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12

The Media of Breathing

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Alpha and Omega

Breathing is the alpha and omega of our time on earth. We breathe first at birth, and death is quite literally breath-taking. To speak with the King James Bible, in dying we "give up the ghost," an expression taken from the Greek verb *ekpneo* (to expire). But breathing's existential meaning is not found only at the beginning and end of life's alphabet, at the alpha and the omega, but also throughout the middle, in the L, M, N, or what we could call the elements (L-M-N) of existence. Things that are found in the middle, in what the ancient Greeks called the *metaxu* or "in between," in what the Romans called the *medius locus* (middle place) and later became the word "milieu," can be considered as media in the broadest sense.[1]

In this chapter I consider the media of breathing. Breath is everywhere in our culture at the moment—as a spiritual practice, as a medical urgency, as a record to be broken, as a biological need put into peril by climate change or industrial pollution. Breath implies life, respiration, as mere air does not, as in the haunting title of Paul Kalanithi's beautiful memoir of his own dying from lung cancer, *When Breath Becomes Air*.[2] But breathing is often considered to be something pure or natural and thereby removed from technical devices, that is, from media. In this chapter, I mean to rethink this assumption and show how an expanded conception of media actually illuminates much of what is most interesting about breath.

The field of media studies as I understand it not only concerns broadcasting, cinema, and the press but also the means of creating worlds and habitats, means that include cultural practices and body techniques on the one hand and

material technologies and apparatuses on the other.[3] Media are often defined as content-distributing institutions such as radio, television, cinema, and the press, but here I will call those "mass media." "Media" as I use the term include both techniques and technologies. Techniques need not take any lasting material form (e.g., swimming technique), while technologies, in my definition, always require a physical tool or device (e.g., scuba gear). The concept of media is useful for the study of breath and breathing because media always put *techne* (art) and *physis* (nature) into mutual play, a relation that is particularly prominent in breathing. Techniques and technologies interact with and bring natural elements or organisms into the light. In this chapter, I understand media of breathing both as techniques (bodily practices such as yoga, singing, playing the flute, or giving birth) and as technologies (devices such as oxygen tanks, air conditioners, iron lungs, and spirometers).

It is one of the central claims of philosophical phenomenology and its many branches that the normal or natural or unnoticed background becomes visible only in a time of crisis or breakdown. Media usually stay in the middle or the background until they are disturbed, at times by analysis, in which case they become objects of theory and practice. Breathing, as one of the most basic and apparently automatic of all human activities, lends itself particularly well to a media analysis: it is an absolutely essential condition of life as we know it, almost always stays in the unconscious background, and yet it has been the subject of enormous technical elaboration. Breathing becomes theoretical or technical only when its usual functioning goes awry, as in a coughing fit or asthma attack, or when the natural breathing milieu is disturbed, such as when humans venture into such hostile environments as mines under the earth, dives into the sea, and flights into the air, or are exposed to severe air pollution or chemical warfare. When a newborn comes out of the womb into the air, when a human being—a land-animal par excellence—goes swimming, or when a miner in a mine shaft or a passenger in an airplane has difficulty breathing due to lack of oxygen, breath can no longer be taken for granted. When the natural or normal media fail, artificial media must step in to fill the gap, and natural ones rise to a new level of self-consciousness. Breathing techniques have arisen in practices, disciplines, and arts such as giving birth, singing, yoga, swimming, and deep-sea diving, all of which require the shepherding and conservation of breath and necessarily raise breathing to the level of conscious reflection, often, however, with the purpose of moving breath to a higher level of unconsciousness. Indeed, Marcel Mauss concludes his classic piece on body techniques with a discussion of "la technique des souffles" found in ancient China and India, a breathing practice whose various forms he considers to be widespread among diverse cultures.[4] Such breathing techniques are ancient, but breathing technologies—which either modify a hostile atmosphere or supplement a lacking body with apparatuses—are relatively recent and belong to modernity.

Martin Heidegger argued that made objects, especially works of art, can disclose truth processes, but he rarely extended this idea beyond paintings and chalices to ordinary, inconspicuous technical objects, even though his thinking has a distinctive feel for the meaning of instruments. But the idea that everyday objects are just as worthy of philosophical consideration as treasured works of art and items of religious ritual is absolutely constitutive for media theory in the wake of such figures as Harold Innis, Marshall McLuhan, and Friedrich Kittler, with their interests in such media as fisheries, linear type, and circuits. "Technology is a mode of revealing" (is eine Weis des Entbergens), according to Heidegger. Technology reveals nature, by unfolding potentials and awareness nature would never possess without intervention. Technology reveals nature as technical, as a storehouse of possibilities for use. In the twenty-first century the technosphere encompasses the biosphere, such that nature must be understood as technical, as something in need of human stewardship and steering.[5] In the classical understanding of elements, water, earth, air, fire, and the quintessence were the fundamental media of life on earth; current conditions call for a revival of such thinking.[6]

