The Breathing Self: Toward a History of Respiration

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Abstract

This dissertation examines human breathing as an historical object. In particular, it traces how changing theories and practices of breathing were at once experiences and techniques of the self. Unlike historical studies of breathing theories and practices to date, this work focuses on a broad cross section of scholarly, scientific, and popular British and American sources spanning the late seventeenth through the mid-twentieth centuries. It questions two common assumptions about breathing and how breathing ought to be studied. First, this study shifts focus away from the frequent preoccupation with *breath* (or air, or oxygen) to *breathing* as gesture, expression, or process. Second, it challenges the assumption that there is such a thing as normal, regular, universal breathing.

Evidence of the possibility of a radically different experience of breathing comes from early English printed texts of the seventeenth century that are used to describe the breathing body before biomedicine and modern physiology; this body does not breathe only with the lungs, which entails a particular view of the body's expression. A major theme of the dissertation is this relationship between the breathing body and its expression. The relationship of breathing, the will, and expression is described using sources from the end of the nineteenth century when psychology was establishing itself as an experimental science different from philosophy and "pneumatology"; at this

moment the breathing body was not understood to be able to change itself. As the will was being discredited as a psychological category, the arrival of new texts and practices from India and China inspired a move away from the idea of immutable, "normal" respiration and opened the possibility of practicing breathing for the sake of change. The relationship of breathing and the will is finally considered in terms of the practical context of techniques of resuscitation in the twentieth century, when different models of breathing and volition led to the development of two very different forms of resuscitation and mechanical ventilation.

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Introduction

It disturbed the nurses in the neonatal intensive care unit to see their tiny patients stop breathing. During the long night shift, time slowed as they watched small chests inside their incubators rise and fall. Sometimes the breaths seemed deep and strong, other times shallow and gasping. Sometimes they could barely begin the count between breathing, and other times they would wait a full, agonizing ten seconds between the beginning of one inhalation and the beginning of the next. It was already hard to keep their own eyes open to maintain the schedule of feedings, holdings, and medication administrations. What if, on one occasion, they were to drift off while a pause in an infant's breath cycle stretched into death? Were the pauses too long? Was the pattern too erratic?

In a 1942 paper, this pattern was identified as Cheyne-Stokes breathing. The paper argued that such breathing should be treated through the administration of high concentration oxygen.[1] This was easy to do since incubator development and marketing were in full swing.[2] The authors of the article weren't entirely sure why the babies exhibited Cheyne-Stokes breathing. They were not, after all, climbers at high altitude. Though premature, the infants were fundamentally healthy. Thus, the authors weren't sure either if there was a correlation between the "abnormal" or "irregular" respiration

[1] J.L. Wilson, S.B. Long, and P.J. Howard, **"**Respiration of premature infants; response to variations of oxygen and to increased carbon dioxide in inspired air," *American Journal of Diseases of Children* 62 (1942): 1080-1085.

[2] J.H. Hess, "Oxygen unit for premature and very young infants," *American Journal of Diseases of Children* 47 (1934): 916-917; W.M. Boothby, "Miniature oxygen chamber for infants; a modification of the Hess incubator," *Staff Meetings of the Mayo Clinic* 9 (1934): 129-131; E.C. Dunham, H.C. Dickinson, G.J. Gowens, and J. Witters, "Incubators for premature infants," *American Journal of Public Health* 30 (1940): 1415-1421; Charles C Chapple, "An incubator for infants," *American Journal of Obstetrics and Gynecology* 35 (1938): 1062-1065.

pattern and any pathology or anoxia. They weren't even sure that so-called "normal" respiration was better:

> We have no proof that the regular type of respiration, which we are accustomed to consider "normal," is "better" for a premature infant than the periodic type of breathing described. Likewise, we have no convincing evidence that an increased oxygen content of arterial blood is beneficial or necessarily of importance. It is evident, however, that these healthy premature infants breathed in a more normal manner in an oxygen-enriched atmosphere.[3]

This study, with its empirical finding that administering constant, high-concentration oxygen to premature babies in their incubators would result in "normal" respiration patterns, set the standard of care in the United States until 1954. And it was during this period that an epidemic of childhood retrolental fibroplasia, which caused irreversible blindness, emerged. The Perkins School for the Blind, which had been about to close for lack of students, had to build a new wing. During the twelve years that it took to trace the cause to the high-concentration oxygen used to make their breathing "normal," between eight and ten thousand children were permanently blinded. [4]

These researchers had inherited certain perspectives on the nature of oxygen and on the nature of breathing more generally. When, in the eighteenth century, the theologian and chemist Joseph Priestley first "dephlogisticated" common air, he felt he had found something pure. He was "fully satisfied with the superior goodness of this kind of air," and tried to measure, through a variety of methods, "that degree of pureness."[5] But this is not the place to tell the story of how Priestley's assessment informed the modern conviction about the "goodness" of oxygen and the corresponding toxicity of carbon

[3] Wilson, Long, and Howard, 1085.

[4] Steven M. Spencer, "Mystery of the Blinded Babies," *Saturday Evening Post*, June 11, 1955.

[5] Joseph Priestley, *Experiments and Observations on Different Kinds of Air: and other branches of natural philosophy, connected with the subject* (Birmingham: Printed by Thomas Pearson, 1790), 118.

dioxide. What possible harm could there be in providing high-concentration oxygen—the very stuff of life itself and a "good" gas—to premature infants?

This is also the story of how we became blind to breathing. A preoccupation with *breath* (or air, or oxygen) as opposed to *breathing*, together with an assumption that not only is there such a thing as normal, regular, universal breathing, but that it is preferable, has prevented the consideration of breathing as an historical thing. First, in keeping with the modern understanding of breathing as fundamentally a matter of chemistry, there has been a tendency to think about breath, air, and atmosphere to the exclusion of *breathing* as a gesture, expression, or process. And secondly, obvious pathologies notwithstanding, breathing has been understood to be universal, both among given individuals or populations, and over the course of historical time. Ideas about breathing may change, but breathing does not. These are some of the assumptions that this dissertation aims to reconsider.

Before breathing came to be thought of primarily as a physiological thing, it was closely aligned with the "spiritual" aspect of life and of bodies, with whatever it was that stood between the material and the immaterial. In the seventeenth century, a branch of metaphysics was devoted to such things; this was called *pneumatics* or *pneumatology.* One of James II's physicians put it most simply: "Man may rightly be divided into to parts, viz. *pneumatology*, which gives an account of his soul, and *somatology,* which is the anatomy of his body."[6] The study of those things like air, gas, or spirit was the study of the soul. As late as the beginning of the nineteenth century, Scottish philosopher James Beattie defined pneumatology as that part of the philosophy of mind that "inquires into

[6] Samuel Haworth, *Anthropologia* (London: Printed for Steven Foster on London Bridge, 1680), 13. http://eebo.chadwyck.com/

the nature of those spirits or minds, whereof we may have certain knowledge…those are the Diety and the human mind. …Pneumatology, therefore…[studies] the Philosophy of the Human Mind, which some writers have termed psychology."[7] A history of breathing might then be thought of as a history of understandings of the soul and of the mind.

Air as it appears (or does not appear) to the eye is suggestive of something vague yet seemingly present, like a soul or a mind. And if we believe in a soul, or even in a mind, for that matter, we might think of it as something present as long as air is entering and exiting the body. But there are still other reasons, perhaps more compelling to us, for whom the word "pneumatology" has lost its meaning, that might cause us to think of breathing together with spirit or mind. Breathing is not like the pulse. We can change our breathing intentionally, while many other aspects of our bodies lie outside of the sphere of our volition. More significantly, however, breathing is *involuntary*.

According to current anatomical and neurophysiological understanding, most breathing is involuntarily controlled by the central pattern generator neurons of the brain stem, sometimes called the "reptilian brain," which directly triggers the muscles of inspiration. Intentional breathing, as in a stressful moment when a friend suggests you "take a deep breath," is controlled by the interaction of nerurons in the cerebral cortex with the muscles of respiration. Through this pathway we can, for a time, override the automaticity of our respiration. Such, in any case, is the current understanding.[8]

This dual nature of respiration makes it a useful window into historically contingent models of human volition. It also suggests that the history of the breath (both

[7] James Beattie, *Elements of Moral Science* (London: Printed for William Creech and T. Cadell and W. Davies, 1807), xv. http://eebo.chadwyck.com/

[8] David J. Pallot, ed. *The Control of Respiration* (Kent: Croom Helm, Ltd., 1983).

in theory and in practice) is a good place to look for changing understandings of self-knowledge and self-transformation. Does the way self and breath are imagined in a given place and time hinder or encourage these as possibilities? If I can use my breath to change my own physiology, to slow my heart rate, for example, what then do I know about myself? If I can use the breath to change my body in specific ways, what kind of self am I such that I can change my own materiality? And what are matter and spirit that they have such a relationship? These are the lofty questions that a grounded study of the history of thought and practice of breathing might allow us to consider.

Can you kill yourself by holding your breath? Both current physiological models and current forms of common sense forbid such a thing. Yet if you were to ask Galen, Pliny, Valerius Maximus, Dr. George Cheyne, Zuchelli (an early eighteenth-century Capuchin missionary), the authors of any number of reports on slave revolts in the seventeenth, eighteenth, and nineteenth centuries, or the woman who, according to *The New York Times*, did just this in a grocery store parking lot in 1983, then you would hear the resounding answer: yes, it is indeed possible![9]

A particular feature of all of these cases is the nature of the extreme desperation experienced by those who chose the willful cessation of breath as their method of departure. They tended to be slaves, foreigners, so profoundly oppressed that their method of claiming freedom had to require nothing; not a rope, sword, or even access to a high place. Under slightly less dramatic circumstances, in the parking lot, a Louise Ramos, who had been arrested for shoplifting and vowed to hold her breath "until I turn

[9] Cases of suicide by breath holding are compiled in V.J. Derbes and A. Kerr, "Voluntary Death by Breath Holding," *New England Journal of Medicine* 249, no. 17 (Oct. 22, 1953): 698-9.

blue," apparently held her breath until she died.[10] This dissertation considers the space between the breathing body and the search for freedom, whether in the secular context of historically variable psychological notions of a faculty of human will, or of religious views of the body and its role in salvation.

When we consider breathing, we are in fact considering a variety of different boundaries and limits: between self and environment as air passes in and out, but also between the breathing, the breathless, and the unbreathing. Insofar as souls and minds are possessed by the living and not the dead, the history of breathing is also a study of the boundaries and limits between life and death. Let's consider an example, and a few of its implications.

When in the summer of 1926 Harry Houdini, bolted and soldered into an airtight brass casket, was lowered below the waters of the Hotel Shelton's swimming pool, he descended with the confidence of one who thinks he knows what is real and what is illusion. Houdini had been flirting with a seemingly unlimited variety of deaths by suffocation since at least 1906, but in this particular instance he was directly addressing the challenge of one upstart imitator who went by the name of Fakir Hamid Bey. There was no immediate threat: Bey's first attempt to remain "indefinitely" in an air-tight zinc coffin beneath the waters of the East River had lasted only nineteen minutes as he had to be hauled up and cut out—still, according to the the *Boston Daily Globe*, in a trance—when a short circuit in his coffin's bell caused it spookily to ring of its own accord. Bey's operation was then moved to the less capricious waters of the W 59th street Dalton High

[10] "Suicide By Breath-holding," *The New York Times,* October 27, 1983.

school swimming pool, where he remained submerged for an hour.[11]

Houdini did not like how similar Bey's performance was to some of his own—the "Self-Liberator" was uniquely known for his masterful yet edge-of-the-seat breath holding—and, most importantly, he did not believe Bey's claim to be able to remain "indefinitely," mouth and nose plugged, beneath the sand or water by entering a "cataleptic trance." Houdini's own performance (down at 49th and Lexington) was intended to show that anyone could remain for long periods with limited air by simply practicing what he referred to as shallow breathing or, as the *The Washington Post* described it, "by conserving oxygen longer than the fakir could carry on in a trance with the aid of his djinns."[12] It was unimaginable that there could be life without breath, and breath without air entering nose or mouth. And contrary to what Bey's performance implicitly argued, the will could not completely master the body, let alone matter itself.

Houdini wrote a lengthly letter to Dr. W.J. McConnell, the physiologist who had taken his pulse and counted his breaths before he was even completely cut out of his casket:

> As you know, I trained for many years as an escape artist and have been nailed in boxes and thrown into rivers; have been locked in milk cans for two and three minutes. The Torture Cell which I am now presenting I have performed for twelve years. This compels me to keep in physical condition and lung capacity all of the time…Am having a coffin made with a glass top, and as soon as it is ready will let you know. I know you are doing a worthwhile work and as my body and brain are trained for this particular line, I am at your service.[13]

His "magic" was a matter of physical conditioning and the careful management of fear.

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[11] "Houdini 90 Minutes in Coffin in Water: Beats Rahman Bey's Record for Stunt by Half-Hour," *Boston Daily Globe,* August 6, 1926.

[12] Harold Kellock, "Houdini—The Master Magician," *The Washington Post*, July 14, 1929.

[13] Houdini letter to Dr. W.J. McConnell, August 5, 1926.

But in spite of Houdini's rhetoric, he was providing audiences with the titillation of watching as he risked suffocating to death before their eyes. Houdini defended this experience morally and intellectually on that grounds that, as Adam Phillips put it, the "way to be a good man in bad times was to be an honest magician."[14] Houdini claimed to be aligned not with (the perhaps literal) smoke and mirrors of the fakes, but instead with what he considered the cutting-edge science and medicine of his day. He imagined himself to be a contributor to the progress of knowledge: his performances were part experiment, with qualified measurement-taking witnesses standing by, and part spectacle.

As Adam Phillips puts it: "There could be nothing more preposterous to the spectators than the idea that Houdini was performing the profound existential questions of their culture…" In order to enact these questions, Houdini used what Phillips calls "the most potent symbolic props in the culture." These were all of the miscellaneous implements of restraint, of the absence of freedom: "Jails, beds, trunks, skyscrapers (Houdini mostly hung himself from banks and newspaper offices), chains, cuffs, evening suits, straitjackets—the paraphernalia of the confined body."[15]

Phillips does not make any comment about the "symbolic prop" of the breath, nor about the fact that the majority of Houdini's most commonly performed stunts involved submersion in water or earth, and that he was always escaping while holding his breath, or surviving longer than would seem possible in the absence of air. In what way was breath-holding, along with the fascinating (or mundane) state of mind that might accompany it, a "potent symbolic prop" of the culture? How did it reveal an anxious fascination with death, a peering into the mystery of where people were in the silence of

[14] Adam Phillips, *Houdini's Box: On the Arts of Escape* (London: Faber and Faber, 2002), 90.

[15] Ibid., 46.

breathlessness?

As we will see, though Houdini may or may not have known it, his performance (and of course Bey's) fit into a genre. Reports of long periods alive but without breath are found in the seventeenth century, and in the eighteenth there were home-grown cases and a fascination with reports of Indian yogis burying themselves alive for extended periods of time. Chapter three will say more about this, but for the moment consider how, in the year 1900, the Tübingen Indologist who had compiled all known cases for publication in *The Monist*, explained the phenomenon:

> From the preparation for his burial which Haridas made in the way of stopping up air passages it is evident that he himself was convinced of the complete cessation of respiration during his cataleptic torpor. Here he was in error, for the absolute cessation of respiration for so long a time would have meant the end of life. A medical colleague kindly informs me that such a stoppage of the air passages as is reported in the case of Haridas is not tight enough to stop all admission of air, aside from the fact that the organs of respiration are not the only means of breathing, but that the skin also serves this end, and further, that even though three or four feet of earth and a closed box enough air may pass for the preservation of life when reduced to its lowest limit, the so-called *vita minima*.[16]

Here, a presumably sensible person is suggesting that one can survive by breathing through the skin. While up to this point I have tried to think of breathing in terms other than the usual physiological ones, or, less anachronistically, in terms other than those denoting a bodily function, there is much to say about the imagination of the breathing body itself. Has it always felt the same to breathe? Have we always thought, and perhaps felt, ourselves breathing with our lungs?

While it was unlikely that the screenwriters of the 1964 James Bond film *Goldfinger* had studied von Garbe's *Monist* piece, it was out of the mouth of 007 that

[16] Richard von Garbe, "On the Voluntary Trance of Indian Fakirs," *The Monist, A Quarterly Magazine Devoted to the Philosophy of Science*, July 1900, p. 15.

pore breathing resurfaced in popular culture. We know we breathe through nose and mouth, and yet when Bond looks down at the motionless golden body sprawled out on the bed he announces: "She died of skin suffocation. It's been known to happen to cabaret dancers. It's all right as long as you leave a small bare patch at the base of the spine to allow the skin to breathe."[17]

The gold-painted woman's death from "skin suffocation" is one in a series of strange and unlikely deaths in the film. And in spite of the fact they might have known better, when actress Shirley Eaton was painted (almost) entirely gold to play the role of Jill Masterson, she was always under the eye of a physician whose presence on the set was deemed prudent. And though it was not visible to the camera, following the instructions that Bond gives in the film, a small portion of her stomach was left unpainted. Nonetheless, rumors circulated following the fantastic success of the film that Shirley Easton had in fact died of skin suffocation on the set. In spite of the fact that she is manifestly alive—she has authored several books—the most recent internet discussion post attesting to her death by skin suffocation was in 2001.[18]

In what kind of body is breathing primarily associated with the lungs? The first chapter in this dissertation, "The Vox Corporis and the Rising of the Lights," uses early English printed texts from the seventeenth century to describe the breathing body before biomedicine and to trace the long history of the idea of skin breathing. Indeed, there was a time before biomedicine in which the entire body was understood to breathe, a perspective that radically changed the sense of how long one might live without visibly breathing. The two sections of the chapter take up different aspects of the breathing body

[17] *Goldfinger,* directed by Guy Hamilton (1964; United Kingdom, MGM, 2012), DVD.

