003), 451–80.
 - 13) Rebecca Lentjes, "Surreal Conjunctions: An Interview with Annea Lockwood," *VAN Magazine*, July 27, 2017, <https://van-us.atavist.com/surreal-conjunctions>.
 - 14) For a longer history of how waves have been given biographies, see Tara Rodgers, "Toward a Feminist Epistemology of Sound: Refiguring Waves in Audio-Technological Discourse," in *Engaging the World: Thinking after Irigaray*, ed. Mary C. Rawlinson (Albany, NY: SUNY Press, 2016), 195–214.
 - 15) Eric Lamarre and W. K. Melville, "Void-Fraction Measurements and Sound-Speed Fields in Bubble Plumes Generated by Breaking Waves," *Journal of the Acoustical Society of America* 95, no. 3 (1994): 1317–28.
 - 16) P. Vigoureux and J. B. Hersey, "Sound in the Sea," in *The Sea: Ideas and Observations on Progress in the Study of the Sea*, vol. 1, *Physical Oceanography*, ed. M. N. Hill (1962; Cambridge, MA: Harvard University Press, 2005), 489.
 - 17) Alexander Babanin, *Breaking and Dissipation of Ocean Surface Waves* (Cambridge: Cambridge University Press, 2011).
 - 18) David R. Barclay, Fernando Simonet, and Michael J. Buckingham, "Deep Sound: A Free-Falling Sensor Platform for Depth-Profiling Ambient Noise in the Deep Ocean," *Marine Technology Society Journal* 43, no. 5 (Winter 2009): 144–50.
 - 19) Michelle Dougherty and Daniel Hinerfeld, dirs., *Sonic Sea* (New York: Natural Resources Defense Council; Yarmouth, MA: International Fund for Animal Welfare, 2016).
 - 20) Stefan Helmreich, "Melt," Theorizing the Contemporary, *Cultural Anthropology* website, January 21, 2016, <http://www.culanth.org/fieldsights/801-melt>.