Romantic Breath (Kittler)

The analysis of breath is a venerable theme in German media studies, which like work by Innis and McLuhan, takes us beyond mass media as the main focus of interest. Take the famous opening line from Friedrich Kittler's *Aufschreibesysteme 1800–1900* (1985), a book foundational for the new field of media studies and later translated into English as *Discourse Networks*: "German literature begins with a sigh."[7] Kittler delights in showing how the obsession with breath and wind during Goethe's era, an era he calls "discourse network 1800," was officially a quest to find a common continuum between nature and humanity, but in fact a symptom of an educational system and gender-based division of labor that sought to convert texts into oral language via the mother's mouth. Texts were as it were ventilated by being read aloud, so that the breathing of the reading mother was the background accompaniment to all reading. (Here we might recognize phonetic writing, as a device for encrypting oral speech, as a breath technology.) The sigh Kittler referred to was the "Ach" uttered by Goethe's Faust, a sound also uttered by E.T.A. Hoffmann's mechanical doll Olympia and many other soulful yearners moved by *Sehnsucht* in the time of Goethe.[8] As Kittler noted, "ach" was a morpheme hidden within the German word *Sprache* (language) and the sound of a timeless and worldless soul that joined in one Nature and Spirit, human and nonhuman.[9]

Of course Kittler could be highly critical, even cynical, about this romantic breath-fetishism, especially in his early campaign to expel the spirit from the human sciences ("den Geist aus den Geisteswissenschaften auszutreiben"). But

he could also treat the subject of breathing with remarkable subtlety. In his essay on Richard Wagner's operas called "World Breath," for instance, Kittler says that the media of Bayreuth were "optics and acoustics, lighting and wafts of breath [*Atemwehen*]." Wagner, who for Kittler was not only a poet and composer but also the first mass media impresario, joined Thomas Edison, inventor of the phonograph, in his willingness to transcend what Jacques Lacan calls "the symbolic" as the source of meaning. That is, both Wagner and Edison were acousticians interested in sound as such, including white noise, whether or not it had a linguistic meaning; both flattened the distinctions among such sounds as "wind and breath, the sounds of nature and human voices." Kittler's Wagner had what Lacan called a "respiratory erotics" centered on breathing as the sign of living human embodiment; Wagner called music "the breath" (*Athem*) of language. In his music dramas, breath served as a sign of life and death, and the ultimate breathing apparatus, sounding the world-breath itself, was the orchestra. Singing was not the privileged form but one among many arts of breathing distinguished for its "intensity of life in the diaphragm, lungs, throat, and mouth."[10] Here Kittler treats breath not only critically, but as the source of music, an undeniable sign of life, and raw material for media experiments.

The same is true in Kittler's recently published youthful essays written in a style reminiscent of Walter Benjamin, in which he ponders, in an almost ecstatic tone, how psychoanalysis might take up a theory of breathing. In contrast to orality and anality, he claims, breathing plays a relatively minor role in the psychoanalytic history of individuals, but breath remains nonetheless at the heart of our social, sexual, and musical lives. Of course Kittler, an inveterate chain smoker, brings smoking into his analysis as one of the many ways that breathing can be made into a cultural technique.[11]

The Natural History of Oxygen

Kittler's reflections on breath were exclusively about how techniques and technologies affect the breathing body. But there are also media that affect the atmospheric milieu. Let us consider the deep history of breathing, far back into its fascinating natural history. In the evolutionary history of life on earth oxygen was first a toxin. Oxygen is now the most widespread element in the lithosphere and the sea, as well as the atmosphere and biosphere, but this was not always the case. Oxygen has a volatile geological history and interacts crucially with both lithosphere and oceans. During the first three billion years the earth was a "giant oxygen vacuum."[12] The natural sinks of the planet quickly sucked up any available freestanding oxygen. (Mars remains in this state: any free oxygen is tied up in the lithosphere as rust, one reason Mars appears to be a red planet to us.) Oxygen remains a sociable element, ready to enter into relations with other elements,

and represents the principal element in the air and the earth's crust today.[13] But it started to fill up the atmosphere when there were no mates left in land or sea. The oxygen vacuum could not last.

The first archaic wave of life on earth was anaerobic, consisting of organisms whose metabolism did not depend on oxygen. Cyanobacteria (blue algae) produced an overabundance of oxygen as a byproduct of photosynthesis that could no longer be absorbed by natural sinks such as the oceans or the lithosphere. (The earth, inasmuch as it participates in the exchange of oxygen and other elements, could even be said to breathe. Mountains, oceans, and forests are sometimes seen as planetary lungs, as they carry out the exchange of oxygen and carbon dioxide). Around 2.3 billion years ago, the so-called Great Oxidation Event took place, with catastrophic consequences that mark it still as the biggest extinction in earth's history. If carbon in the atmosphere now threatens life as we know it, oxygen once did the same. Some anaerobic life forms survived the catastrophe and live on, for instance, in our intestines and contribute to making wine and vinegar, but they are no longer the dominant species on earth. This catastrophic toxin, freestanding oxygen, eventually became the basis for respiration as organisms adapted evolutionarily to the new habitat, eventually becoming the dominant organisms on earth. But oxygen is still toxic: too much of it can lead to blindness or brain damage for newborns, and scuba divers must take care to avoid an overdose of it from their oxygen tanks.