[18] Steven Connor, *The Book of Skin*, (Ithaca: Cornell University Press, 2004).

before physiology. The first uses the case of a common and deadly ailment, *the rising of the lights*, as an embodied example of how the body once breathed. Though the rising of the lights was thought to cause suffocation, it was not the lungs that were treated. Fears similar to those that are invoked by the death of the gold-covered Jill Masterson are present in these early English texts. We find as well admonitions about how to care for the skin and how to hold the body to allow respiration to occur freely.

This dissertation begins with materials from the late seventeenth century in order to be able to describe breathing before biomedicine, and before Priestley and Lavoisier's discovery of oxygen. In order to encourage a rethinking of taken-for-granted breathing, in order to make ordinary breathing strange, I wanted to find the closest moment in time that would allow us to imagine a body the most unlike our own. But this project is also concerned with a particularly persistently reappearing epistemological question, and I have chosen to examine three moments when that question was open to renegotiation, the end of the seventeenth century being the first. This leads us to the second half of the first chapter, *the vox corporis,* or the relationship between the breathing body and its expression.

Natural philosophers and physicians in the late seventeenth century and the *fin de siècle* were similarly absorbed with renegotiating the relationship of matter and energy, to use modern terms. While there is certainly a sense in which it is true that "there was no such thing as the Scientific Revolution," for my own purposes I have chosen that moment precisely because it illustrates the move to an epistemology that, revolutionary or not, was certainly rather different than before. This was the famous break between so-called "primary qualities" and "secondary qualities." This new view, unlike the formerly

dominant Aristotelian metaphysics, held that "surface" properties—for our purposes *expressions*—could no longer be considered trustworthy guides to supposed interior essences. The concept was in evidence in works such as Hooke's *Micrographia,* which illustrated, undeniably and in gorgeous woodcuts, that a needle that seemed sharp and acted sharp was, at the deepest level (or at least it seemed the deepest level), in fact a complex topography of hill and vale: not "essentially" sharp at all.[19]

In terms of the body and its breathing, the implications of this shift away from Aristotelian metaphysics were twofold. One question concerned whether or not a person could express something other than the state of his or her body; was expression a matter of the particular, capricious wind blowing through a person, or was the breath of a muscular, willing body its own to shape as it chose? And so this was a matter of what we would now call the mind/body question, too. There was a kind of primary and secondary quality relationship that held between the body and what it expressed.

The second version of the primary/secondary quality shift as it impacted breathing was described as *motion* vs. *substance:* which of these was it that made a thing what it was, essentially? Was it how it moved, what it did, how it appeared, its motions (i.e., the expansion and contraction of the chest and the "beating of the lungs") or was it, on the other hand, something hidden, an active ingredient, a bit of matter that held a certain potential, for example a certain "springiness" in the air? At the end of the seventeenth century, the broad move was away from thinking of "motion" as essential toward thinking of "substance" as essential. This move was never entirely complete, as we will

[19] Robert Hooke, *Micrographia*, *or, Some physiological descriptions of minute bodies made by magnifying glasses with observations and inquiries thereupon* (London: Printed by Jo. Martyn and Ja. Allestry, 1665). http://eebo.chadwyck.com/

see, when it came to the understanding of respiration: at the Royal Society they strongly suspected there was "something" in the air, but to know what it was, one would have had to wait until the eighteenth century. The first chapter, then, considers how the body breathed, how troubled breathing was treated, and the implications for the self and its expression when primary and secondary qualities, or the motion and substance of the breathing body, were divided. All of this, of course, was the proper subject of *pneumatology*.

Chapter two, "The Respiratory Reflex," follows the trail of the breath as a window into the soul at just the moment when psychology was trying to establish itself as an experimental science different from philosophy and "pneumatology" as well, though in many ways strikingly similar to the latter. We then move from the seventeenth to the nineteenth century, and find similar questions on the table. In particular, issues of primary and secondary qualities, or substance and motion, are under discussion again with respect to breathing, but now in a new way. At the end of the nineteenth century, the language of conversation was at first thermodynamical: work, energy, temperature, entropy. But the questions at stake were so fundamental that the change brought about in physics forced a shift in the standing metaphysics which had broad ramifications. To put it too simply, the old substance/motion, matter/spirit question was decided in favor of both: they were physically understood to be interchangeable, fungible. Nothing was made or destroyed but instead changed from one form to another. This was, perhaps not coincidentally, the moment when the study of the human mind was taking experimental form. In the late nineteenth century, the connection among breathing, expression, and the "passions" (by then referred to as the "psychical" or "emotions") was taken up experimentally as part of

psychology's aspiration to become a science. The breath was experimentally tracked, traced, and correlated with what were understood to be universal and immutable categories not only of human subjective and affective experiences, but also of human kinds.

It was not, as Nile Green put it in his article "Breathing in India, c. 1890," that breathing was "perhaps the most subtly contingent of all human activities."[20] Instead, there was, according to the view presented in *The Respiratory Reflex,* such a thing as "normal respiration." For any given kind of body, and for any given state of that particular body and mind (kinds and states of bodies were understood to exist in limited and clearly defined "species"), there should be a "normal" breath.[21] In the earliest days of developing the experimental view of the mind, the breath was seen in ways reminiscent of the early modern view, before primary and secondary qualities had been separated. Though ostensibly in the new metaphysics of the late seventeenth century a space had been carved out between body and expression, and between breathing and experience, in the fledgling attempts to experimentalize the mind of the late nineteenth century, this space had seemingly closed again. Body, breath and mind were imagined to mirror one another perfectly and in perfectly predictable and universally invariant ways. One implication was that this breathing body could not change itself.

The "psychophysical" project, of which the experimental study of breathing was a part, was by the early decades of the twentieth century abandoned as a failed program. Experimental psychology would move on to a different understanding of the role of the

[20] Nile Green, "Breathing in India, c. 1890," *Modern Asian Studies* 42, no. 2 (2008): 283-315.

[21] This was, of course, part of the broader force of "normalization" the nature and impact of which was shown by Georges Canguilhem in *The Normal and the Pathological* (New York: Zone Books, 1991).

body in understanding the mind. The breath, which had formerly been a visible, tight correlate of something hidden, would become an empty "respiratory reflex." While in the third chapter I will emphasize the criticisms of this view that came to the fore in the early twentieth century, it was by no means a complete rejection of "normal breathing." The idea was simply too clinically useful, and perhaps the "subtle contingencies" of the breath were unimaginable in a world committed to the idea of breathing "normally."

Each new formulation of the relationship between motion and substance or spirit and matter entailed a theory of change. In the third chapter, "Breathlessness and Transformation," we return to breathlessness in light of a new theory of change that arose as a result of putting spirit prior to, rather than on par with, matter. Could the breath be a source of transformation; could spirit-like breath change rigid matter? A move away from the idea of immutable, "normal" respiration opened the possibility of practicing breathing for the sake of change. While the aspiringly scientific psychology of the nineteenth century had tried on a theoretical program that assumed a kind of identity of body and mind (or matter and energy), with the new century came arguments and demonstrations of the superiority of spirit, mind, or energy; mind—and will—over matter.

The second half of the nineteenth century is sometimes characterized as the third great awakening. This period saw the flourishing, among other forms of Protestant zeal with respect to social engagement and missionary work, of groups like Mary Baker Eddy's Christian Science, which emphasized precisely the possibility of healing the flesh through the mind. The psychophysical project had failed, in the academy but also popularly, if the mind-over-matter movements of the early twentieth century are any indication. These ideas occupied the popular imagination, and dramatic displays of

willful breathing struck a certain deep chord with audiences. In the third chapter, then, I juxtapose the late nineteenth-century view of breathlessness as a species of pain (in keeping with the classifications of breath we saw in chapter two), with the new option of intentionally practicing breathing—and breathlessness—for salvation. But in tandem with these claims that spirit could set the body free came perhaps the most unequivocal rejection of the "motion" or "spirit" side of breathing.

Finally, in chapter four, "Breathing Out of Body," we consider the history of what should be done when someone who should be breathing is not breathing. The aim is to show what was really thought about breathing in the early and mid-twentieth century, between which periods a significant change occurred. That change was from a view that forbade positive pressure ventilation, blowing into the body, whether with tools or by mouth, to a new, widespread practice of positive pressure. This shift led from the iron lung, a method of life support closely associated with a body breathing through the skin, and with an idea of *tonos*, or tension as a definition of life articulated by a now-forgotten physiologist, to the kind of positive pressure mechanical ventilators that are in use today. We will see how conversations that had begun in the Royal Society at the end of the seventeenth century came full circle at a specific moment in the middle of the twentieth century when, in 1957, Peter Safar publicly demonstrated mouth-to-mouth resuscitation at a meeting of anesthesiologists in Los Angeles. Safar humbly noted that it was the same week as the launch of Sputnik.[22] This bizarre claim of importance is somewhat less so in light of the history of positive pressure ventilation of which mouth-to-mouth is a species. The last time anyone had really considered positive pressure was when, in 1664, Hooke

[22] Mickey S. Eisenberg, *Life in the Balance: Emergency Medicine and the Quest to Reverse Sudden Death* (Oxford: Oxford University Press, 1997), 101.

had first dramatically separated movement from substance, and a dog from his diaphragm, rib cage, and all other muscles of breathing. He referred to the result as "extracorporeal respiration": breathing out of body.

Historiography

There are at least two reasons that the history of breathing has been relatively neglected by historians of medicine and the body. The first is an anachronistic reduction of breathing to a purely physiological process. This doubly impacts the likelihood of breathing as a choice of research topic. On the one hand, the history of physiology, like the study of physiology itself, is considered a thing of the past. The major scientific problems of physiology were solved, it is thought, by the work of the nineteenth and early twentieth century. Plodding and rather positivist studies of the historical development of physiological research likewise tend to sit dust-covered on the shelf. Secondly, though studies of the body have revealed almost every aspect of embodied experience to be historically contingent, breathing as a "physiological" object has seemed simple: the living breathe and the dead do not. What is less assailable than that?

This work fits into two closely related fields of study, the history of medicine and the history of the body. Within the history of medicine, breathing has been primarily touched upon either in terms of the history of the physiology of respiration, or in terms of the history of bodies situated in breathing environments, various "airs, waters, and places." This Hippocratic and neo-Hippocratic perspective on body as a process fundamentally inseparable from its environment is described by Charles Rosenberg in "Airs, Waters, Places: A Status Report." There he traces the history of a recurring tension

between bodies that are "situated" and bodies that are "abstracted and generalized." This same tension exists both in medical theory and practice, and in the manner of writing the history of those things.[23]

Insofar as breathing is one of the main negotiators of the boundary of the body with its environment, there is a sense in which any study of human health and the environment broadly construed is a study of breathing, and in this sense the history of medicine has had much to say. In particular, since they are so often indicative of "what's in the air," respiratory illnesses have served as excellent sampling devices for historians of medicine to look into matters of disease ontology, public health, therapeutics, morality, and politics. In fact, one could perhaps argue that the study of respiratory disease has itself shaped the direction that the social history of medicine took after the 1950s. The *mal du siècle*, otherwise known as consumption, pthisis, and scrofula—all forms and names for what is now called tuberculosis—is perhaps a case in point. Before Thomas McKeown attempted to reorient interest from bacteriology to public health, René and Jean Dubos, in their 1952 *The White Plague: Tuberculosis, Man, and Society,* suggested an agenda for the social history of medicine. They proposed the study of tuberculosis as a matter not only of the identification of microorganisms but also of sanatoria, public health, literature, social mores, images of the romantic self, institutions, and the environment more broadly.[24] (The work perhaps fits more closely into what Charles Rosenberg calls the "reformist" tradition of social medicine descending from Rudolph

[23] Charles Rosenberg, "Airs, Waters, Places: A Status Report," *Bulletin of the History of Medicine* 86, no. 4 (Winter 2010): 661-670.

[24] René Dubos and Jean Dubos, *The White Plague: Tuberculosis, Man, and Society* (Boston: Little, Brown and Company, 1952). Thomas McKeown, *The Role of Medicine: Dream, Mirage, or Nemesis?* (Princeton: Princeton University Press, 1979.

Virchow; in this sense it might be better placed into the history of social medicine *per se*, rather than the social history of medicine).[25] In the intervening years the same territory has been updated, refined, and cleared of all remaining traces of positivism, recently by Helen Bynum in her *Spitting Blood: The History of Tuberculosis*.[26] More recently asthma has been opened up kaleidoscopically as a matter of the environment by Carla Kierns and Mark Jackson.[27]

"Airs" have not only been considered as a matter of the history of disease, however broadly disease may be understood. The sense of airs as environments has been an extremely productive framework for historians of medicine, not only because the "neo-Hippocratic" orientation of this thread of the social history of medicine reflected the neo-Hippocratic orientation of the places and times that it studied. A 2012 special issue of the *Bulletin of the History of Medicine* devoted itself to modern *airs, waters, and places*. The bulk of the contributions were related to modern ideas of climate and the body: modern medical climatology, colonial climates, climate and environmental determinism. One paper considers Ancel Keys' physiological work at high altitude, a subject closely related to respiration physiology. But in a collection devoted to the modern study of the body and its environment, not one addresses modern breathing directly.[28]

Nancy Tomes's *The Gospel of Germs: Men, Women, and the Microbe in*

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[25] Rosenberg, "Airs, Waters, Places," 661-670.

[26] Helen Bynum, *Spitting Blood: The History of Tuberculosis* (Oxford: Oxford University Press, 2010).

[27] Carla Christine Keirns, "Short of Breath: A Social and Intellectual History of Asthma in the United States" (Ph.D. thesis, University of Pennsylvania, 2004), and Mark Jackson, *Asthma: The Biography* (Oxford: Oxford University Press, 2009).

[28] Alison Bashford and Sarah W. Tracy, eds., "Modern Airs, Waters, and Places," Special issue, *Bulletin of the History of Medicine* 86, no. 4 (Winter 2012): 495-715.

American Life describes how germ theory was integrated into a world in which *miasms*, sewer gases, and all manner of insalubrious airs were still very much woven into the practical imagination.[29] Conevery Valencius Bolton considers airs in a similar way for an earlier period of American life.[30] Environmental historians, like Gregg Mitman, have studied how breathing, in particular the obstructed breathing of allergies, co-occurs interdependently with troubled landscapes.[31]

Quite apart from this trajectory of the history of medicine, there is the history of respiration physiology and the intellectual history of breathing conservatively construed, by which I mean the history of ideas of breathing. For a broad overview with attention to the philosophical issues at stake, I have relied on Georges Canguilhem's essays on the history of physiology collected in *A Vital Rationalist,* Thomas Hall's two-volume *History of General Physiology*, and Everett Mendelsohn's *Heat and Life: The Development of the Theory of Animal Heat.*[32] My understanding of skin breathing and respiration in the ancient world—which profoundly influenced the early modern view—is informed by Furley and Wilkie's *Galen: On Respiration and the Arteries*. In this work they attempt to set more ahistorical readings of Galen's view of respiration and the skin straight, arguing that Galen did indeed hold a view of skin breathing.[33]

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[29] Nancy Tomes, *The Gospel of Germs: Men, Women, and the Microbe in American Life* (Cambridge: Harvard University Press, 1999).

[30] Conevery Valencius Bolton, *The Health of the Country: How American Settlers Understood Themselves and Their Land* (New York: Basic Books, 2002).

[31] Gregg Mittman, *Breathing Space: How Allergies Shape our Lives and Landscapes* (New Haven: Yale University Press, 2008).

[32] Georges Canguilhem, *A Vital Rationalist: Selected Writings of Georges Canguilhem* (Cambridge, MA: MIT Press, 1994); Thomas S. Hall, *History of General Physiology,* vol. I and II (Chicago: University of Chicago Press, 1969); Everett Mendelsohn, *Heat and Life: The Development of the Theory of Animal Heat* (Cambridge, MA: Harvard University Press, 1964).

[33] David J. Furley and James S. Wilkie, eds., *Galen: On Respiration and the Arteries* (Princeton, NJ:

For the early modern period, I do not know of any work that attempts to give a practitioner's or a patient's eye view of breathing, which is what I do in the first chapter of this dissertation. The standard work on the scholarly study of respiration is *Harvey and the Oxford Physiologists: Scientific Ideas and Social Interaction* (1980), which treats seventeenth-century circulatory and respiratory physiology as a matter of intellectual history.[34] For the Enlightenment through the end of the nineteenth century, we have Charles Culotta's unpublished 1968 dissertation "A History of Respiratory Theory: Lavoisier to Paul Bert, 1777–1880," which brings the story up to about 1880.[35] There are few works that address the history of respiration physiology after 1880; however, the respiration physiologist John B. West's recent *Essays on the History of Respiratory Physiology* ambitiously includes essays ranging from respiration in Galen to Barcroft's studies of respiration at altitude in the 1920 as told from the perspective of one contributing to the making of this history.[36]

In keeping with the more recent preoccupations of science and medicine itself, with respect to the early modern period, in recent years the history of the functions of the body and of its fluids has been relatively neglected. The exception is the edited volume *Blood, Sweat and Tears: The Changing Concepts of Physiology from Antiquity into Early Modern Europe.*[37] But even in this unusually large volume, comprised of more than

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Princeton University Press, 2014).

[34] Robert G. Frank, Jr., *Harvey and the Oxford Physiologists: Scientific Ideas and Social Interaction* (Berkeley: University of California Press, 1980).

[35] Charles Culotta, "A History of Respiratory Theory: Lavoisier to Paul Bert, 1777–1880" (Ph.D. diss., University of Wisconsin, Madison, 1968).

[36] John B. West, *Essays on the History of Respiratory Physiology* (New York: Springer, 2015).

[37] Manfred Horstmanshoff, Helen King, and Claus Zittel, *Blood, Sweat and Tears: The Changing Concepts of Physiology from Antiquity into Early Modern Europe* (Leiden; Boston: Brill, 2012).

twenty-eight papers on topics from sperm to blood to the pulse and vision, only two touch on breathing at all, and they do so indirectly. The volume is extremely diverse, but there is a definite emphasis on the study of the humors (which reflects a recent interest in taking the humoral view of the body seriously), the senses, so-called neurological topics, and related issues of the relationship of the body and soul. Breathing is nowhere directly addressed. Of two papers that indirectly consider breathing, Rainer Broemer's "The Nature of the Soul and the Passage of Blood through the Lungs in Galen, Ibn al-Nafīs, Servetus, İtaki, 'Aṭṭār" and Michael Stolberg's "Sweat: Learned Concepts and Popular Perceptions, 1500-1800," the latter has been the most helpful in thinking about the relationship of sweating and breathing.

The work that brings together sweating, the skin, and the air in a particular, historically situated self is Shigehisa Kuriyama's "A Silent Revolution: Colds, Catarrhs, and the Experience of Air."[38] Here he traces the loss of the ancient and persistent intuition that connected the ancient Stoic and Early Christian pneumatology of *tension*—the springy, taut characteristic of living bodies—with "airs" of various kinds that pushed on the skin and pores, causing (among other things) colds: "The feel for the air was the same time a certain feel for the self."[39]

The difference between the history of medicine and the history of the body might be said to lie in the latter's coy use of the word *body*. The possibility of a history of the body implies that there is a history not only to ideas but to materiality. It implies that not

[38] Shigehisa Kuriyama, "A Silent Revolution: Colds, Catarrhs, and the Experience of Air," in "Medicine and the History of the Body, Proceedings of the 20th, 21st and 22nd International Symposium on the Comparative History of Medicine East and West," ed. Yasuo Otsuka, Shizu Sakai, and Shigehisa Kuriyama (Tokyo: Ishiyaku EuroAmerica, Inc, 1999).

[39] Ibid., 169.

only were bodies once differently imagined, theorized, and represented, but that they once might have felt, sensed, and perceived differently, that perhaps the very stuff of the body's substances and gestures was different. This is the thread that ties together an extremely diverse collection of studies all of which might be construed as a part of the history of the body; not all are exclusively historical, as the close affinity with ethnography is clear.

A quintessential example of the genre is Barbara Duden's *The Woman Beneath the Skin: A Doctor's Patients in Eighteenth-Century Germany*, which uses a unique set of notes on female patients by an eighteenth-century German country doctor.[40] Her training as an historian had not equipped her, Duden writes elsewhere, "with the methods with which I could grasp the lived body recorded in these documents as a subject for historical study. The search for these methods sparked the conversation."[41] That conversation has resulted in historical studies of the body on almost any imaginable topic. Let me give just a handful from what is a giant bibliography of the areas of focus and the kinds of studies that fall under history of the body. Gender and sexuality are emphasized, as in Aline Rouselle's studies of sexual practice in Greek and Roman antiquity, Katharine Park's reconsideration of the history of anatomy in terms of medieval female bodies, or Hugh Shapiro's study of spermatorrhea in Republican China.[42] A focus on everyday, embodied

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[40] Barbara Duden, *The Woman Beneath the Skin: A Doctor's Patients in Eighteenth-Century Germany*, trans. Thomas Dunlap (Cambridge, MA: Harvard University Press, 1991).

[41] Barbara Duden, "A Repertory of Body History," in *Fragments for a History of the Human Body*, *Part Three,* ed. Feher, Naddaff and Tazi (New York: Zone, 1989), 471-554.

[42] Aline Rouselle, *Porneia: On Desire and the Body in Antiquity* (New York: Basil Blackwell, 1989);

Hugh Shapiro, "The Puzzle of Spermatorrhea in Republican China," *Positions* 6, no. 3 (1998): 551-96; Katharine Park, Secrets of Women: Gender, Generation, and the Origins of Human Dissection (New York: Zone Books, 2006).

life is an obvious way of getting to the historicity of the body and to body experience, as in work like Caroline Walker Bynum's *Holy Feast and Holy Fast.*[43] The history of the senses and perception is also emphasized in work by scholars like Jean Starobinski and Alain Corbin.[44] Race as an historically contingent construct and as constitutive of the body is examined in the work of, among others, Keith Wailoo and Hannah Landecker.[45] As diverse as histories of the body are, and as daring as they have been in seeking the historicity of the body in virtually every aspect of embodied life, none have addressed breathing *qua* breathing.

Well before studies of the so-called body were overcome by the tendency to, as Roger Porter once put it, "float off into the stratosphere of discourse analysis," Marcel Mauss wrote very directly about the materiality of the body as a social thing.[46] In his *Summary Instructions* and *Instructions for Ethnographers*, he wrote of *techniques of the body*, plural and not singular, because he was following something like the Baconian inductive method: the abstract, *The Technique*, would emerge from close observation of a broad and deep cross-section of techniques. It was essential, he clarified at the outset, "to

[43] Caroline Walker Bynum, *Holy Feast and Holy Fast: The Religious Significance of Food to Medieval Women* (Berkeley: University of California Press, 1987).

[44] Alain Corbin, *Le Miasme et la jonquille: L'odorat et l'imaginaire social XVIIe-XIXe siècles* (Paris: Aubier, 1982) and Jean Starobinski, "The Natural and Literary History of Bodily Sensation," in *Fragments for a History of the Human Body*, *Part Two,* ed. Michel Feher, Ramona Naddaff and Nadia Tazi (New York: Zone, 1989), 350-394.

[45] Keith Wailoo, "Inventing the Heterozygote: Molecular Biology, Racial Identity, and the Narratives of Sickle-Cell Disease," in *Race, Nature, and the Politics of Difference*, ed. Donald Moore, Jake Kosek, and Anand Pandian. (Durham: Duke University Press, 2003), 235-53; Hannah Landecker, "Immortality, In Vitro: A History of the HeLa Cell Line," in Paul Brodwin, ed. *Biotechnology and Culture: Bodies, Anxieties, Ethics* (Bloomington: Indiana University Press, 2000), 53-74.

[46] Roy Porter, "The History of the Body," in *New Perspectives on Historical Writing,* ed. Peter Burke (University Park, PA: Pennsylvania State University Press, 1991), 206.

move from the concrete to the abstract and not the other way around."[47] As for "techniques," these were simply "the way in which from society to society men know how to use their bodies." Mauss's essay includes a long list of desiderata for the study of body techniques: rearing and feeding the child, the techniques of sleep, running, dancing, climbing, rubbing, washing, and soaping. His last programmatic request, and the one with which he closes the essay, is for a study of the techniques of breathing. It rambles in Mauss's somewhat charming way, and I'll quote the full paragraph since he points to something important for this project:

> I don't know if you have paid attention to what our friend [Marcel] Granet has already pointed out in his great investigations into the techniques of Taoism, its techniques of the body, breathing techniques in particular. I have studied the Sanskrit texts of Yoga enough to know that the same things occur in India. I believe precisely that at the bottom of all our mystical states there are techniques of the body which we have not studied, but which were perfectly studied by China and India, even in very remote periods. This socio-psycho-biological study should be made. I think that there are necessarily biological means of entering into "communion with God." Although in the end breath technique, etc., is only the basic aspect in India and China, I believe this technique is much more widespread. At any rate, on this point we have the methods to understand a great many facts which we have not understood hitherto.[48]

To my knowledge, from the time of Granet, no scholar took up this challenge in the spirit of Mauss until Kristofer Schipper. This is not to say that all sorts of practice manuals purporting to teach historical methods of "Taoist breathing" do not exist—there is no shortage of these—but here we are considering scholarly translations and studies in the spirit of Mauss. Schipper included detailed descriptions of the methods and purposes of certain Taoist breathing practices in his at once historical and ethnographic *The Taoist*

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[47] Marcel Mauss, "Techniques of the Body," reproduced in *Beyond the Body Proper: Reading the Anthropology of Material Life,* ed. Margaret Lock and Judith Farquhar (Durham, NC: Duke University Press, 2007), 50.

[48] Ibid., 68.

Body, which appeared sixty years after Mauss's programmatic statement.[49] Around the same time, Sinologist Livia Kohn edited a volume on Taoist meditation practices, *Taoist Meditation and Longevity Techniques*, which is still the common reference.[50] Other scholars of Taoism, like Isabelle Robinet and Fabrizio Pregadio, have brought attention to the meanings of "alchemy" as not simply *chemistry,* as some earlier scholars claimed, but also in terms of "inner alchemy" or intentional transformation and sublimation of the body.[51]

As far as Indian practices are concerned, the works of French medical doctor, historian of religion, and Indologist Jean Filliozat played a large role in showing the antiquity and originality of Indian medical theory to scholars who had only been familiar with ancient Greek medicine. He was one of the first rigorous Western scholars to take yoga and its history seriously.[52] Though Mircea Eliade's work in general is no longer considered reliable (and not only as a result of distaste for his far-right politics), it was nonetheless influential, and he wrote a great deal on the history of yoga and Indian body techniques.[53] More recently, scholarship has turned to tracing the relationship of Indian body practices, especially but not limited to yoga, with colonialism. This work has led to very interesting new appraisals of the supposed antiquity of what is now practiced in

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[49] Kristofer Schipper, *The Taoist Body* (Berkeley: University of California Press, 1993).

[50] Livia Kohn, ed., with Yoshinobu Sakade, *Taoist Meditation and Longevity Techniques* (Ann Arbor: Center for Chinese Studies, University of Michigan, 1989).

[51] Fabrizio Pregadio, *Great Clarity: Daoism and Alchemy in Early Medieval China* (Stanford, CA: Stanford University Press, 2006); Isabelle Robinet, *Taoist Meditation: the Mao-Shan Tradition of Great Purity* (Albany: State University of New York Press, 1993).

[52] Jean Filliozat, *Religion, Philosophy, Yoga: A Selection of Articles* (Delhi: Motilal Banarasidass Publishers, 1991).

[53] Mircea Eliade, *Yoga: Immortality and Freedom*, trans. Willard R. Trask (Princeton, NJ: Princeton University Press, 1969). A sober assessment of Eliade and his role in the formation of the discipline of the history of religions is found in Steven Wasserstrom, *Religion After Religion: Gershom Scholem, Mircea Eliade, and Henri Corbin at Eranos* (Princeton, NJ: Princeton University Press, 1999).

Europe and North America as "yoga." Among several scholars working along these lines are Joseph Alter, analyzing Gandhi's body practices, and Mark Singleton, writing on the modern origins of current yoga practice and the arrival of the idea of exercise as a form of salvation; their work has changed the way we think about supposedly "non-Western" ways of being a body.[54]

But what about breathing beyond India and China? Has a certain kind of persistent Orientalism led us to believe that "body techniques" are less significant in traditions that did not explicitly attend to the breathing and evolve yoga or *qi gong* (however modern these may prove to be)? Mauss is suggesting that breathing techniques are "much more widespread" than we might think, and that by using the ethnographic sensibility he describes, including the materiality, gestures, and movements of the body, "a great many facts we have not understood" can be understood. This is the hope of looking at breathing in places besides China and India as a social and historical thing.

In this project I am clearly less interested in the "biological means of entering into 'communion with God'" than in the broader implications of Mauss's point. This is to say that evidence from cultures that have cultivated breathing practices suggests that breathing and the textures of subjectivity, or "states" (mystical or mundane), are linked. Following in the direction in which Mauss points, we might attempt to track the connection between breathing in specific contexts and how it "feels to be." Only a handful of works have this as their explicit program, and these focus on different places and times than does my dissertation: namely, High Colonial India in Nile Green's paper

[54] Mark Singleton, *Yoga Body: The Origins of Modern Posture Practice* (Oxford: Oxford University Press, 2010); Joseph Alter, "Yoga in Asia – Mimetic History: Problems in the Location of Secret Knowledge," *Comparative Studies of South Asia, Africa and the Middle East* 29, no. 2: 213-29; Joseph Alter, *Yoga in Modern India: The Body between Science and Philosophy* (Princeton, NJ: Princeton University Press, 2004).

"*Breathing in India*, c. 1890" and Ancient Greece and China in Shigehisa Kuriyama's chapter entitled "Wind and Self."

Nile Green, an historian primarily of Islam and its various globalizations, explicitly attempts to *historicize* meditation. He argues that as long as meditation, and the breathing techniques associated with it, are viewed as simply "mysticism," we will be "incapable of recognizing the rhetoric of meditation."[55] His paper is a very interesting case study, comparing Hindu and Muslim meditation manuals and their breathing techniques. While this dissertation focuses on entirely different kinds of materials, it also has as one objective to offer a way to "historicize meditation" and to recognize the rhetoric with which various practices are currently presented.

Kuriyama's extended meditation on the relationship of breathing and self is in the chapter "Wind and Self" in *The Expressiveness of the Body.* There, earlier arguments about the relationship of muscularity and the autonomous, willful self are extended to include changing understandings of wind, pneuma, and breathing from the Hippocratic Corpus through Galen. In the Hippocratic world, breath was a capricious and all-embracing wind that blew through a permeable body, bringing it anger, disease, or joy. Wind was also change itself, and so how the question of the body responded to change—they way it breathed or was breathed—was closely related to the imagination of fate. The very possibility of a body viewed anatomically (rather than in terms of meridians of flow, for example), is connected to the perception of wind and breath. Specifically, the shift from "external" to "internal" winds was what opened up the anatomical, organ view.[56]

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[55] Nile Green, "Breathing in India, c. 1890," 4.

[56] Shigehisa Kuriyama, *Expressiveness of the Body and the Divergence of Greek and Chinese Medicine* (Cambridge, MA: Zone, 1999), 233-270.

In sum, while many historians have considered aspects of the body that push up against its breathing, few have attempted to consider breathing itself as an historical thing, at least as far as Western sources are concerned. I hope that this small contribution will at the very least open this as a new field of inquiry. As Kuriyama has said of the body more generally, "The body is unfathomable and breeds astonishingly diverse perspectives precisely because it is a basic and intimate reality."[57] This work takes the same view with respect to breathing, and argues that in assembling these "astonishingly diverse perspectives" we come as close as we can to knowing about something unfathomable: our own breath.

[57] Ibid., 14.

Chapter One: The Vox Corporis and the Rising of the Lights: The Moral Anatomy of the Breathing Body in the Late Seventeenth Century

A certain lack of conviction characterized Robert Boyle's 1682 report on studies of respiration to date. He wrote not in order to announce any new certainties, but rather to avoid appearing "sullen or lazy." Not only had circumstances augured against carrying out all desired experiments, but the object of study had proved unexpectedly recalcitrant. Matters had become more rather than less complex: "I have yet, because of the inconvenient season of the year, made so few experiments, and have been so little satisfied by those I have been able to make, that they have hitherto made respiration appear to me rather a more, than a less mysterious thing, than it did before." What had been accomplished, however, confirmed his "diffidence of the truth of what is commonly believed." The confirmation and articulation of these doubts in the form of certain conclusions about what he called the "use," or purpose, of respiration, would require more time for "deliberate" examination: "*magis eligo cautam ignorantiam confiteri, quam falsam scientiam profiteri*."[58] Better to be prudent than be in error, better safe than sorry.

The history of knowing breathing is the history of relating to the unknown and the hard to know about ourselves. And since, as will be detailed in this chapter, breathing was intimately connected with the vital spirits, and therefore with the motions of the soul, the use of breathing was related to the nature of human volition, expressiveness, and being. At the same time, breathing marked the boundary between the living and the dead,

[58] "I would rather be prudent than profess false knowledge." Robert Boyle, *New Experiments physico-mechanical, touching the air: "A Digression containing some doubts touching respiration."* (London: Printed by Miles Flesher for Richard Davis, 1682). http://eebo.chadwyck.com/

and so to know the use of breathing represented significant knowledge of nothing less than the "uses" of life and death themselves. Crucial insight seemed always just around the corner; when the season was right, when all the data was in— then. By the time of Boyle's *New Experiments*, respiration had been a major focus of work at the Royal Society for the more than twenty years since its founding, and in its early years perhaps the main focus of work.[59] In spite of these efforts, the use of respiration remained uncertain. Then, as now, questions about breathing—and all that breathing meant—remained unanswered.[60]

In the time of Boyle, things were no longer as they seemed. It had become possible, they thought, to look below surfaces; in Hooke's 1665 *Micrographia*, a formerly smooth and sharp needle was revealed to be a rugged landscape.[61] It was undeniable that the needle's sharpness did not in fact consist in the sharpness of its essence or the sharpness of its component parts. Was it mere coincidence that in the early years of the Royal Society respiration was one of the most frequently discussed topics, while the relationship of surface appearances to hidden essences was a major epistemological concern?[62] What would it mean to look below the surface of respiration?