Breathing is thus not in the least invariant or purely natural; rather, it has a decisively historical character. And respiration is not a condition for all forms of life. The equation that breathing air is life itself holds for only one part—though a very important once—of life on earth. Respiration, which produces carbon dioxide and water while burning sugars by means of oxygen, is the counterpart of photosynthesis, the transformation of light energy into chemical energy. When we breathe in, we unravel the work done by some plant remote in time and space. Respiration is the consumption of energy, photosynthesis its storage. Breathing is thus connected to the total circulation of life on our planet. Though every person has a unique respiratory signature, all of us are unified in our ecological dependence on photosynthesis for every drop of energy.

Comparative Phenomenology

The origin of life is in the water, and the assimilation of oxygen by organisms first took place in the oceans. As in the human fetus, so in biological history: breathing organs were first filled with fluid. The respiratory systems of land animals had to undergo a fundamental metamorphosis to be able to slurp the fuel of oxygen directly from the air instead of as diffused in an aqueous medium. Cetaceans, a family of mammals that include whales, porpoises, and dolphins, turned back to

the sea from the land around fifty million years ago, and thus show the enormous plasticity of breathing organs and the creative diversity of evolution's natural laboratory. They retain lungs, rather than gills like fish, and thus can only breathe directly from the air. Their ear-nose-and-throat complex differs radically from ours. Dolphins speak (or rather "phonate") with their nose (or blowhole), hear with their jaw, and lack the musculature to move their faces expressively. As an organ of acoustic production, the cetacean blowhole appears to be just as versatile an instrument as the human voice, but dolphin hearing and phonation far exceeds ours in range and sensitivity, giving many species sonar powers.

During fifteen to fifty million years of ongoing evolution, among some cetacean species the two nostrils made a long journey to the top of the head where they converged into a single rather cyclops-like hole. Since cetacean breathing takes place through the blowhole and not the throat, breathing and swallowing, phonating and eating are completely separate; in contrast to humans, the dolphin nose and mouth are completely differentiated. Cetaceans cannot breathe or produce sound through their mouths; the evolutionary distinction of nose for breathing/phonating and mouth for feeding spares them the multitasking of the human throat for speech, breath, and food. A dolphin could never choke on its food. Humans, in contrast, have a single pass-through point by which we satisfy our needs for solid, liquid, and gaseous substances. (Cetaceans, by the way, cannot directly drink seawater, due to its high salinity, and hydrate indirectly from the organisms that they consume as food.) We breathe through our mouth or our nose, and normally direct traffic for the windpipe and the esophagus quite successfully, but these organs share precious real estate in the human body in a sometimes dangerous way unknown to our mammalian cousins in the oceans. Dolphins would never need to learn the Heimlich maneuver, a first-aid technique to save a person from choking.

If you will allow me a bit of speculation about comparative animal phenomenology, we could imagine one cetacean art that is essential to their existence: breathing technique. Human beings, of course, have developed a stunning array of diverse breathing arts and cultures, but these are rarely incontestable necessities for survival. John Cunningham Lilly, the American neurologist who launched the popular and ever proliferating story of communicating dolphins in the 1960s, began his first surgical experiments on dolphin brains in the mid 1950s with anaesthesia in order to numb the pain that his direct drilling into their skulls would cause. His research team swiftly killed five dolphins in a row before they realized that dolphins do not have autonomic breathing. With conscious control of breath taken away, the drugged animals suffocated to death.[14] Breathing among dolphins seems to be necessarily under conscious control. The blithe assumption that all animals necessarily breathe in the same way that we do can obviously be fatal. And when human autonomic breathing is interrupted—as in sleep apnea—the results can also be fatal.