Experiments concerning the nature and use of respiration run throughout the

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[59] Diana Hall, "From Mayow to Haller: A History of Respiratory Physiology in the Early Eighteenth Century" (Ph.D. diss., Yale University, 1966).

[60] An interesting recent article summarizes the work to date on the understanding of breath holding, what determines how long humans can sustain breath hold, and what triggers the break point, or when the person must begin breathing again. The article claims that these questions do not currently have definitive answers (surprisingly, it isn't as simple as the body signaling that it is out of oxygen). See Michael J. Parkes, "The Limits of Breath Holding," *Scientific American*, April 2012, 75-9.

[61] Robert Hooke, *Micrographia*, *or, Some physiological descriptions of minute bodies made by magnifying glasses with observations and inquiries thereupon* (London: Printed by Jo. Martyn and Ja. Allestry, 1665). http://eebo.chadwyck.com/

[62] Hall, "Fram Mayow to Haller," 17.

charming if intellectually promiscuous (or so it strikes a modern ear) variety evident in the early *Journal Books* of the Royal Society.[63] Intermingled with reports on the results of placing into the pneumatical engine not only birds, humble bees, common flies, hairy worms, the occasional rodent, and even Hooke himself, were accounts of compounds ("rusma") that removed all the "haire" on Boyle's "hairey armes,"[64] speculations on the manner of Chinese writing (Hooke determined it to have "anciently been after the manner of the Europeans"),[65] and theorizing about how the manatee or sea cow is able to walk on the bottom of the sea (air bladders within).[66]

Their interest in respiration was likewise not limited to abstruse (if physiological) speculations. It was rumored that there were treasures deep beneath the waters, and that knowing breathing would allow those mysterious depths to be plumbed. The potential spoils of underwater salvage operations, pearl diving, and the larger development of English colonies and the requisite naval power have all been shown to have been preoccupations of members of the early Royal Society.[67] It's no surprise, then, that Edmund Halley's periodic reports on his progress with a new kind of "diving engine" were particularly enthusiastically received. The amaneunsis, tasked with responsibilities in excess of his usual recording, was undoubtedly less enthusiastic about learning how

[63] The so-called "Royal Society Journal Books" were edited in the eighteenth century by Thomas Birch as *The History of the Royal Society of London* (London: Thomas Birch, printed for L. Davis and C. Reymers, 1757).

[64] Royal Society Journal Book, March 12, 1662. "Mr, Boyle brought in a composition call'd rusma which being put on a hairey arm took off all the haire without paine in a very short time, as 2 or 3 minutes."

[65] Royal Society Journal Book, November 2, 1692.

[66] Royal Society Journal Book November 21, 1692.

[67] See James Delbourgo, "Divers Things: Collecting the World Under Water," *History of Science* 49, no. 163 (2011): 149-85.

long he could stay below water in the experimental bell (twenty minutes).[68] Birds introduced into Boyle's pneumatical engine ("most of the animals we kill'd in our engine were birds"), on the other hand, did not survive nearly as long, though it was not necessarily as a result of running out of air: "for a while, he was so little sensible of his imprisonment, that he ate very chearfully certain seeds that we conveyed in with him, and not only lived ten minutes, but had probably lived much longer, had not a great person, that was spectator of some of these experiments, rescu'd him from the prosecution of the trial."[69] There were a host of reasons why the maximum time life flourished in the absence of air proved difficult, if not impossible, to determine.

The implicitly normative question of how long an organism could survive the absence of breath had assumptions about surface (or expression) and essence buried within it. What gave something its appearance, its characteristics; what made it what it was? And, in turn, to what degree was it possible that something could change, become different than it had been-–or had seemed to be—before? We will consider the relationship of breathing, normativity, and change throughout this chapter. But by way of further introduction, and by way of articulating one perspective on the possibility of change, consider Francis Bacon's position on the flexibility of human being.

In his *Letter to Henry Savill*, *Touching Helps for the Intellectual Powers*, Bacon offered going without breath—a voluntary triumph over a most demanding need—as a central example of the what he calls "strange victories over the body": "For as to the *body of man*, we find many, and strange, Experiences, how *Nature* is overwrought by *Custome*,

[68] Royal Society Journal Book, July 19, 1661.

[69] Boyle, *New Experiments physico-mechanical.*

even in Actions, that seem of most difficulty, and least possible."[70] These "strange victories" were the possibility of "custome" overriding the natural, achieved by divers and others who work under water and who have, with practice, become able to hold their breath an "incredible time."[71] Others have become able to endure the "stifling breath of an oven" without suffocating, while others are able to train their bodies to take strange "forms and motions." Still others can cause themselves to enter "trances and astonishments." As for the breath-holders, Bacon does not speculate about the possible mechanisms for this unusual ability, nor does he offer an explanation rooted in the "natural" capacities of the body. Instead, he believes that the body of man may be "moulded, and wrought." Divers and other breath holders were able to extend the "natural" capacity to live without breath because they had extended themselves through learning and practice.

Bacon's understanding of the body's perfection resides precisely in *flexibility*. According to Park and Daston, while "art," wonders, and variations on the natural had, at one time, threatened to disturb the Aristotelean order of nature, these would eventually come to be seen by some as *productive* of new kinds of order: "For Bacon…art and nature were most similar in their wonders, for nature's wanderings were creative, pregnant with hints for the mechanical arts rather than mere mistakes."[72] Bacon thought of the human body—and the human will—as flexible and modifiable in a way similar to the flexibility of plant and vegetable life. His was not an essentialist view of the human

[70] Francis Bacon, "A Letter and Discourse to Sir Henry Savill, Touching Helps, for the Intellectual Powers" in *The Works of Francis Bacon*, ed. James Spedding, Robert Leslie Ellis, and Douglas Denton, vol. 7 (Cambridge: Cambridge University Press, 2011), 93-4.

[71] Francis Bacon, "A Letter and Discourse to Sir Henry Savill," 93-4.

[72] Lorraine Daston and Katharine Park, *Wonders and the Order of Nature* (Cambridge, MA: Zone, 2001), 291.

body. There was no danger in extending, changing, or adapting the body by "art." The will of man, "art," could be expressed without danger or harm through changes in the very nature of his body. And he gave human breathing as one example.

As we shall see in more detail later on, in the case of going without breath, there was in the seventeenth century a physiological explanation that did not demand any particular or intentional molding of the body (when above water, at least). And it is perhaps not surprising that this explanation shows us, as we will see below, the intimate connection that was understood to exist between breathing and the experiencing and expressive self. In particular, cessation of breathing was one special case in which, for a time, the soul did not seem to write on or mold the shape of the body.

To what depths of self and world could understanding the use of the breath allow one to descend? Against the backdrop of a new distinction between primary and secondary qualities and shifting boundaries between art and nature, this chapter gives an account of the breathing body before the discovery of oxygen and before the predominance of so-called biomedicine. These sources require that we reimagine the apparently self-evident process of breathing. The seemingly obvious question of "what is breathing" arose in the course of perusing various accounts of breathing found in seventeenth-century English books, especially those printed in the latter half of that century. There are many voices contained in these sources, and they don't always speak in unison. In order to convey some sense of their variety, I have not restricted my investigation to any particular genre. Plays, sermons, religious treatises, physicians' casebooks, scholarly medical literature, natural philosophical texts, and reprintings of late-Renaissance books of magic, among others, all touch upon breathing and its

pathologies in revealing ways. Rather than pinpointing, say, the late seventeenth-century account of respiration in treatises by university-educated physicians, or in the work of a certain playwright, the aim here is to reconsider breathing across a range of works. At the same time, I focus on questions of breathing, rather than genre.

The first part of the chapter will explore the theory and experience of breathing as it existed outside of the experimental world of the Royal Society. The way that the body breathed will be illustrated in part through the particular case of the rising of the lights, a malady that used to kill frequently, by sudden suffocation, but which is now forgotten. Using the rising of the lights as a starting point, I survey a wide range of topics to describe what breathing was before biomedicine, including the rising of the mother, transpiration, pores, and "skin breathing." The rising of the lights, in particular, will require that we reconsider our assumptions about the importance of the lungs to breathing.

In the second part of the chapter, we will consider the implications of being a body that breathes as much through its skin as into its lungs. How does such a "physiology" (to use that anachronistic term) determine the way that this body expressed itself, and to what degree it could know and change itself? What was the relationship between what this body *expressed* and what it was understood to be, *essentially*? That is to say, what did the breathing body and its soul have to do with the passions? Secondly, if, as Francis Bacon held, a thing was determined by its "accidents" rather than by any unchanging, inherent characteristics, then what could bodies and selves *become*? While "air" was indeed one of the Galenic non-naturals, those factors that could be managed, changed, and brought under control for the sake of health and longevity as part of

hygienic regimen (the long western tradition of self-care medicine), breathing itself was not explicitly *practiced* as it would come to be later.[73] Given the way a seventeenth-century body breathed, to what extent could it change itself, heal itself, and take intentional action to direct its destiny?

The Rising of the Lights

Anne Ward of Stratford had black evacuations from her mouth and her belly, and then fell into the rising of the lights. She hadn't suffered the terrible sensation of suffocation for long before her breathing stopped entirely. Those in attendance at the bedside were certain she was dead. Then suddenly, she audibly exhaled. She was alive, but unable to speak. After an hour, the doctor, John Hall, finally arrived.[74] He carried out the same treatment with which he had saved a Mrs. Goodyear and a Mrs. Savage from death by rising of the lights. A great cupping glass was applied to the "mouth of the stomach," following which Anne Ward regained her voice. All night long, she held in her mouth a pectoral roll.[75] She then received a series of clysters prepared according to Hall's

[73] Breathing practice and instruction manuals appear as a genre in the United States between 1880 and 1920, roughly speaking.

[74] John Hall (1575-1635) was a surgeon-physician and William Shakespeare's son-in-law. He collected two volumes of case studies between the years 1611-1635 which were translated from Latin to English by James Cook and published in 1679 as *Select Observations on English Bodies of Eminent Persons in Desperate Diseases*. The case of Anne Ward appears in James Cook's translation.

[75] Exactly what a "pectoral" remedy would have referred to in Hall's time is not entirely clear. In particular, it begs the question of the difference between digestive and respiratory symptoms and etiologies, which I will consider more below. I find "pectoral decoctions," "pectoral drinks," "pectoral ptysans," and the like to refer to formulas which are intended both for respiratory and digestive ailments. Is this because they are particularly intended to treat those respiratory symptoms which can be rooted in the stomach? Hall does not reveal the ingredients of his own "pectoral roll," nor does he say if it is intended more for the stomach or the lungs. By 1823, the *Encyclopedia Londinensis* can't make sense of the ambiguity and erases it: "The epithet [pectoral] was, however, indefinite, inasmuch as it included demulcents, attenuants, astringents, and even anodynes, or whatever contributed to ease the breathing and cough," and concludes that the term "pectoral" is far too vague, and has "therefore been discarded. The more limited term *expectorants* is preferable." John Wilkes, ed., *Encyclopedia Londinensis* (London: 1823), 429.

formulas (which included many substances intended to act on the stomach and digestion).[76] The first clyster produced two stools and the second, eight, a sign that she would live. A cure was a noteworthy event in cases of the rising of the lights. Unsurprisingly, then, John Hall included Anne Ward in a collection of his most important cases, which was published posthumously in 1679.[77]

The first thing we might notice in this account is the relative absence of the organ we might most expect to encounter: the lungs. Returning to the treatment of Anne Ward's ailment for a moment, why did John Hall treat her stomach rather than her lungs? Why wasn't a suffocating woman given air, perhaps via bellows? Why would enemas be one of the first courses of action in this case? While air was certainly understood to enter the lungs, these strategies just begin to hint at the extent to which breathing was not associated primarily, or exclusively, with the lungs.

We will see how this lack of emphasis on lungs informs other aspects of the body and self. John Hall's casebook, for example, does not tell us how long Anne Ward remained without breathing before those in attendance thought she was dead. As we will see in other accounts, this state of apnea could stretch to implausibly long periods of time. (Perhaps surprisingly, to this day, there is no consensus view concerning how long

[76] A clyster is an enema. Dr. Hall's clyster formula contained Oak, which both Gerard's *Herbal* and Culpeper's *The English Physician* describe as being useful, among other things, for treating the rising of the mother. It also included "diacatholicon," or "diacylon," which is described as a purgative electuary (an electuary is a paste, often made using honey as the binding agent); something called Oil of Carmin which I am not currently able to identify; an electuary containing tamarind which, according to Gerard, is cold and dry in the third degree, and is also gently purgative; rose, which Barroughs in *Marrow of Physick* cites as commonly given in clyster for "strangury"; and cream of tartar, which Oswald Croll in his *Royal and Practical Chymistry* calls "the universal digestive."

[77] John Hall, *Select Observations on English Bodies of Eminent Persons in desperate Diseases*, trans. James Cooke (London: Printed for John Sherley, 1657). http://eebo.chadwyck.com/

the breath can be held before damage to the brain or death ensues).[78] The relative neglect of the lungs, and the related indeterminacy with respect to going without air, makes the relationship between death and the extended absence of breath into an historical thing; there will be more to say about this as we go along.

How We Forgot

When John Graunt, a member of the Royal Society, compiled the weekly London bills of mortality, he aimed to summarize the main causes of death in London between 1629 and 1659. He recorded 2,700 deaths resulting from the rising of the lights and the so-called "rising of the mother" combined. (I will say more below about the debates surrounding the differentiation of these two categories.) This was certainly a far less common cause of death than "age," which claimed (by Graunt's calculation) 15,759 lives, or plague, which took 16,384. Having said that, death by rising of the lights occurred more frequently than drowning, execution, "killed by various accidents," and cold and cough combined. In the period of Graunt's calculations, it was about as common for an adult to die of the rising of the lights as for a child to die in "child-bed."[79]

While the rising of the lights appeared in university-educated physicians' casebooks, it was also commonly used as a colloquial phrase. It was invoked in a funeral speech for Charles II as a powerful reminder of death without warning, a potent manifestation of the fleeting nature of life: "Nothing is without the Empire of Death…An apoplexie in the Brain, and Inflammation or Quinsie in the Throat, a violent eruption of

[78] A summary of research to date is found in Parkes, "The Limits of Breath Holding."

[79] John Graunt, *Natural and Political Observations Made Upon the Bills of Mortality*, 5th ed. (London, 1676).

sudden Rising of the Lights, may quickly dispatch us, and cause us in an instant to die and shut the great Gulph of Eternity, and Eternity at one draught swallows up the fluency of time, and is above the temporal conditions of past, present, and to come."[80]

That the rising of the lights was a common name for a familiar experience is further suggested by the fact that few authors wasted words describing its symptoms in detail. A 1651 treatise by Francis Glisson, the Regius Professor of Physic at Cambridge, for example, warned of "a swelling of the lungs, vulgarly called 'the rising of the lights,'" that can occur as a dangerous sequelae of rickets left long and ineffectively treated.[81] Sermons and plays from the second half of the seventeenth century suggest that the discomfort of the rising of the lights must have been witnessed (if not directly experienced) by enough people for the mention of it to serve as a resonant analogy for ailments harder to articulate. We suffer, sermonized Donald Lupton, from "agues of wavering consciences, burning fevers of sinful lust, consumptions of faith and zeale, and all the swellings and rising of the lights to pride, or vain ambition."[82] "Lights rising" was used to invoke the experience of a trapped desire, threatening to erupt and to harm body

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[80] Henry Anderson, *A loyal tear dropt on the vault of the High and Mighty Prince, Charles II, of glorious and happy memory* (London: Printed for Luke Meredith, 1685). http://eebo.chadwyck.com

[81] Francis Glisson (1598-1677) was Regius Professor of Physic at Cambridge. Francis Glisson, *A treatise of the rickets being a diseas common to children. Wherin (among many other things) is shewed, 1. The essence 2. The causes 3. The signs 4. The remedies of the diseas. Published in Latin by Francis Glisson, George Bate, and Ahasuerus Regemorter; doctors in physick, and fellows of the Colledg of Physitians at London. Translated into English by Phil. Armin.* (London: Printed by Peter Cole, 1651). http://eebo.chadwyck.com

[82] Donald Lupton, *Solitariness Improved, in occasionall meditations upon several subjects* (London: Printed for John Rothwell, 1640). http://eebo.chadwyck.com Another curious example of the association of guilt, what we might call "repression" and uneasy conscience, is found in Edward Waterhouse's *Sober inspection into the vertues, vices, and ordinary means of the rise and decay of men and families* (London: Printed for T. R. by R. Royston, 1665). http://eebo.chadwyck.com There he invokes both the idea of rising lights as difficult to hide and as characteristic of undesirable emotional experience— guilt, pride, lust— and the treatment of eating something heavy to push it down, in the example of Judas' guilt: "…not Judas his thirty pieces bear down the rising of the lights of this clamorous conscience; but that it shall break out and ruffle him into self execution.."

and reputation if not carefully managed:

> *Arb:* Now can't I say I love him, yet I have a mind to tell him too.
> *Ruth:* Keep it in, and choak yourself, or get the Rising of the Lights.
> *Arb*. What shall I say?
> *Ruth.* Say something, or he'll vanish.[83]

Passions unspoken could eventually emerge as sudden suffocation by rising of the lights. Whatever this rising of the lights might have been, it was clearly a broadly resonant category, making it all the more striking that it eventually became harmless, forgotten, a curiosity.