If their breathing is always under conscious control, how do cetaceans sleep? Some experimentally observed dolphins can remain awake for five days in a row without showing symptoms of sleep deprivation. It appears that their brains sleep one hemisphere at a time, even shutting the corresponding eye, in what is known as "unihemispheric sleep."[15] Among humans, conscious breathing is an exception, but among cetaceans it seems to be the norm. Every cetacean seems to be a kind of yogi, a respiratory artist who puts breathing in the foreground of consciousness. Human breath, at rest, consists of more or less uniformitarian pulses unless interrupted by snoring or apnea, but cetacean breathing, especially among deep divers, involves huge cataclysmic intakes. A sperm whale at rest will breathe three to five times a minute, but in preparation for deep dives will hyperventilate, storing up oxygen in its blood, a saturating technique that has been inspirational for recent human freedivers. The staple in sperm whale diets is squid, which they hunt in forbiddingly cold and dark ocean depths, up to three kilometers below the surface of the ocean, holding their breath the entire time, and putting themselves at risk of the bends (nitrogen narcosis). Humans are thus not the only species to suffer occupational hazards! Emmanuel Levinas was thus perhaps wrong when he declared among all animals that humans were the ones capable of the longest breathing, though he was obviously not making a point about comparative zoology, but rather pneumatology.[16] Sperm whales can stay under for an hour on a single breath. One wonders what existential depths reflections on breathing might take among whale philosophers.

Exhalation also seems to be a cultivated technique among cetaceans. Some whales can blow circles of air bubbles into the water to herd fish together, and air bubbles also serve as an expression of breathing capacity and thus indirectly as a signal of bodily size, an important bit of information to share in the dark ocean. Bubbles may also build temporary shields of impermeability to sonar. Our lungs and breathing organs evolved in a world in which we could take environmental access to oxygen for granted, but marine mammals can breathe only at the ocean's surface (a fact that whale hunters have long exploited, "there she blows" being the classic call of a spotter on a whaling ship). Since they cannot survive outside the ocean—beaching is fatal—cetaceans must know how to modulate breathing at every point in time.

Breathing Technique

Perhaps breathing to cetaceans is more like singing to us, a craft in which breathing can never be left to its own devices; our habit could be their art. "A good voice teacher spends most of her time teaching people how to breathe."[17] The same is true for many other musical and athletic disciplines. Humpback whales can "sing" (if this is the right word for a practice humans have only known about

since the mid-twentieth century) for up to twenty minutes without emitting air bubbles, and it seems that they are somehow recycling the air, perhaps like the circular breathing used by wind instrumentalists (the saxophonist Kenny G has held a continuous note for over 45 minutes). What would the art of singing be like without the suspension of the urgent need to draw breath? Kittler called singing the "final and most important transformation of breathing."[18] Human song creates art in the space where desire is hemmed in, where the body disappears into voice and air. When a person sings, every phrase is a battle against the desire to inhale. When a choir sings, they learn to breathe in concert. Song is one aspect of what Hegel beautifully called "gehemmte Begierde, aufgehaltenes Verschwinden"—"arrested desire, disappearance delayed," and thus sublimated into lasting work.[19] Might not cetacean song, if its phrases can extend into multiple-minute lines, have a completely different relation to breathing, and thus to finitude, desire, and embodiment?[20]

It is unclear what function whale song serves, but it is evidence that breathing techniques are found among cetaceans (though they lack breathing technologies). Breathing techniques as a rule emerge in hostile environments in which breath is strained or scarce. Among humans, some kinds of musical performance are a chief domain of breath control, such as the playing of woodwind and brass instruments. We get some interesting hints about the preciousness of breath to the performer from a classic treatise on flute playing from 1752 by Johann Joachim Quantz, a court composer and flautist who gave daily lessons to Frederick the Great. His book still counts as a canonical work in wind pedagogy and was recommended to me recently by two friends who play bassoon and oboe professionally. Its seventh chapter concerns the taking of breath in playing the flute. "Taking breath at the right time," says Quantz, "is an essential matter when playing wind instruments and in singing." When performers do not properly save up breath, melodies can be broken and notes that belong together can be separated. A composer could, in theory, write endless passages, but for a performer breath implies finitude. "To play long passages it is necessary to draw in a good supply of breath." In this flute-players might be compared to sperm whales before they dive into the depths. Quantz's book provides specific instructions about when to draw breath and at which notes. Stringed instruments, he notes, have a great advantage over wind instruments because playing them is relatively independent of physical need.[21] Quantz ties breathing directly to time and rhythm, as it always is.

The art of playing a woodwind instrument makes clear a fact obvious to anyone who has run too hard or held their breath: breath is a scarce resource and highly desired commodity. You can never get enough of it but always must. Some forms of music are stolen from and constitute a temporary denial of our primal desire to take breath, the first act we did after being born. Breath was our personal declaration of independence. Breathing is not just a background to everything we do, but the field in which fundamental questions such as time, being, embodiment, desire, and rhythm play out.

Technologies of Breathing

Oxygen, cetacean anatomy, and breath technique are not media in a traditional sense, though each one discloses in a different way a creative connection of nature and craft. Nature is not an unchangeable given, but is plastic and historical, full of almost technical adaptations to new circumstances; there is a media history to nature as well as culture. This is one crucial lesson of the evolutionary philosophies developed by figures such as Charles Sanders Peirce and Niklas Luhmann. But there are breathing media in a stricter sense such as material devices that aid breathing by either extending the body or modifying the environment. Such technologies—as distinct from techniques—are abundant in modernity, an epoch in which breathing increasingly is the object of technical, medical, military, and artistic manipulation. To speak with Heidegger, technology (*Technik*) has "revealed" (*entborgen*) breath and breathing. The two main forms are (1) apparatuses that directly affect the body's breathing, such as scuba gear, iron lungs, gas masks, or CPAP (Continuous Positive Airway Pressure) masks, and (2) forms of direct intervention into the breathing milieu, that is, of "air conditioning" that allows more or less normal breathing by creating atmosphere-like conditions in otherwise alien habitats such as aircraft or mines.

Mining was the primal source of modern breath technologies, as Lewis Mumford showed in his classic book *Technics and Civilization*.[22] The underground environment is alien and hostile—it is dark, wet, dangerous, often too hot or too cold, and can lack fresh air and abound in hazardous gazes, sometimes fatally so. Mumford argued that the mine was the first completely artificial environment inhabited by humans, and a seedbed of such inventions as 24/7 work, lighting, and, above all, ventilation. Mumford draws heavily on the massive twelve-volume work *De re metallica* (1556), a treasury of medieval technique by Agricola (Georg Bauer). Agricola, now regarded as a founding figure in geology, metallurgy, and mineralogy, was very familiar with the mining techniques and technologies of the sixteenth century thanks to his many visits to the mining region of the Erz Mountains in Saxony. The desire for salt, coal, and precious metals called forth numerous innovations in mining, both apparatuses such as primitive gasmasks that helped miners breathe in a harsh environment, and air conditioning and ventilation ducts, which modified the atmosphere enough to allow miners to more or less breathe normally. In mining, breathing was always dangerous, and miners ran both long-term health risks such as black lung as well as immediate ones such as suffocation. This explains the practice of bringing canaries into coalmines as indicators of air quality (they were an early warning system of toxic atmospheres because their smaller bodies showed the effects of bad air more quickly). In Mumford's view, the mine was a kind of hell, the primal scene of capitalist exploitation and the birthplace of modern physics, that is, an abstract world of quantity without color, air, and life. The mine for Mumford foreshadowed the trenches of World War I.

Air-Quake

And it is in the trenches that Peter Sloterdijk begins his analysis of breathing in the twentieth century. In his dramatically exaggerated claim, the century was born on 22 April 1915 with the first application of poison gas as a military weapon. Modernity appears in the sky, as Hans Blumenberg showed in his studies of early modern cosmology in Copernicus and Galileo, but Sloterdijk shows that historical upheavals can be seen in the lower atmosphere as well as the celestial vault. Mustard gas was the opening salvo of what he calls "atmoterrorism." In gas warfare, the breathing environment could not remain in the unnoticed background but had to become a manifest operation.[23] His thesis is that modernity is a "history of atmospheric explication." By *explication* he doesn't mean conceptual clarification, as that term normally does in English, but rather a historical process in which implicit assumptions about life and the environment are forced to become explicit objects of representation and management.

Poison gas suddenly and dramatically demonstrated the hitherto unconsidered fragility of the atmosphere. Chemical warfare abruptly brings what was once in the neglected, anciently buried, forgotten, unknown, never-known, or never-noticed background to a new level of excruciating clarity.[24] (Here Sloterdijk builds on the phenomenological idea that technology arises where habit is interrupted.) Modern men and women are "condemned to punctilious [*förmlichen*] climate anxiety and atmospheric design." After the cloud attacks of the first world war and the fire and atom bombs of the second, which showed the radiophysical dimension of the atmosphere with wickedly unprecedented clarity, we have lost forever an "unquestionably given, worry-free, taken-for-granted air milieu." Once to exist in the world was to exist in the breathable air without a second thought, but with what Sloterdijk calls the "air-quake" (*Luftbeben*) of the past one hundred years, we have lost the once unreflective character of breathing and have thus undergone a fundamental change in the nature of our existence.

Sloterdijk's narrative of the breathing milieu being broken once and for all by poison gas on 22 April 1915 is dramatic, but there have always been environments, as noted earlier, that make it hard for humans to breathe, such as underground, underwater, smoke, the arctic, high altitudes, and outer space. Media sprout up in harsh environments. Diverse breath media directly modify the atmosphere so that we can inhale and exhale more or less naturally (i.e., without artificial devices) in artificial environments. Housing, heating, and clothing allow us to breathe in the winter. Windows and other forms of ventilation allow for fresh air, and air conditioning (here taken in the usual sense) allows people to breathe (or even exist) in the summer season in places such as Saudi Arabia or Arizona. Oxygen tents provide higher concentrations of that gas to medical patients whose lungs are weak. Crazy ideas of geoengineering imagine altering the chemistry of the entire atmosphere in efforts at habitat maintenance and climate control.