Already by the 1790 edition of Scottish physician William Buchan's *Domestic Medicine,* the broadly used and often translated popular home medical manual, the forgetting was well underway. The rising of the lights appears there as one of the many names for "croup" that can be heard around England: "Children are often seized suddenly with this disease, which, if not quickly relieved proves mortal…In some parts of England where I have observed it, the good women call it *the rising of the lights*. It seems to be a species of asthma, attended with very acute and violent catarrhal symptoms."[84] Yet there is nothing in mid- to late seventeenth-century discussions of the rising of the lights to suggest that this experience was primarily associated with or most frequently struck children. Nor, more importantly, was suffocation by the rising of the lights thought to be caused by fluid congestion, phlegm in the head or chest, which was characteristic of the various forms of "catarrh." It is true that in the late seventeenth-century conversations

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[83] Sir Robert Howard, *Five new plays as they were acted by his majesty's servants at the Theatre-Royal, "The Committee, or The Faithful Irishman"* (London: Printed for Henry Herringman, 1692). http://eebo.chadwyck.com

[84] William Buchan, *Domestic Medicine*: *or, a treatise on the prevention and cure of diseases by regimen and simple medicines* (London: Printed for A. Strahan and T. Cadell, 1790), 557. http://eebo.chadwyck.com

there was speculation about a mysterious, parallel increase in occurrences of the childhood illness "rickets" and of the rising of the lights. But there's no evidence to suggest that the rising of the lights was in any way associated with children. Or, for that matter, with phlegm and catarrh.

By the early twentieth century, the forgetting was essentially complete. A 1926 discussion of the London Bills of Mortality in *The British Medical Journal* resulted in a cacophony of inconclusive speculation about just what this deadly ailment with its mysterious name might have been. The letter of one physician, E.M.L., offered little insight: "as a student I was told that this term was a synonym for emphysema." He goes on to express doubt regarding Sydenham's "solution" of classing the ailment together with hysteria, "seeing that hysteria is not a very fatal disease." (Hysteria, or "the rising of the mother" or matrix, of course *was* at the time a fatal disease as evidenced by the London bills—on this point, more below.) E.M.L. is sure of one curious thing, though: "This remedy of small shot or mercury, meant to force the rising lungs to descend, seems to have been very general." Could a 1920s reader of the *BMJ* have been convinced that the rising of the lights was akin to emphysema, and that it was symptomatically relieved by the eating of lead shot?

In another letter, one F. William Cock could only throw up his hands and conclude that the diagnosis was a poorly defined category intended to capture all deaths from throat disease, and that it should therefore "apply to all forms of inflammatory trouble, not Diptheria only…but also acute septic conditions." Preoccupation with infectious etiologies and assumptions that the category was a catch-all for some hodge-podge of throat pain and infection, however, left him with a conundrum: "The wonder is

that there were not more returns under this head, seeing that in London alone, as late as 1850, not one water supply was uncontaminated." Explaining everything according to an infection model, this commentator had forgotten the very most basic thing: the old meaning of the word "lights."

"'Lights' to an ordinary person means an animal's lungs," explains the most illuminating correspondent in the *BMJ* conversation, an author identifying himself only as the author of a book on folk-medicine in Eastern England. He had collected reports from the 1890s of doctors and pharmacists who had been surprised and unsure what to make of patients who claimed their lights were rising. There had been, he wrote, some slippage in meaning: " if the local butcher is asked for a pennyworth of 'lights' for the dog, probably some spleen and possibly pancreas will be included in the parcel along with lung and trachea." But this slight shift in usage was not important; the rising of the lights of his interviewees—residents of the English countryside who had suffered during the late nineteenth century—and the rising of the lights of the seventeenth-century London bills must have been the same thing, he concludes, because "The class of people who would use such a term are far too conservative to have allowed a hundred years or two to have made any difference in their nomenclature."[85] One of his doctors reported a woman requesting something for her husband "really suffering from liver and stomach troubles, and complaining he always has something in his throat." The doctor's real work began, however, when she revealed that her husband had been eating handfuls of lead shot to "keep his lights from rising." The rising of the lights, he guessed, referred to the unnatural and uncomfortable rising of the lungs themselves, ascending and obstructing

[85] *The British Medical Journal* (4 December 1926): 1081.

the throat and causing suffocation. The editors of the *BMJ* didn't seem to find this explanation entirely satisfactory, however. The discussion inconclusive, the jury out, the discussions concluded with the editor's comment: "We are afraid that these lights must now be quenched."

It is tempting to stop here and conclude that the rising of the lights was some vague, generalized kind of swelling of the lungs, chest, or throat. A diagnosis that disappeared as medical vision grew more refined, precise. But then we might miss a chance to see breathing—perhaps the most apparently familiar, natural, and universal of bodily functions—as something quite different from what it now seems to be.

The Stomach and the Lungs

Let's return to the seventeenth-century accounts. Consider first the received status of the lungs in this period. In his 1638 *History of Life and Death*, Francis Bacon gives a fairly standard rendition of the relative status of the organs of the body: "Of the spleen, gall, kidneys, mesentery, entrails, and lungs I make no mention, as they are only members ministering to the principal." These can all be plagued with their own diseases, but the "prolongation of life, repair of the body and retarding atrophy of old age" all depend on the health of the "principal viscera."[86] The "principal viscera," according to Galenic physiology, were the heart, brain and liver. The lungs served the heart and were not (to use anachronistic language) a "vital organ" in and of themselves. When life was threatened and the lungs seemed to be involved, they were not necessarily thought to be the ultimate cause of death.

[86] Francis Bacon, *History naturall and experimentall, of life and death: or, of the prolongation of life* (London : Printed by John Haviland for William Lee, and Humphrey Mosley, 1638).

The focus of medical treatment and theory was centered elsewhere.[87] Recall that Dr. Hall's treatment for what was clearly a lung-related emergency focused on releasing the stomach: he applied a cupping glass at its "mouth," and administered medicines intended to purge and unblock it. That this was not an eccentric strategy is suggested by the etiology given in a 1694 work by Antione Le Grand, a philosopher who was attempting a broad application of Cartesianism. Interested in explaining the causes of disease in general, he chose to consider convulsion, quinsy, and the rising of the lights: "The rising of the lights is incident to those whose stomach is obstructed by certain

[87] "Common" remedies— treatments by the doctrine of signatures, and generally applicable panaceas— for the rising of the lights say more about its ubiquity and the fact that it was feared than they do about learned etiologies or body sensibilities. William Vaughan in 1630 listed many remedies for the "straightness of the breast, and the rising of the lights." Among them was quick sulphur beaten to powder and well mixed with sugar caudy, vinegar scillitick with ammoniacke dissolved. He repeats Fracastorias' remedy, lungwort of either oak or juniper. But, he says, "in truth the foxes lights soaked for three dayes in Vinegar, and afterwards dryed in an oven, being taken to the quantity of a nutmeg, eyther alone, or with some liquor, is the best remedy, as well for this infirmity, as for the cough proceeding of the difficulty of breathing, for it is knowne, that of all Creatures the foxe hath the longest breath, and strongest winde." William Vaughan, *The Newlanders cure aswell of those violent sicknesses which distemper most minds in these latter dayes* (London: By N[icholas] O[kes] for F. Constable, 1630). http://eebo.chadwyck.com

Tracts written to advertise panaceas like Van Helmont's *Oyl of Sulphur* or "Dr." John Jone's *Mysteries of Opium Revealed* included the rising of the lights among the common maladies that could be well treated: "A Gentlewoman in the country being very much troubled with Rising of the Lights, so that every night she feared dying in her sleep, was by providence of a friend, who had good testimony of my oyle, directed to send me for some of it; I sent her two ounces which she daily using, according to my directions, soon became very well to her great comfort." (It was also effective for the man who slept sitting up because he feared he could not breath lying down, and for one "many years troubled by very stinking breath, and continual head-ache, by reason of vapours ascending from putrified lungs." Jean Baptiste Van Helmont, *Fons Salutis, or The fountain of health opened in the wonderful efficacy and almost incredible virtue of true oyl, which is made of sulphur vive, set on fire and commonly called oyl of sulphur per campanam* (London: Printed by Andrew Coe, 1665). http://eebo.chadwyck.com

Together with "the rising of the lights" I sometimes also see something called "the straightness of the breast." And what was "straightness of the breast"? To our ear, it sounds like a strange but not impossible description of the way a particular body might be shaped: he has a straight-shaped breast or chest. But again and again authors describe "straightness of the breast" as a kind of event, an occurrence, even a symptom that can arise and then leave. A clue comes from John Mayow's *A Tract of the Disease Rhachities commonly called Rickets* (Oxford: Printed by L.L. for Th. Fickus, 1685). Mayow describes a situation in which the ribs "cannot enlarge their arches," the intercostal muscles cannot extend, and the breast cannot expand: "It is no wonder, if the lungs, which have not room to dilate themselves, as stuft with clotted blood, (as it falls out) and puft up, by reason of the aforesaid straightness of the breast." The straightening of the breast, often mentioned together with the rising of the lights, was, it seems, an episodic stiffening of the ribs, such that they were unable to expand together with the lungs.

humors. For since the blood is strained through the liver, it may very well so happen, that that which is transmitted from the milt through the splenick vessel, of flows from the mesentery is corrupted and shuts up the pores through which it is to pass."[88] The "rising of the lights," which caused death by *suffocation*, had its etiology not only in the lungs themselves, but also in the stomach.

A 1695 "Englished" version of Averroes gives yet another similar causal story, explaining the connection in this way:

> Those whose stomachs are foul, do not digest their Food to a requisite degree, send gross and flatulent juices up to the Lungs, begetting obstructions and shortness of Breath…In such in whom the heat is potent, and the circulations free, those gross juices are contracted into hard lumps, and nature sends them up the windpipe… in phlegmatick complexions, whose heat is less, and the circulations of the blood and spirits dull and obstructed, this matter becomes tough and glewy stops in the breast, is the original of coughs, shortness of breath, soreness in the stomach....[89]

Irrespective of a particular individual's temperament, whether a given stomach tended to the cold or the hot, all three etiologies describe a body that could be suffocated and killed by stomach obstruction resulting in respiratory distress.[90] It is the "lights" that rise, but

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[88] Antoine Le Grand, *An Entire Body of Philosophy according ot the principles of the famous Renate Des Cartes* (London: Printed by Samuel Roycroft, 1694). http://eebo.chadwyck.com. "Milt" was one possible word for "spleen." I'm afraid I don't yet know what "mesentary" means here.

[89] Averroes, *Averroeana being a transcript of several letters from Averroes an Arabian philosopher at Corduba in Spai, to Metrodorus a young Grecian nobleman, student at Athens in the years 1149 and 1150* (London : Printed and sold by T. Sowle, 1695). http://eebo.chadwyck.com

[90] I should mention at least one alternative etiology, that of Gideon Harvey in his 1666 *Morbus Anglicus, or the anatomy of consumptions*. Ferdinand the Emperor and Francis the French king, their bodies opened following their deaths, had been found *lung-grown*, with the filaments attaching the lungs to the pleura dangerously strained and shortened, affixed and sticking the lungs to the surrounding pleura which had resulted in fatal over-heating and over-drying of the heart. The *opposite* circumstance, excessive loosening and detaching of the filaments holding the lungs, was the cause of the rising of the lights: "these said filaments being overmuch relaxed, or broken, do induce that accident which may be properly stiled the Rising of the Lights." Gideon Harvey, *Morbus Anglicus, or the anatomy of consumptions*, 2nd ed. (London: printed for Nathaniel Brook at the Angel in Cornhil, 1666). http://eebo.chadwyck.com The lights, not properly fixed in the body, wandered up. This kind of argumentation— from the connection of organs with one another via "filaments" or "ligaments"--appears in descriptions of the characteristics of the diaphragm,

the "lights" themselves are only instrumental, coincident to the more fundamental process causing suffocation.

From the standpoint of modern body sensibility, it is difficult to understand common treatments for other sorts of respiratory distress and obstruction that did not necessarily center on the lungs or the airway. Here are a handful of curious examples. *Wheasing anxiety*, also called *asthma*, could be "happily cured" using the first-line approach of an antimonial vomit. With this treatment, "in those who vomit easily, the phlegmatick humors which are contained in the sharp artery are thereby immediately brought up." (The *sharp artery* is also glossed as trachea.) But those who would be hurt by vomiting can just as successfully be treated by evacuating the humors *downward* via gentle purgation.[91] Those with respiratory distress who are also "costive" will find their breathing eased with the help of a carminative clyster,[92] and those tending to be plethoric benefitting from a vein opened in the foot or leeches applied to the haemorrhoid veins.[93]

Another place where we notice the peculiar absence of lungs is in methods of returning dying people to life. The resuscitation of patients who were not breathing did not necessarily involve what we consider to be the most important, life-saving step: getting air into the lungs. Following what everyone thought had been a successful execution by hanging, Anne Green, a servant with the misfortune to become pregnant by

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and in particular the connection between the diaphragm and the passions: how the midriff "imprints mad ravings on the brain." The history of the connection between the diaphragm or midriff and the mind could be a chapter unto itself.

[91] Robert Johnson, "Chapter 1: Of Shortness of Breathing," in *Enchiridion Medicum* (London: Printed by J. Heptinstall, for Brabazon Aylmer, 1684). http://eebo.chadwyck.com

[92] Culpeper also recommends a "carminative decoction" as clyster to "discuss wind, draw down the matter," in cases of what he calls the suffocation of the womb. Nicholas Culpeper, "The fourth book: the suffocation of the womb," in *Culpeper's directory for midwives* (London: Printed by Peter Cole, 1662). http://eebo.chadwyck.com

[93] Johnson, "Chapter 1: Of Shortness of Breathing."

her employer, seemed just a bit too warm as the physician Thomas Willis was about to begin dissecting her. A resuscitation attempt ensued, the key component of which was not giving her air to the lungs, but instead a series of enemas.[94] Positive pressure ventilation, the blowing of air into the lungs by mouth or machine, was a technique that was repeatedly reinvented and occasionally in favor, but most commonly *out of favor* until at least the late 1950s.[95] This fascinating story needs its own chapter. But here we can consider one way that this tension—a debate ultimately about the difference between the powers of motion, on the one hand, and substance, on the other—appeared in the seventeenth century.[96] It will lead us, through a few twists and turns, to consider the relationship of breathing and expression via the vital spirits.

Motion and substance were very much on the table in the Royal Society. One item of discussion frequently raised in the Society's Journal Books, the complete records of their regular meetings, was whether it was the *motion* of the lungs or a *substance* in the air, and if so what kind of substance, that gave breathing its apparent capacity for sustaining life. A series of closely related experiments culminated in 1667 when Hooke opened the thorax of a dog, punctured its lungs, and kept it alive for a time using bellows to provide a continuous flow of air.[97] Seventeenth-century texts traced back to Galen the maxim that the muscles were the instruments of the will.[98] But here it was not a willful,

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[94] Richard Watkins, *Newes from the Dead or A True and Exact Narration of the miraculous deliverance of Anne Green* (Oxford: Printed by Leonard Lichfield for Tho. Robinson, 1651). http://eebo.chadwyck.com

[95] See for example a 1959 paper attempting to show the superiority of exhaled air resuscitation over manual respiration: Peter Safar et al., "The Resuscitation Dilemma," *Anesthesia and Analgesia* 38, no. 5 (1959).

[96] E. Trier Moerch, "History of Mechanical Ventilation," in *Mechanical Ventilation*, ed. Robert R. Kirby, Robert A. Smith, and David A. Desautels (New York, Churchill Livingstone, 1985), 1-58.

[97] Royal Society Journal Book, October 24, 1667 and *Philosophical Transactions of the Royal Society of London* 2 no. 23-32 (1666-7): 539-540.

[98] Kuriyama discusses the history of this formulation before Galen in his *Expressiveness of the Body and*

muscular beating of the lungs and chest that gave breathing its power to maintain life. Instead, a passive, incapacitated, and vulnerable animal was given life as long as a hand pumped the bellows. This phenomenon was called, evocatively, "extracorporeal breathing," and it pointed to *substance* rather than *motion* as maintainer of life. The "beating" of the lungs, they determined, was neither necessary nor intimately linked with the preservation of life. This shift from emphasis on motion to emphasis on substance was extremely rich in implications. In medical practice, however, things looked entirely different. There, the life-giving capacity of breathing still had little to do with any substance entering motionless lungs. Instead, breathing and all the movements of life were one and the same. Before showing how this was true in the physiology of expression, we need to complete the description of the breathing body.

Transpiration and the Rising of the Mother

It wasn't just an obstructed, upward-moving stomach that could cause suffocation. With the exception of one year (1630), the London bills of mortality listed those dead of the rising of the lights and the rising of the mother (or "matrix" or "uterus") as separate categories. But when he made one grand tally of all deaths between 1629 and 1659, Graunt chose to combine the fatalities of the two diagnoses into one group: "the rising of lights and mother."

Like the rising of the lights, the rising of the mother was characterized by a frightening experience of obstruction in the throat, suffocation, and blocked breathing. A French surgical manual by M. De La Vauguion, which appeared in English translation in

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the Divergence of Greek and Chinese Medicine (Cambridge, MA: Zone, 1999), 147-50.

1699 and was cited well into the eighteenth century, introduced the signs of the rising of the mother thus: "The most ordinary signs of the hysterick passion, are difficulty of breathing, which causes a suffocation with a great constriction of the throat, as if the patient had a morsel which she could not swallow, and the throat were gripped with a mans hand."[99] The mother or womb was drawn upwards or sideways, compressing the neighboring parts of the body and especially the diaphragm, and so by compression, "causing suffocation and difficulty breathing."[100]

Like the rising of the lights, the rising of the mother was traced back to (among other causes) stomach obstruction. One obvious thing distinguished the two "risings": only women could suffer from the rising of the mother or matrix. The rising of the mother could kill, leaving its victim somehow in convulsions yet with neither detectable pulse or respiration. And these fits could go on for extended periods of time.