Bodily Breathing Machines

Sloterdijk's analysis of modern atmospheric alteration rests overwhelmingly on military evidence (as is true also with Kittler), although there is plenty of industrial disturbance as well. War, of course, is an essential source of technical innovation (as Marx, Sombart, Mumford, and others have noted), but allied areas such as medicine and exploration have also inspired breathing media that alter the body's capacity for breathing rather than the atmosphere itself. My adult son, who was born ten weeks premature in 1986, survived the first four months of his life thanks to an endotracheal intubation that delivered oxygen directly to his immature lungs via an apparatus lodged in his windpipe. This intubation, as it happened, caused iatrogenic damage to his lungs, and he required supplemental oxygen for an additional year via a nasal cannula. For his first-year home, we had oxygen tanks in our house and tubes that connected him to them—a big tank for normal use at home, a small one for when he went out. (Thankfully, his lungs have since fully matured.) My wife can sleep much better thanks to her CPAP machine, which protects her against the risk of sleep apnea (spontaneous cessation of breathing) by providing a steady stream of air. Asthma patients benefit from inhalers that open up the pulmonary tubes and ease breathing. When breathing via mouth or nose is obstructed, doctors can install a tracheotomy tube, which allows for breathing directly from the trachea. Iron lungs are an early form of a branching family of apparatus designed to aid the breathing of patients whose muscles cannot manage respiration on their own.

All the previous media enable the body to cope with breathing requirements. But some recent innovations are hybrid between techniques and technologies—between bodily regimens and mechanical devices. Extreme athletes who take part in the sport of freediving and the related sport called, almost comically, "competitive apnea" can reach astonishing depths underwater on a single intake of air; the current world record, held by the Austrian Herbert Nitsch, is 214 meters deep, using fins and weights, but no oxygen. The world record for "static apnea," or holding one's breath underwater without movement after having hyperventilated with concentrated oxygen, has almost doubled from twelve minutes and thirty-four seconds in 2002 to twenty-four minutes and three seconds in 2016. Much of this recent acceleration has been aided by medical research and by comparative studies of cetaceans; some practitioners are themselves medical doctors. Such long spans without breathing mix bodily techniques (the system must be trained) and technologies (oxygen tanks do not occur in nature). Here is another example where technique steps in where the unaided body comes up short.

Clearly no human in the history of the world could ever go twenty-four minutes without inhaling unless he or she had help from a developed technical and technological apparatus. Such radical stretching of the possibilities of breathing is possible only in a rare historical moment: our own. It is indeed perhaps

one of the chief marks of our time that breathing has become so pliable and so urgent. We measure lung capacity with spirometers and police measure the blood alcohol level of motorists with "breathalyzers" at the same time that breathing techniques spread abroad as therapies for the soul. The enveloping source of life in the air has taken on an increasingly artificial and self-conscious character as its manipulability and fragility have been "explicated" as Sloterdijk says.

With the technologization of the atmosphere also comes the atmospherization of technology, a historical development that culminates in the metaphor of so-called cloud computing. It is remarkable how automatically the word "cloud" in English has come to stand for online computing. This metaphor is one more sign of the long-term fall of the air from its taken-for-granted, natural status, and of the ways our time confounds atmospheric and technical facts.[25]

Media of Breathing: A Rough Classification

In this chapter, I have contrasted techniques as practices and technologies as material devices as well as the organism as a breather and the atmosphere as the enabling environment for breath. These four basic categories, I believe, account for the media of breathing. Let us divide them into four groups: (1) techniques that affect the breather and (2) the atmosphere, and (3) technologies that affect the breather and (4) the atmosphere.

Table 1. Outline of Breathing Media

	Organism	**Environment**
Techniques	1	2
Technologies	3	4

Quadrant 1 is one of the oldest domains of bodily techniques, certainly among humans and perhaps also other animals such as cetaceans. Humans have played with holding and modulating the breath in singing, sport, and spiritual practice. Birthing is one of the most important domains of breath technique as well, and midwives among other tasks coach mothers in breathing. Other authors in this collection and elsewhere explore the vast and fascinating arrays of human breathing techniques. I recommend especially the work of Maria José de Abreu.[26]

Quadrant 2 is equally ancient, though perhaps less effectual in producing reliable results. Humans have sought to manipulate the atmosphere for millennia through rain dances, animal sacrifices, holy fires, and other ritual techniques of propitiating the gods. The biblical prophet Elijah collaborated with YHWH to control the rain in order to teach the people a lesson, and Aeolus, the son of Poseidon, was the controller of the winds for the ancient Greeks, the friend/enemy

of sailors. Chinese emperors sought the mandate of heaven, and bells, feng shui, and musical instruments have all sought to call forth good wind and weather or appease bad weather (though perhaps these belong in quadrant 4, due to the material devices involved). Television weather forecasters often take on the persona of shamans as they claim to bring the weather and take personal responsibility for it. As Kittler quipped, "we can never separate weather from the gods."[27] Though largely pushed aside by modern science, techniques of atmospheric manipulation are certainly a long-lasting part of human cultural practices.

Quadrant 3 designates medical and other enhancements of physiological or anatomical breathing capacities such as CPAP machines, nasal cannulas, intubation, iron lungs, and tracheostomies. There are also pharmaceuticals such as bronchodilators that enlarge pulmonary pathways when inhaled. Scuba (self-contained underwater breathing apparatus) and other kinds of diving gear belong here as well, though of course there is rarely a technology without a technique (one reason some recent theorists prefer the middle term *techne*): divers have to learn how to use and interact with these devices.

Expanding our definition of technologies that shape the breath, we might also include devices that measure or train the breath. I spent the summer of 1976 reading spirograms (this was before digital spirometry), which are graphic depictions of people's lung capacity. It was a menial task, and a way for a college undergraduate to contribute to a public-health research project, but I learned a lot about medical graphic methods. We might also include sound-recording or more specifically voice-recording devices here. The phonograph is one of a family of media that allow the spoken or sung breath, or at least its acoustic effects, to be played back at a later time. The technical origin of the phonograph, like that of the telephone and the cinema, is closely tied to a range of physiological devices.

An even more interesting and ancient technology of breathing is the art of writing. Several languages, such as ancient Greek, carry diacritical marks as instructions for aspiration. More fundamentally, the written vowels of the alphabet—as thinkers such as Spinoza and Herder pointed out—are markers of the breathed part of language. Spinoza compared the consonants and vowels to playing a flute: the constants were like the fingers on the holes on the flute, and vowels were the breath that flowed through it.[28] Herder thought Hebrew had no need of written vowels because language was voiced by the breath of God.[29] A consonant is an unvoiced abstraction, an asymptote marking a vocal sound's point or manner of articulation, but a vowel marks the flow of breath through the lungs, larynx, and vocal tract. A vowel is a vocal, and as a graphic mark, it is a technology shaping bodily performance.[30] Key among technologies of breathing are those that register and record.

Quadrant 4 is largely the domain of war and industry, of systematic and intentional or unintentional alteration of the atmosphere through such technologies as architecture, ventilation, poison gas, cloud-seeding, or the burning of coal

and gas, which has dumped enormous amounts of carbon and other particulates into the atmosphere. Every time we turn on a lightbulb or start a car, we add to atmospheric carbon. Every character on this page has a carbon cost. Such atmospheric effects are typically unintended side effects, but it is now possible to manipulate rainfall directly by dispersing chemicals into clouds around which crystals may form. Airports also practice weather modification by controlling fog or rain. Some technologies try to, but clearly do not, act directly on the atmosphere, such as psychoanalyst Wilhelm Reich's "cloudbusters," which he thought he could use to alter the atmosphere's "orgone energy." To me it is not clear if Reich's "cosmic orgone engineering" is any crazier than recent schemes for geoengineering that would dump sulfur compounds into the atmosphere in the hopes of blocking the sun to cool the planet! As we have seen in the natural history of oxygen, the atmosphere has a long and volatile history; remarkable about our moment is the way that human causes have entered into that history on an unprecedented geological level.

In addition to modification of the atmosphere in general, we should include in quadrant 4 technologies that build microhabitats such as ventilated mine shifts, cabin pressure in aircraft or underwater craft in which people can breathe without the need for a bodily supplement. A gas mask would belong in quadrant 3, and a regulated, breathable aircraft in quadrant 4. Scuba gear would belong in quadrant 3, but a submersible craft in which one could breathe normally in quadrant 4. Thus we see how the media of breathing cut across some of the main domains of human endeavor: art, religion, medicine, and warfare. Obviously—and fortunately for our ongoing inquiries—there are many counterexamples and hybrid cases for further research. Breathing turns out, again, not to be only the alpha and omega of our existence, but also in the very middle of it! It is the medium of our lives in every sense.

Table 2. Media of Breathing

	Organism	**Environment**
Techniques	Art, Athletics	Religion, Ritual
Technologies	Medicine, Registration	Warfare, Industry

Notes

1. Wolfgang Hagen, "Metaxy. Eine historiosemantische Fußnote zum Medienbegriff," in *Was ist ein Medium?*, ed. Stefan Münker and Alexander Roesler (Frankfurt: Suhrkamp, 2008), 13–29.

2. Paul Kalanithi, *When Breath Becomes Air* (New York: Random House, 2016).

3. I agree with those who argue that body techniques should be included within cultural techniques, such as Bernhard Siegert, *Cultural Techniques: Grids, Filters, Doors, and Other Articulations of the Real*, trans. Geoffrey Winthrop-Young (New York: Fordham University Press, 2015) and Erhard Schüttpelz, "Körpertechniken," *Zeitschrift für Medien und Kulturforschung* 1 (2010): 101–120.