The first English-language account of the rising of the mother by a university-educated physician was Edward Jordan's *A briefe discourse of a disease called the suffocation of the mother,* which appeared in 1603. It related many cases of the suffocation of the mother in which women stayed for extended periods of time—even days—in the state of respiratory suppression. The *syncope* associated with the rising of the mother was the "very image of death…the breath or respiration clean gone." A woman could lie like a corpse "three or four hours together, and sometimes two or three whole days without sense, motion, breath, heate, or any signe of life at all." It was as

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[99] M. de La Vauguion, *A Compleat body of chirurgical operations containing the whole practice of surgery, with observations and remarks on each case, amongst which are inserted the several ways of delivering women in natural and unnatural labors* (London: Printed for Henry Bonwick, 1699), 34. http://eebo.chadwyck.com

[100] Edward Jorden, *A briefe discourse of a disease called the suffocation of the mother* (London: Printed by John Windet, 1603). http://eebo.chadwyck.com

though she were hibernating: “like as we see snakes and other creatures to lie all the winter, as if they were dead, under the earth.”[101] This phenomenon was certainly worthy of commentary, but it did not challenge any of the then-current views on how breathing worked. Rather than expressing amazement about the possibility of returning to life after extended periods without breath, many authors were more concerned with a different question: how to avoid mistaking the difference between life and death itself.

Those who met their demise as a result of apoplexy, the rising of the lights, or the rising of the mother were at risk of being buried before the humors had stopped moving and the soul had finally left the body. Many authors urge caution in these cases: the humors were thought to move for three days after death. How could an observer be certain that it was the appropriate time to bury a body? Jorden, for example, citing ancient debates on the length of time that a woman’s body should be left before burial, reports a consensus centering on a duration of approximately three days.[102] A 1658 English translation of Dutch university-educated physician Levinus Lemnius' 1559 *Occulta naturae miracula* gives a similar caution, and delineates the specific cases of death—or apparent death—in which extended waiting before burial is necessary: “Wherefore,” says Lemnius, “it is fit a law should be made, that those who are to take care of the dead bodies should not presently put them into their coffins, whom they think to be dead especially those that are strangled by the Apoplex, Epilepsie, or rising of the Mother; for oft-times their soul lies within them, and they live again.”[103]

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[101] Ibid.

[102] Ibid.

[103] Levinus Lemnius, *The Secret Miracles of Nature: In Four Books* (London: Printed by Jo. Streater, 1658). This book was translated into English more than 100 years after it was originally written. It admittedly emphasized the “miraculous.”

Extasie: "Blood around the heart in men is thought"[104]

Not limited to hysterical women and apoplectic men, the apparent cessation of respiration and the appearance of death was reported in yet another case, not entirely unlike the difficult to differentiate "fits," apoplexies, and risings. Truly understanding the physiology of extasie depends on understanding the vital spirits, which will be discussed in the second half of the chapter. Nonetheless, it's possible to get a taste here. In a mid-seventeenth-century text on the physiology of the passions, we read an account of something called "extasie":

> That whereof we speak is…a certain ravishment of the soul, which takes from the body the use of exterior sense and motion, the imagination and the understanding not forbearing to operate, which happens by a strong attention which binds the soul to the beloved object, which makes it lose the care of all animal functions, and which imploying all the spirits in that thought, hinders them from flowing to the organs of sense and motion; and this ravishment may sometimes pass to such an excess that the vital faculties may receive no more influence from the soul, so that respiration will cease, and that there will be only natural vertue to sustain life.[105]

Of interest here is not only the view that breathing was guided by, directed, or depended on the influence of the soul, but also that there was a possible state of the body in which "natural virtue" alone could sustain life. A "strong attention" could so bind the soul to a beloved object, and so occupy the spirits, that the senses themselves would be withdrawn and all obvious signs of life, for a time, cease. We have then not only a suggestion of the entanglement of understandings of breathing and the boundary of life and death, but also of a relationship between breathing and the senses, breathing and the texture of

[104] Empedocles (fr. 105), in *Galen: On Respiration and the Arteries*, ed. David J. Furley and James S. Wilkie (Princeton: Princeton University Press, 2014), 6.

[105] Marin Cureau de La Chambre, "Part 4: What the causes are of the characters of Love," in *The Characters of the Passions* (London: Printed by Tho. Newcomb, for John Holden, 1650), 8.

experience itself. Whatever the mysterious connection between breath and the soul, here was breath entwined with the senses and with the capacity for expression. The withdrawal of the "senses," which happened as the spirits became absorbed in a particular direction, went together with the cessation of respiration.

But long breath holding was not something on the far edges of the natural. It is indeed true that the journals of the new scientific societies of the seventeenth century "swarmed with reports of strange phenomena."[106] Voyagers returned from distant lands, bringing marvelous objects for cabinets of curiosities. The Aristotelian order was rejected in favor of Baconian inclusion of all marvelous particulars.[107] This was the world in which a woman might stay alive three days without breathing. But long breath holding was no miraculous, anomalous occurrence. There were explanations possible within medical theory, and these explanations were not new. Nicholas Culpepper's 1688 edition of Bartholin's Anatomy is one of many texts that report stories of divers who could stay for hours—he claims a maximum of three or four—under the water, "by nature and not by art." In the West Indies, he reports, divers stay for an hour under water hunting for pearls. The "Aeguptians" are the "most perfect" divers, lying in wait under the water and pouncing on the unwary sailors on deck, pulling them beneath the water, killing them, and robbing their ships. Fisherman dive deep and catch fish in each hand and "a third in their mouths." For Culpepper, the body has other ways of sustaining life than by breathing through the mouth or lungs: "These persons doubtless, do either live only by Transpiration, as such so that have fits of the Apoplexy and the Mother; or they have

[106] Lorraine Daston, "The Language of Strange Facts in Early Modern Science" in *Inscribing Science: Scientific Texts and the Materiality of Communication*, ed. Timothy Lenior (Stanford: Stanford University Press, 1998), 20-38.

[107] Ibid., 25.

Anastomoses open in their Hearts, by means of which as in the womb, the blood is freely moved without any motion of the Lungs."[108]

What was this "transpiration" ? It was also used to account for the survival and recovery of a woman (or a man sick with apoplexy or any of its many close cousins) for an extended period without breath. According to medical theory, a woman lying as if dead simply breathed through her skin:

> Galen wondreth how these women can live, who are troubled with these cruell fits of the *Mother*, without any pulse or breathing,..to this I answer, that although these women live without respiration, yet doe they not live without transpiration; for this being performed through the pores of the skin, by the motion of the arteries, conserves the symmetry of the vitall heat; for then that small heat retiring to the heart, as to a castle, may be preserved by this benefit of transpiration alone.[109]

Transpiration, life-sustaining breathing through the skin, might take over or supplement breathing through mouth, nose, and lungs in still other situations. Bartholin, for example, wrote that the child in the womb breathes in part by transpiration: "The lungs shine with yellow redness, which is afterwards allayed by their motion. Because they are at present immoveable, because transpiration alone and the Ventilation of the Mothers Blood do suffice the Child in the Womb, unless it happen to cry in the Womb."[110]

The doctrine of skin breathing, called in seventeenth-century texts *transpiration*, is probably first found in fragments of Empedocles which were fortunately preserved in

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[108] Thomas Bartholin, *Bartholinus anatomy made from the precepts of his father, and from the observations of all modern anatomists, together with his own... Published by Nicholas Culpeper and Abdiah. Cole.* (London: Printed by Peter Cole, 1688). http://eebo.chadwyck.com

[109] Ibid.

[110] Ibid.

lengthy quotations in Aristotle's *De Respiratione*[111] but likely originally written around 450 B.C.E. Here is how it reads in Furley and Wilkie's translation:

> Thus do all things breathe in and out: for all, there are tubes of flesh, left by the blood, *stretched over the outermost part of the body*, and over the mouths of these *the exterior surface of the skin* is pierced through with close-set furrows, in such fashion that blood lies hidden within, but a clear path for air is cut through by these channels. When the delicate blood runs away from these, air seething with fierce flood rushes in; when it flows back, it breathes out in return.[112]

Perhaps because of the strangeness of the idea that the entire surface of the body inhales and exhales, and because of the ambiguity in the original Greek, alternative readings of the fragment that erase or minimize the presence of skin breathing have been proposed.[113] The currently standard work by Furley and Wilkie, though, argues strongly that the only coherent reading of the passage is that the blood vessels and arteries do indeed breathe through the skin.[114] Based on their study and translation of Galen's works on blood and respiration, Furley and Wilkie argue that by his time, the idea of the entire body breathing had not only persisted but evolved: "By Galen's time it was a theory of some precision: the arteries draw in air through the skin in diastole and expel waste through the skin in systole, and this process is part of the system that maintains moderate heat in the body."[115] Breathing through the skin also appears in Plato's *Timaeus*, there necessitated by the doctrine of *horror vacui*, the impossibility of empty space: whatever moves *out* of arteries, vessels and lungs displaces air that was formerly on the outside of those

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[111] Furley and Wilkie, *Galen,* 3.

[112] Ibid., 3.

[113] Furley and Wilkie actually claim that there was general consensus on the skin breathing interpretation until the late 1950s, from which point on there has been "nothing by controversy." See Furley and Wilkie, *Galen,* 4 n. 1.

[114] Furley and Wilkie, *Galen,* 5.

[115] Ibid., 5.

structures, necessitating its movement *in*[116] (a mechanism that Galen rejected, claiming that the filling of empty space did not account for the existence of intentional breathing).[117]

The possibility suggested, then, is that something other than (or in addition to) sweat could move in and out through the various pores of the body. When it is discussed by historians, transpiration is usually assumed to be a very subtle, indeed invisible kind of *sweat*. For example, Michael Stolberg's "Sweat: Learned Concepts and Popular Perceptions, 1500-1800," focuses entirely on transpiration as "sweat" (though with more gradations of "subtlety" than modern conceptions of would allow—including the mysterious "insensible transpiration"). He does not mention any connection between transpiration and respiration.[118]

Breathing through the Pores

What then was the relationship between *sweat, transpiration* and *respiration*? One connection was simply at the level of language. In seventeenth-century texts, the pores (whatever those might be) breathe. A 1670s pamphlet advertising a "most admirable cordial, the elixir of life," promised that unlike other "cordial waters" or "sweating medicines," which caused violent, great, and weakening sweats, this cordial "expels much of the peccant Humour by a kind of Transpiration or breathing through the Pores, and lastly evacuates the grosser matter from the very Center of the Body, to the

[116] Ibid., 7.

[117] Ibid., 9.

[118] Michael Stolberg, "Sweat: Learned Concepts and Popular Perceptions, 1500-1800," in *Blood, Sweat and Tears: The Changing Concepts of Physiology from Antiquity to Early Modern Europe,* ed. Manfred Horstmansoff, Helen King, and Claus Zittel, Intersections: Interdisciplinary Studies in Early Modern Culture, vol. 25 (Brill: Boston: 2012).

great comfort and satisfaction of the Patient."[119] Transpiration, defined here in passing, was breathing through the pores.

In the 1630s, James Hart described the excrements of "nutrition" as breathed out of the pores of the body both *insensibly*, as in transpiration, and *sensibly* in sweat. Such excrements were particularly abundant in all sorts of fevers: "The third, is called nutrition, and is performed in the whole body; and hath for excrements, certaine fuliginous vapors, which by insensible transpiration breath out by the pores of the body; and the sweat, which is apparent to the eye."[120] Breathing through the pores was not the same as sweating, but was this "breathing" just a manner of speaking, a way of describing the wafting out of a subtle fluid?

The Pores

How were various substances, both gross and subtle, understood to move in and out of the body? What were pores? Bartholin defined them thus:

> Now its holes are some of them visible, as the Mouth, the Ears, the Nostrils…others insensible, as the pores. Those pores of the body, being otherwise not Conspicuous, are seen in winter, when the Body is suddenly bared; for then the Scarf-skin looks like a Gooses Skin when the feathers are pulled off…it is close wrought, not only to defend the parts under it but that also too great an efflux of vapor, blood and spirit and heat might not happen.[121]

The pores could at times be seen, at other times were hidden. They could at times hold in vapor, blood, and spirit, and at other times allow these to be released.

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[119] Anon., "Elixir magnum vitae: or, the great elixir of life, being the most admirable cordial-drink, and its singular virtues, never before made publick; is now exposed to sale, as the most excellent preservative of humane bodies, for the general good of all persons" (London: s.n., 1670-80). http://eebo.chadwyck.com

[120] James Hart, *Klinike, or The diet of the diseased· Divided into three bookes* (London: Printed by Iohn Beale, for Robert Allot, 1633). http://eebo.chadwyck.com

[121] Bartholin, *Bartholinus anatomy.*

Breathing might be visualized as a process in which air enters what is essentially a closed loop from mouth and nose to trachea, lungs and back again. This was not thought to be the only way that air moved in and through the body. Consider the dangers of children's violent coughing:

> Hence infants and children are troubled with an implacable cough…so that their breath is stopt, and they are ready to be strangled, and all their Pipes of breathing being shut, their breath that goes and comes will come forth behind and break out, not without great danger to their lives, if you do not hold their buttocks close pressed together with both your knees; that so the breath that strives to come out behind the wrong way, may be forced to return back, and come forth at the wind pipes as it should.[122]

Air was not limited to moving through the pathways with which we are accustomed, nor did apparent lung pathology find its root there.

A curious understanding of the possible entries and exits for air appears in a late sixteenth-century childbirth manual (which was reprinted well into the seventeenth century). There it is recommended that if a woman should die in childbirth, she should be laid on her side with mouth, genitals and anus exposed so that, in case the fetus still lives, it can breathe through her skin: "But contrary to all this, yf it chanse that the woman in her labor dye & the chyld havyng lyfe in it, then shall it be mete to kepe open the woman's mouth, and also the nether places, so that the chylde maye by that meanes bothe receave & also expell ayre & brethe which otherwyse myght be stopped."[46] (How the fetus breathed was a topic of much debate, and transpiration was certainly not the only theory offered.) Should "regular" breathing be in some way compromised, the body had other ways of accomplishing the same goals. Bartholin lists several functions of the skin, the fourth of which is the most interesting for our purposes: "that it might give way to

[122] Lemnius, *The Secret Miracles of Nature*.

Excrements, and exclude insensible sooty Fumes by way of insensible Transpiration."[123] This transpiration relieves the body of more excrements than all of the "sensible" evacuations together (Bartholin cites Santorio Sanctorius' famous measurements of his own insensible transpiration to the effect that one day's insensible transpiration is equal to fifteen days of stool!).

The most important point is perhaps that the skin is not a one-way street, exclusively an organ of excretion (or exhalation): it also *attracts* air in particular situations. This further defines transpiration as part of the body's "respiratory" exchange with the environment. Matter, even relatively gross matter, can enter into the arteries through the pores of the skin. When suffering from fevers, especially, the sick person should not be allowed to spend too long in "the linnen they lye in," for the excrements of all kinds can easily be drawn back into the body. Those long sick should be kept "clean and sweet," for the arteries of the body not only expel waste, but also absorb what is nearby:

> For this must be well considered, that the arteries of the body have a double motion, one whereby they expell these excrements already named; and the other whereby they draw in the ambient aire to refresh the blood. Now whatsoever aire is next unto them, be it good or bad, sweet or stinking, they draw it in. And therefore, if thou let this dung-hill lye about thee, undoubtedly the arteries will draw in these noisome excrements, which will suffocate naturall heat, and by consequent, prolong thy disease.[124]

Likewise, according to one (late sixteenth-century) manual on the topic of avoiding the plague, vigorous exercise was potentially dangerous in that overly opened pores could allow unintended substances to enter the body: "You must beware of all vehement and immoderate exercise, which doth prouoke sweate, as is tennis, dancing, leaping, running,

[123] Bartholin, *Bartholinus anatomy.*

[124] Ibid.

footeball, hurling, and such like: because they doe ouermuch heate the body, and open the pores of respiration, whereby the enfected ayre hath the more scope to enter our bodyes, but moderate exercise is very conuenient, the vse of whote houses at this time, I thinke very dangerous because it doth too much open the pores."[125]

Brain Breathing

Perhaps absorption through the skin and into the arteries is limited to the "absorptive" function of the skin with which we are familiar? That matters are stranger than this is suggested by descriptions of breathing directly through and into specific locations in the body; through the skin into the arteries, and through the nostrils into the brain.[126] An English translation of Pierre Charron's *Of Wisdome: Threee books written in French by Peter Charron* (1608) gives a description of the nose as a pathway of air into the brain: "The outward visible parts, if they be single, are in the middle as the *Nose* which serveth for respiration, smell, and the comfort of the braine, and the disburthening thereof, in such sort that by it the aire entereth and issueth both downe into the lungs and

[125] Simon Kellwaye, *A defensative against the plague containing two parts of treatieses* (London: Printed by John Windet, 1593). http://eebo.chadwyck.com

[126] In the works of Galen, the arteries and skin were for breathing into the heart, while the nostrils were intended for breathing directly into the brain. By symmetry, we might then expect there also to be "liver" breathing, but as first Owsei Temkin and later Julius Rocca have shown, the addition of the "natural virtue," as the third in a supposed tripartite pneumatology, was mentioned only once by Galen himself. In fact the "three pneuma" theory was much more a later elaboration by "Galenists," and in particular Hunayn ibn Ishaq. I still wonder, though, why later Galenists wouldn't have proposed breathing into the liver, since their physiology would have practically required it. See Oswei Temkin, "On Galen's Pneumatology," in *The Double Face of Janus and Other Essays in the History of Medicine* (Baltimore: Johns Hopkins University Press, 1977), 180-89, and Julius Rocca, "From Doubt to Certainty: Aspects of the conceptualisation and interpretation of Galen's natural pneuma" in *Blood, Sweat and Tears: The Changing Concepts of Physiology from Antiquity to Early Modern Europe,* ed. Manfred Horstmansoff, Helen King, and Claus Zittel, Intersections: Interdisciplinary Studies in Early Modern Culture, vol. 25 (Brill: Boston: 2012), 629-659. Before Galen, *The Sacred Disease* of the Hippocratic Corpus also includes descriptions of breathing directly into certain vessels and the brain in order to cool the body, and in the case of the brain, in order to allow it to perform its functions: sense and motion.

up into the braines."[127]

The nostrils, according to some authors, were in fact especially designed for breathing directly into the brain. The body that is, as the Hippocratic author put it, "breathing everywhere" is a body with a topography; locations on its surface are all different, specific, and meaningful. In the case of the nostrils, the left nostril was associated with the liver and the right with the spleen. (Though different authors sometimes flip the association, it is apparently always one or the other side with liver or spleen.) Phlegm flowing from one or the other side was considered diagnostic for those organs. An evil hemorrhage "in the affects of the Liver flows out of the left nostril, and in the affects of the spleen, out of the right."[128] Likewise, treatments for liver or spleen could be "directly" introduced by pouring medicine into the nostril associated with it. A good general tonic for the spleen was a quart of wine boiled with leaves of tamarisk and a good quantity of cumin, beaten to a powder, given warm, or "poured into the left nostril everyday."[129]

At some point, this body topography was forgotten.[130] As an example of the

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[127] Pierre Charron, *Of Wisdome: Threee books written in French by Peter Charron*, trans. Samson Lennard (London : Printed [at Eliot's Court Press] for Edward Blount & Will, 1608).