4. Marcel Mauss, "Les techniques du corps," *Journal de psychologie* 32 (1935): 293.

5. See Peter K. Haff, "Humans and Technology in the Anthropocene: Six rules," *The Anthropocene Review* 1 (2014): 1–11.

6. See my *The Marvelous Clouds: Toward a Philosophy of Elemental Media* (Chicago: University of Chicago Press, 2015).

7. Friedrich Kittler, *Aufschreibesysteme 1800–1900*, 3rd ed. (München: Fink, 1995), 11. "Die deutsche Dichtung fängt an mit einem Seufzer."

8. E.T.A. Hoffmann, *Der Sandmann* (Stuttgart: Reclam, 2015; first published 1816).

9. Kittler, *Aufschreibesysteme*, 55. See also Geoffrey Winthrop-Young, *Friedrich Kittler zur Einführung* (Hamburg: Junius Verlag, 2005), 23ff.

10. Friedrich Kittler, "Weltatem. Über Wagners Medientechnologie," in *Die Wahrheit der technischen Welt*, ed. Hans Ulrich Gumbrecht (Frankfurt: Suhrkamp, 2013), 160–180.

11. Friedrich Kittler, "Atmen," in *Baggersee: Frühe Schriften aus dem Nachlass*, ed. Tania Hron and Sandrina Khaled (Paderborn: Wilhelm Fink, 2015), 17–19.

12. Carl Zimmer, "The Mystery of Earth's Oxygen," *New York Times*, October 3, 2013.

13. See Nick Lane, *Oxygen: The Molecule that Made the World* (Oxford: Oxford University Press, 2004) and Donald E. Canfield, *Oxygen: A Four Billion Year History* (Princeton, NJ: Princeton University Press, 2014).

14. John C. Lilly, *Man and Dolphin: Adventures on a New Scientific Frontier* (Garden City, NY: Doubleday, 1961), chap. 3.

15. Sam Ridgway et al., "Dolphin Continuous Auditory Vigilance for Five Days," *Journal of Experimental Biology* 209 (2006): 3621–3628.

16. See Lenart Škof, *Breath of Proximity: Intersubjectivity, Ethics, and Peace* (Dordrecht: Springer, 2015), 138.

17. Judith Pascoe, *The Sarah Siddons Audio Files* (Ann Arbor: University of Michigan Press, 2011), 37.

18. "die letzte und wichtigste Verwandlung des Atmens." Kittler, "Weltatem," 164.

19. Georg Wilhelm Friedric Hegel, *Phänomenologie des Geistes* (Hamburg: Felix Meiner, 1952; first published 1807), chap. 22.

20. See Mladen Dolar, *A Voice and Nothing More* (Cambridge, MA: MIT Press, 2006).

21. Johann Joachim Quantz, *Versuch einer Anweisung die Flöte traversiere zu spielen* (Berlin: Johann Friedrich Voss, 1752), 73–76. Original quotations: "Dem Athem zu rechter Zeit zu nehmen, ist bey Blasinstrumenten, so wie beym Singen, eine sehr nöthige Sache." "Um lange Passagien zu spielen, ist nöthig, dass man einen guten Vorrath von Atem langsam in sich ziehe."

22. Lewis Mumford, *Technics and Civilization* (New York: Harcourt, Brace, 1934), chap. 2.

23. Peter Sloterdijk, *Schäume* (Frankfurt: Suhrkamp, 2004), 89.
24. Sloterdijk, *Schäume*, 140–141.
25. See my essay, "Cloud," in *Digital Keywords: A Vocabulary of Information Society and Culture*, ed. Benjamin Peters (Princeton, NJ: Princeton University Press, 2016), 54–62.
26. For instance, see Maria José de Abreu, "TV St. Claire," in *Deus ex Machina*, ed. Jeremy Stolow (New York: Fordham University Press, 2013), 261–280; and Maria José de Abreu, "Breath, Technology, and the Making of Community Cancão Nova in Brazil," in *Aesthetic Formations*, ed. Birgit Meyer (New York: Palgrave Macmillan, 2009), 161–182.
27. Friedrich Kittler, *Musik und Mathematik*, vol. 1, part 1 (Munich: Fink, 2006), 79. For more on the theme of atmospheric divination, see Peters, *Marvelous Clouds*, 243–248.
28. Benedictus de Spinoza, *Compendium Grammatices Linguae Hebraeae* (Amsterdam: Jan Rieuwertsz, 1677), chap. 1.
29. Johann Gottfried Herder, *Abhandlung über den Ursprung der Sprache* (Stuttgart: Reclam, 1966; first published 1772), chap. 3.
30. See my essay, "A Short History of Vowels" (manuscript in progress).

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