[128] Robert Bayfield, *Tes iatrikes kartos, or A treatise de morborum capitis essentis & pronosticis adorned with above three hundred choice and rare observations* (London: Printed by D. Maxwel, 1663). http://eebo.chadwyck.com

[129] E.R. Gent, *The Experienced Farrier, or Farring compleated in two books physical and chyrurical* (London: Printed by Richard Northcott, 1681). http://eebo.chadwyck.com. Here he is suggesting that the spleen be treated via *left* nostril. I am not sure if this was an eccentric variant, an error, or if the practice itself varied from practitioner to practitioner.

[130] By the end of the seventeenth century, the view that if it was not *impossible* to breathe into the brain then it was at least *pathological* was often found. In 1699, Benjamin Allen opens his discussion of the "true" causes of the apoplexy with a display of his knowledge of the results of Boyle and the experiments with the pneumatical engine, as well as the "method of cutting the brain" (i.e., the anatomists who argued that the ventricles of the brain were *not* in fact intended to manufacture and distribute the animal spirits), and argues that the cause of apoplexy is air entering the brain *when it should not*. Benjamin Allen, *The Natural History of the Chalybeat and Purging Waters of England* (London: Printed by S. Smith and B. Walford, 1699). http://eebo.chadwyck.com. It is becoming a world in which air, rather than serving

forgetting, consider that recognition of and curiosity about the "nasal cycle," the fact that human breathing switches cyclically (every 90 minutes or so) between predominantly left, right, or both nostrils, is generally traced back no earlier than the work of Richard Kayser in the late nineteenth century.[131] But this is an immediately accessible observation to any breathing person with two nostrils (which side are you mostly breathing through now?). Perhaps we lost sensitivity to body topography when we lost the notion of breathing through pores all over the body's surface, rather than through mouth and nostrils alone.[132]

Perhaps yet stranger than a body with a topography is that its breathing seems to be carried out by the body of its *own* volition. No breather is required:

> Therefore God hath created it [the nose] not only to serve the sence of smelling, but also for respiration, that it should be the principall pipe and passage, by which both the braine and lungs may draw in or let out breath as neede requireth. For this cause the braine doth stretch out and restraine it self: and as by stretching foorth it selfe it draweth in the aire by the nosethrilles, so by keeping it self close together it retaineth the aire.[133]

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primarily to cool the heart or brain by *surrounding* them, is understood to enter the blood. Allen is at pains first to show that air is admitted to the blood ("I need no other argument, but that blood continues to follow on bleeding"), and he claims (invoking the same not entirely self-explanatory rationale) that the air does *not* enter the brain, or nerves, or any of the "Specifick juyce" of the Animal. Air certainly *can* enter directly into the brain, but when it does it is the cause of "*spuma* at the nostrils and mouth, and for the difficulty of breathing, or cessation of respiration attended with an entire pulse…and the Distention of the Lungs in the apoplectick that is mentioned by Wepferus." Air no longer traveled to the brain by carefully designed conduits to protect it from the danger of overheating. Instead air in the brain would cause it to malfunction in dangerous and dramatic ways.

[131] Richard Kayser, *Die exakte Messung der Luftdurchgängigkeit der Nase.* (Berlin: Arch. Laryng. Rhinol., 1895) 8: 101.

[132] It is interesting to note Harvey's insistence on the anatomical symmetry of the two sides of the heart: "Why, I ask, when we see that the structure of both ventricles is almost identical, there being the same apparatus of fibres and braces, and valves, and vessels, and auricles, and in both the same infarction of blood, in the subjects of our dissection, of the like black color, and coagulation— why I ask, should their uses be imagined to be different, when the action, motion, and pulse of both are the same?" William Harvey, "De motu cordis, Prooemium," in *Galen*, ed. Furley and Wilke, 42. In an interview, Ivan Illich suggested that Harvey's idea of something flowing through a circuit and returning to its origin unchanged would have struck early modern people as deeply counterintuitive; what a thing is is connected to where it is, and transition from place to place necessarily entails change.

[133] Pierre de La Primaudaye, *The French academie Fully discoursed and finished in foure bookes, All*

The brain itself reaches out, through the nostrils, to bring air to itself.

The image of the brain and lungs "drawing in or letting out" breath as they need to may be just a manner of speaking, but it is an interesting one. For the author goes on to describe the brain "stretching out and restraining itself." There is here a kind of agency given to these organs; they move and take action of their own accord. It is not the breather, a willful someone residing in the body, who is in charge of the breathing, intentionally pulling air in *through* the lungs. Rather the lungs—and brain— themselves reach out or pull back. Just like the "rising" of the lungs and mother, here, too, other interior parts of the body seem able to "move" of their own accord. What kind of self is implicit in such a breathing body? How does it express itself? These will be the questions of the remainder of the chapter.

Breathing and Expression

The connection between breathing and expression was the vital spirits. According to the ancient theories of respiration that were inherited by English physicians and philosophers of the seventeenth century, breathing was primarily for the purpose of cooling the dangerously exuberant heat of the heart, and for the production of the vital spirits. This heat in the heart was nothing less than the "vital flame," the pure and powerful heat of life itself. While there was debate about the nature and location of this fire—was it familiar fire, or something less material and more mysterious?—most accounts concurred both that the heart was an organ of nutrition, vitality, and perception,

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written by the first author, Peter de la Primaudaye, Esquire, Lord of Barre, Chauncellour, and Steward of the French Kings house (London: Printed [by John Legat] for Thomas Adams, 1618). http://eebo.chadwyck.com

and that the "fire," if left unventilated, could be suffocated by accumulated waste, or alternatively, burn out of control.[134] For this reason, the heart had been wisely designed: safely surrounded by the beating lungs which cooled, ventilated, and regulated it, setting the pace and intensity of the burning of the heart's fire, and driving the production of the spirits that carried out the soul's intentions. It was, at times, given as evidence for all this that cool air entered the nostrils while warm air exited them, or that the breathing of someone overcome by anger was not the same as that of one full of joy.

This simple account belies the fact that the "use" of breathing had likewise been a matter of significant difference of opinion in the time of Galen, and that theory and practice had changed in meaningful ways since his time.[135] It is important to consider, if briefly, the ancient view of heat and of the psychic pneuma since these were so closely linked with the fire and vital spirits of the early modern period. The influential work of Erasistratus, for example, had posited a substance-centered orientation to the problem of the use of breathing. But Galen's powerful refutations closed the debate with broad and lasting certainty: the use of breathing was not related to its *substance* but to its *quality*.[136] There's much more that could be said about this, but for our purposes here it is enough to emphasize several of the central features of the Galenic view of respiration which dominated thinking about breathing for a remarkably long time.[137]

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[134] See Everett Mendelsohn, *Heat and Life: The Development of the Theory of Animal Heat* (Cambridge, MA: Harvard University Press, 1964).

[135] See Furley and Wilkie, *Galen*, and Rocca, "From Doubt to Certainty," in Horstmansoff, King, and Zittel, *Blood, Sweat, and Tears*, 629-659, as well as Gerard Verbeke, *L'Evolution de la doctrine du pneuma: Du Stoicisme à saint Augustin* (Paris: Desclee De Brouwer, 1945).

[136] Galen takes on the views of Erasistratus in particular in his "On the Use of Breathing," in Furley and Wilkie, *Galen,* 71-135.

[137] See the translations of Galen's treatises on breathing in Furley and Wilkie, *Galen*, 71-229.

There was, of course, the primary use: breathing was to manage the vital heat which originated in the heart (though it did this not by virtue of any *substance* in the air). Secondly, as described in *On the Use of the Parts*, outside air was transformed, through a series of stages in the arteries, lung, and brain, into so-called "psychic pneuma"[138] which carried out the intentions of the soul.[139] Finally, he espoused a teaching found also in Empedocles and the Hippocratic Corpus, to the effect that not only the nostrils and lungs but the entire surface of the body breathed—through the pores of the skin directly into the arteries, through the nostrils directly into the brain, and through the trachea into the lungs.[140] About this strange pore breathing, more later.

If life was a flame that if left untended would certainly burn out, the rhythm of breathing was a flexible structure within which that pure intensity of life could safely evolve and unfold itself. We speak now of the "breath of life," but in a world before biomedicine, though breathing was understood to be necessary for life, it was not mistaken for "vitality itself." Instead, the breath was a conductor of life's flow, rate, and directionality. The motion and location of the body; how, where, and in what way air entered and exited the body; as well as the motion of the lungs themselves: these were the clues to the significance of breathing and its key role in the maintenance of life. And this is why breathing was so intimately connected with the particular passions, sense experiences, and expressions of an individual body's life.

The breathing body was bound to express. Through the vehicle of the *vital spirits*

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[138] Galen, *On the Use of the Parts*, trans. Arthur John Brock, classics.mit.edu

[139] In analogy with the tripartite soul, there were through late antique, medieval and early modern medicine, three kinds of pneuma or spirits; whether Galen was committed to just one "natural pneuma" or all three is a matter of discussion amongst scholars of classical medicine. See Owsei Temkin, "On Galen's Pneumatology," *Gesnerus* 8 (1951): 180–89.

[140] See Furley and Wilkey, *Galen*, 71-247.

its breathing was, if not identical with, then intimately related to that expression. There were at least two standard accounts of where and by what process the spirits were produced. In his *Sylva Sylvarum*, Francis Bacon explains that fire and air—brought together in breathing—were like "oyle and water," tending to pull apart, but holding together, mixing and blending uniquely in the bodies of vegetables and animals: "Flame and air do not mingle, except it be in an *instant*, or in the vitall spirits of vegetables, and living creatures… As for *living creatures*, it is certaine, their *Vitall Spirits* are a Substance Compounded of an *Airy* and *Flamy* matter; And though *Aire* and *Flame* being free, will not well mingle; yet bound in by a *Body* that hath some fixing, they will." A living vegetable or animal body, then, was a unique environment where elements of unlike natures could remain unusually bound for a time. This was necessarily a volatile and explosive meeting, for the force of the elements' movement in opposite directions remained potential in their union. "Wrestling, leaping, or playing division upon the lute" were made possible from even a small quantity of the spirits made by the compounding air and flame: "Such is the force of these two Natures; *Aire* and *Flame*, when they incorporate."[141] The breathing body was a space which could contain the potential inherent in the meeting of air and fire and require it to manifest.[142]

Later in the seventeenth century, the French physician and philospher Marin Cureau de la Chambre made the vital spirits the centerpiece of his embodied theory of the passions. In five lengthly volumes, *Les caracteres des passions* (parts of which were "Englished" in 1661 as *A Discourse on the Passions in Two Parts*) he elaborated on a

[141] Francis Bacon, *Sylva Sylvarum or A Naturall History in ten centuries* (London: Printed by John Haviland and Augustine Mathewes for William Lee, 1627), 30.

[142] Rocca claims that the spirits resulting from compounds of fire and air was a theory of stoic origin. "From Doubt to Certainty," in Horstmansoff, King, and Zittel, *Blood, Sweat, and Tears*, 629-659.

rather simple idea: "It is a most certain thing that the body changeth and varies it self, when the soul is moved…"[143] The body and soul varied always and only together. Any movement of the soul left imprints, which he called *characters*; the soul's movements were always visible, if only as a certain " air on the face." On such a tight correlation between movement of the soul and the expression of the body, the very possibility of *deception* came into question:

> Nature having destin'd man for a civil life, thought it not sufficient to have given him a tongue to discover his intentions; but she would also imprint on his forehead, and in his eyes, the images of his thoughts; that if his speech happened to belye his heart, his face should give the lye to his speech. In effect how secret soever the motions of his soul are, what care soever he takes to hide them, they are no sooner formed by they appear in his face; and the disquiet they cause is sometimes so great that they may be truely called tempests, which are more violent at Shore than out at sea…*the passions are better known in they eyes than in the soul itself.*[144] (Italics mine)

The body could not lie.

La Chambre's is a distillation model of respiration; the spirits are produced by the condensation that happens in presence of cool air in the lungs. Blood is heated in the right ventricle, the hottest part of the body. The boiling blood enters the lungs where it meets the cool air that has been drawn in by respiration. The coolness of the air on the boiling liquid draws out and "thickens" the fumes which are "exhaled from all parts." Just as the spirits of a wine are "reduced into a body," in the distilling of *aqua-vitae,* the spirits of the body are "framed," or made, by a process analogous to distillation. They are brought into material, if vaporous, form by the meeting of cool air and hot, even boiling, blood.[145]

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[143] Marin Cureau de la Chambre, Chapter 1: "What the Characters of the Passions are in Generall," in *A Discourse upon the Passions: In Two Parts* (London: Printed by Tho. Newcomb for Hen. Herringman, 1661).

[144] Ibid., italics mine.

[145] Marin Cureau de la Chambre, ch. IV, art. 3. "How the Spirits are Framed," in *The Art of How to Know*

It is because the body requires spirits to carry out all of its activities that it cannot go long without respiration: "Hence proceeds the indispensable necessity of respiration; for if those parts of the blood, which are so reduc'd into fumes, should not be condens'd, and reassume a kind of body, they would be immediately dissipated."[146] Without breathing, there would be no spirits generated from the blood. And the motion and expression of the body that was, in substance, its life, would cease.

It was the *spirits* that wrote the soul's intention on the body; they were sometimes described clearly echoing the common way that Galen was said to have described the muscles, as the "instruments of the soul" (and indeed it was spirits that gave the muscles themselves their power). In La Chambre's detailed account of the state of the body, spirits, and humors in laughter, constancy, courage, anger, love, joy and hope (to name a few), the vital spirits played the central role. Since breathing drove the production of the spirits, certain qualities of breathing were associated with various states of mind, and with various passions.

Why, for example, do lovers sigh? The lover's soul is so preoccupied that it forgets to send spirits to cause respiration, that most necessary action. The lungs "beat" slowly. The fire love kindles in the heart is not sufficiently "tempered," and the "fumes and vapors" that are the result of the rising humors cannot be discharged. When a thought that had "forcibly detained" the mind is allowed to issue forth, it does so with a sigh.[147] This would only be the case, however, in *true* love; for "simple and imperfect love"

Men, trans. John Davies of Kidwelly (London: printed for Thomas Basset, at the George in Fleet-street, near Cliffords-Inne, 1670), 1-2.

[146] Ibid.

[147] La Chambre, Part 4: "What the causes are of the characters of Love," in *The Characters of the Passions,* 7-8.

would not make a sufficiently strong impression on the body; the body and its breathing were an open book.

Modes of breathing could also distinguish genuine from false, sociable laughter. In genuine laughter, the breast is "so impetuously agitated, and with such suddenly-redoubled shakes, that we can hardly breathe, that we lose the use of speech, and that it is impossible to swallow whatsoever it be." But "mean" laughter "takes not away the respiration nor the speech.[148] False laughter could be distinguished by the unperturbed breathing of the impostor.

Beyond the waxing and waning of the passions, ways of breathing could also be characteristic of certain kinds of people, those of a particular "complexion." The respiration of a "bold" man, for example, is

> is strong and impetuous, because heat is encreased, which augments the force of the vital parts, and requires a greater refreshement, for which cause the breast and the lungs extend and enlarge themselves the more to attract the greater quantity of fresh air, and they fall with precipitation, the more readily to drive away the fumes which the boiling of the spirits and the humor excite.[149]

Such oft-repeated patterns left a permanent mark on the body. The broad chest of the courageous man was suited to his large, hot heart. His "stronger respiration" demanded the bold choleric's characteristically broad, flaring, and open nostrils.[150] In this way the shapes and topography of the body itself took on expressive meaning. It is curious, for example, that the chest, or "boosom," the mind, and the breath often appear together. In his 1650 text against the "unlawful division of the Church of God," John Rocket has his

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[148] La Chambre, Part Four: "The Characters of Laughter," *The Characters of the Passions,* 2-10.

[149] La Chambre, X.

[150] Ibid. "The nostrils open and widen themselves, because the heat growing stronger requires a greater respiration, and obligeth the soul therefore to enlarge the passages; by reason whereof those who naturally have those parts wide and open, and commonly bold and cholerick."

Christ "breathing out of the bosome of his Father his mind to us: Love they enemies!"[151] Later, using the same image of the trajectory from breast, to mind, to breath, he describes not God and his son, but the Son and his disciple: "hearken to the voice of *John,* his beloved Disciple, lying in his bosome, and breathing out the mind of his Master to us." It's curious both that the chest is the seat of the soul's most lofty thoughts, and also that these thoughts are not simply spoken, but *breathed.*

This is a world in which everything from the earth to vegetable and animal bodies emanates *vapors* of various kinds. Even stones have a kind of breathing: the first English instance of the word *atmosphere* describes the vapors emerging from the moon—that sphere of "breath" that surrounds it.[152] In addition to vapors, there were winds, entering the body through open pores, causing illness, sudden changes of character, and sudden changes in life course.[153] In this world, then, breathing was both metaphor and mechanism for *influence*. In his classic history of the physiology of acting, Joseph Roach traces the origins of the "desperate" prejudice against actors in the seventeenth century to

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[151] John Rocket, *Divisions cut in pieces by the sword of the Lord: or, A discourse on a text of Scripture, of the unlawfulness of divisions in the Church of God, upon the highest pretences whatsoever. By John Rocket, minister of the Word at Hickling in Nottingham-shire* (London: Printed by Thomas Maxey, 1650). http://eebo.chadwyck.com

[152] Or at least the *Oxford English Dictionary* gives the first use in English of the word in 1638: "There is an Atmo-sphæra, or an orbe of grosse vaporous aire, immediately encompassing the body of the Moone." John Wilkins, *The Discovery of a World in the Moone. Or, a Discourse tending to prove that 'tis probable there may be another habitable World in that Planet* (London: Printed by E. G., for Michael Sparke and Edward Forrest, 1638). http://eebo.chadwyck.com Quoted in *Oxford English Dictionary*, 2nd ed., s.v. "atmosphere."

[153] There is much to say about wind in western medicine and thought. The Hippocratic treatise *Airs, Waters, Places* most famously discusses the relationship of dominant wind patterns to temperaments of inhabitants of various places. See Kuriyama, *The Expressiveness of the Body and the Divergence of Greek and Chinese Medicine*. One example from the early seventeenth century, the Dutch physician Levinus Lemnius, writes that the coming weather can be predicted by unusual raving of otherwise calm people in the streets. The humors, liquid, like the sea, and themselves moving with the fluidity of wind, are pushed and pulled by winds: "But as the waves of the sea by the violence of the winds, swell and are lifted up, so in mans body the humors are moved and rage, by the same force, the vapors and fumes whereof carried upwards, trouble the mind and make it peevish, forward, angry, hard, and untractable…" Lemnius, *The Secret Miracles of Nature*.

a certain aspect of their breathing bodies: their heightened and expansive passions were a danger both to themselves and to their audiences.[154] Expressed passions had the power to affect witnesses, for breathing did not simply convey or express a passion but was also able to render bystanders and the environment different than before. Breathing was not simply about the maintenance of an individual life, and breathing *upon* someone or something was a transmission which had the capacity to transform.

These transformations were both magical and dangerous. How, for example, did one make another fall in love? By breathing out from the eyes: "The eye is principally interessed herein, breathing thence the most thin spirits and darting forth the visual rayes, as the arrows of *Love* which penetrate the heart."[155] One could also be harmed by an unfortunate crossing of the path of malicious breathings. Edward Topsell's *The historie of foure-footed beastes* contains accounts of the habits and behaviors of real and fantastical beasts. Topsell appropriated a common understanding about the power of *breathing on* to describe the stingy lion who "yet having eaten his belly full, at his departure by a wilfull breathing upon the residue, he so corrupteth it, that never after any beast will tast thereof: for so great is the poyson of his breath, that it putrifieth the flesh."[156] Topsell's *unken* is from Hungaria, like a weasel but longer, red on the belly, and mouse-colored on top. Its breathing upon the face of men is "venomous and poysonfull." Or so, Topsell wrote, said soldiers, sleeping on the ground under tents, who were unlucky enough to awake to find an *unken* looking them in the eye, breathing on

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[154] Joseph R. Roach, *The Player's Passion: Studies in the Science of Acting* (Cranbury, NJ: Associated University Presses, Inc., 1985), 27-8.

[155] Will Greenwood, *Apographe storges, or, A description of the passion of love demonstrating its original, causes, effects, signes, and remedies* (London: Printed for William Place, 1657). http://eebo.chadwyck.com

[156] Edward Topsell, *The historie of foure-footed beastes* (London: Printed by William Iaggard, 1607). http://eebo.chadwyck.com

them, poisoning them.

Sermons of the period often cited gospel stories, but the miracles there recounted are not the least bit impossible for the breathing body. Other gospel breathings perform work that is quite simply miraculous: When the newly risen Jesus breathes on his disciples, transmitting to them the holy ghost, they gain nothing less than the capacity to forgive sins: "The words of salutation, of mission, the breathing on them, and imparting the Holy Ghost to them do import, that the remission and retaining of sins there promised, was a peculiar power given to them on whom he thus breathed."[157] According to Ivan Illich, the *conspiratio*, the kiss of the early Christians—a symbolic or perhaps literal breathing into one another's mouths—was likewise intended to symbolize a sharing of the holy spirit, binding the community together in spirit rather than law.[158] One was included in the community not by virtue of birth into a particular group, but by the sharing of spirit that superseded law and tribe. In Austinian speech acts, certain words uttered can perform actions: "I marry you," "I christen this ship." But among the early Christians, simply breathing was sufficient. The movement of breathing was movement itself, action itself, life itself. We will return to the question of the meanings of breathing into others' bodies and breathing *for* others in the context of the history of resuscitation techniques in the last chapter.

This way of breathing carried within it an implicit theory of meaning and action.

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[157] John Tombes, *Theodulia, or, A just defence of hearing the sermons and other teaching of the present ministers of England* (London: Printed by E. Cotes for Henry Eversden, 1667). http://eebo.chadwyck.com

[158] Ivan Illich and David Cayley, *Rivers North of the Future* (Toronto: House of Anansi Press, 2005). "The high point of Christian ritual and ceremony still consists in a communal meal of bread and wine, a symposium, but in the first centuries of Christianity there was also *conspiratio*, that is a breathing into each other's mouths. That's what Christians did. They came together to eat and kiss, to kiss on the mouth. In this way they shared the Holy Spirit and became members of a community in flesh, blood, and spirit" (85).

In the view of human embodied expression that had been inherited from the ancient world, there was no disjunction between "primary" and "secondary" qualities. Interiors, surfaces, and potentialities were all bound into one breathing whole. "Breathing" as the word appeared in both learned and vernacular English print, could be simultaneously the statement of an "interior" experience, a description of an outer appearance, and the taking of action. One could "breathe after purity," "breathe forth affections," or "breathe out blood thirsty malice." One could "breathe courage into them," or "breathe nothing but destruction."[159] These breathings entailed a state of the body, and that body had a given, necessary, corresponding expression. The body could not help but reveal the powerful currents—blood, heat, fluids, spirits—that moved not only beneath its skin but also across that highly permeable barrier. The breath could not be isolated from other aspects of the body and its environment. A person could not breathe without revealing everything about him- or herself, and perhaps even transmitting that experience—be it a state of consciousness or an intention—to others in the vicinity. This view entailed certain limitations on the possibility of self-transformation.

Perhaps the most articulate seventeenth-century exponent of this view of embodied expression was John Bulwer. For our purposes, it's also of interest that he had much to say on the question of self-transformation. Both recent scholarship and several of Bulwer's own works claim that he was carrying out the Baconian program; his *Chirologia* declares itself in its preface to be another *Novum Organum,* while *Pathomyotamia or a dissection of the significative muscles of the affections of the minde* (1649), claims to be inspired by Bacon's *De Augmentis Scientarum.* Though he claimed

[159] Common collocations assembled from various sources through a search for "breathe" and related words in the Early English Books Online database in 2012.

association with and authority through the Baconian Method, he and Bacon differed on many if not most points, not the least of which was the issue of intentional modification of self and body. Bulwer's account of the passions is the traditional one, not at all dissimilar to that of de la Chambre in that the passions were always and only produced by a specific state of heat, humors, and spirits. Bulwer, like his father, was a physician, but his books primarily concern rhetoric and the embodied expression of meaning, a body of knowledge he named "vox corporis" or "moral anatomy."[160] His accomplishments were disciplined and traditional in their commitment to the identity of body and expression, but highly eccentric in other ways. Amongst many contributions, he developed the first known sign language (some of which is apparently still in use), attempted to give detailed descriptions of the anatomy of the facial muscles and describe their recruitment in "affections of the minde,"[161] and compiled a massive catalog (reprinted several times together with its striking woodcuts) of all the "native and nationall monstrosities that have appeared to disfigure the humane fabrick."[162] This book Bulwer called *Anthropometamorphosis: Man Transformed or, the artificall changling* (1653), and it detailed all the "scenes of man's transformation," of the seemingly endless ways that peoples of "diverse nations" deform the perfection of the human body.[163]

Bulwer's concern about transformations of the body derived from his view of the

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[160] John Bulwer, *Pathomyotamia or a dissection of the significative muscles of the affections of the mind* (London: Printed by W.W. for Humphrey Moseley, 1649). http://eebo.chadwyck.com

[161] Bulwer's work on hand gestures is found in *Chirologia or the Natural Language of the Hand* and its addendum *Chironomia or the art of Manual Rhetoricke* (London: Printed by Tho. Harper, 1644). http://eebo.chadwyck.com

[162] John Bulwer, *Anthropometamorphosis: Man Transformed or the artificial changling* (London: Printed by William Hunt, 1653). On the history of this book, see Dominic Montserrat, *Changing Bodies, Changing Meanings: Studies on the Human Body in Antiquity* (London: Routledge, 1998).

[163] Ibid.

direct correspondence between body and mind, which allowed of no variation from person to person; the way the body expressed the passions was necessarily universal. Based on this premise of universality, Bulwer composed his catalog of *intentional* deviations from the one, natural body, a body painstakingly and assiduously designed by God. Bulwer held the universal body to be perfect, indeed nothing less than the image of God himself. Intentional deviation from this natural image, "artificial" changing of the body, was then an act against both God and Nature. His elaborate theory of gestures of the face and hands, and his description of the muscles involved in facial expression, were likewise necessarily *universal*, and natural. Their movements perfectly mapped what we might call the movements of the mind.

Anthropometamorphosis with its plentiful woodcuts strikes a modern reader as lighthearted. Imagine it all illustrated: the long, cone-shaped heads of the Marcones of Puntus; nations "with feet a cubit long"; the women of Mexico, whose breasts have been pulled long with ropes such that they suckle children over their shoulders; the Brazilians who dye their thighs with such a "black colour, that seeing them afar off, they seem as if they were clothed in sacerdotal breeches"; and Indian divers who have had the separation between their nostrils cut out, "their noses slit like broken winded horses. It is an ill trade, that cannot be exercised without deforming the body, that being a badge of their profession, which is a penall marke of a melefactor among us."[164] The detail of the frontispiece, however, conveys the actual weight of the matter at hand. (See Figure 1.)

[164] Bulwer, *Anthropometamorphosis*.

Figure 1. Anthropometamorphosis. Source: John Bulwer, *Anthropometamorphosis: Man Transformed or the artificial changling* (London: Printed by William Hunt, 1653).

Bulwer depicts the trial before God and Nature of an "artificial changling." From the sun above descend rays in the form of scepters on which are variously written slogans to the effect that the universe is governed by the laws of nature established at its creation. Out of a nearby angel's mouth float the words: "*god has made man righteous, but he has found out many inventions*." The devil, opposite, laughs. Meanwhile, a donkey, leopard, dog and ape also rejoice: "*behold*," their bubbles say, "*man is become one of us."* Under a tent across which is written the word *anthropometamorphosis*, sit opposed two books: one, *On the use of the parts,* and the other *On the abuse of the parts*. The grievous abuse of the parts has roused the ghost of Galen himself, who is present to the judgment of the changeling as "guilty of high treason against nature."[165]

Bulwer's theory of the *vox corporis* was in essential alignment with views of breath, the spirits, and the way the body expressed as outlined in this chapter. In this view, breathing was a theory of meaning (it's perhaps no accident that Bulwer happened to be a designer of sign languages and a cataloger of gestures). The breathing of the body was not just the cause of a particular "state of mind," but was in fact that experience and that expression in essence. There was no extra fold, hidden somewhere in the mind, in which meaning resided. Unlike the waters into which the diving bell descended, the mind had no dark depths. The movements of the body were the movements of the breath and these expressed meanings as they took action. But if a body cannot help but reveal itself, with what capricious will could it commit treason against nature? What kind of "art" might it exercise to change itself, when its pores were indiscriminately open to all the

[165] Ibid.

winds that might blow? The breath was, itself, the very capacity for change. And yet significant resistance to change persisted.

This attempt to simply describe what it was like to breathe before biomedicine has gestured to the identification of several tensions that we will see persist throughout the discussion of breath in the chapters to come: *surface-essence, substance-motion, art-nature*, *volition-surrender.* What were the most important features of this body? As we saw, suffocation might be caused by obstructions anywhere within it or on its surface. The organs moved of their own accord, both pathologically, as in the rising of the lights or the rising of the mother, and for the sake of the body, as in the brain's reaching out for air. The body was significantly porous and interpenetrated by its environment. The whole body breathed. This opened the possibility for what were certainly understood to be extreme and remarkable states, in part because they seemed to correspond to a particular quality of being—that is, the apparent absence of all sensibility in the prolonged absence of breath. This was, of course, an aspect of the understanding of the vital spirits, which depended on respiration to be produced. In this way they were a source of life, sensibility, experience, and action.

Bacon's epistemology made space for spontaneity in nature and willful expression in people, and welcomed the possibility of strange victories over the body. In parallel with this, looking beneath the surface of the visible movements of breathing, formerly taken to be powerful components of its capacity to manifest life, led to a reorientation that emphasized the substance of the air quite irrespective of the shapes taken by the body it passed through. These breathing movements, I've tried to suggest, had been understood to be nothing less than the expressions of the body, the movements of the soul as carried

out by the body's spirits. This view of breathing was found in the body that breathed everywhere, across all of its surfaces. This gave the breath, broadly construed, great powers. In addition to the contagion with which we are familiar and fear, breath could transmit everything that it was. It transmitted the movements of life in all shades: anger, joy, love, intentions, wishes, and desires.

This victory of substance over motion had implications for the self and its volition. The muscles had formerly been the instruments of the soul, and in the beating of the lungs, and the expansion and contraction of the motions of breathing, they had been the first place where the self exercised a certain control over life, or at least a certain capacity to welcome breath. This control was conceived of differently depending on whether one emphasized the Hippocratic winds blowing through open pores, or the Galenic internal pneuma of muscularity. These, at least, were the views of various scholarly texts. Practical and more colloquial accounts, as we have seen, sometimes seem to put the source of intentional breathing in the body itself—the body breathing its desires, the brain reaching out to cool itself—rather than in any higher "rational soul." In spite of the subtleties of the source of control in breathing, when the use of breathing was transferred from the *movements* of the body to the *substance* in the air, this control was likewise transferred from the winds of destiny or the muscles of the self to the hand that held the bellows.

Chapter Two: The Respiratory Reflex

"We really have no right to the *great* period, we who are modern and in every sense short of breath." —Friedrich Nietzsche[166]

While Swami Vivekenanda, newly arrived from Bombay, was receiving a two-minute standing ovation from more than seven thousand attendees of his speech as the representative of Hinduism to the 1893 Chicago Parliament of Religions, Professor Fitz of Harvard's Lawrence School was using a device of his own design, the Fitz pneumograph, to collect at least "four hundred and seven respiratory tracings secured from boys and girls, young men and women, and from individuals of various races found in Chicago during the World's Columbian Exposition."[167] Among those he studied were included, if a footnote expressing his gratitude is any guide, "the Samoan Village, the Turkish Theatre, the Bedouin Village, the Bedouin Encampment, the Eskimo Village, the Streets of Cairo, the Javanese Village; and also…a group of Hawaiian dancers which was in Chicago during the summer of 1893, and…Mr. Salisbury, of 'Buffalo Bill's Wild West.'"[168] Both Fitz and Vivekenanda were convinced of the importance of breathing. But while Fitz was using characteristic breathing patterns to distinguish what he thought

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[166] Friedrich Nietzsche, *Beyond Good and Evil*, trans. Walter Kaufman (1886; New York: Vintage Books, 1966), 183.

[167] George Wells Fitz was an instructor in physiology and medicine at Harvard during the last decade of the nineteenth century. He established an exercise physiology laboratory at Harvard and also inaugurated the option to major in what would now be called "P.E."—the undergraduate major in anatomy, physiology, and physical training—in 1891. See William D. McArdle, *Essentials of Exercise Physiology* (Baltimore: Lippincott, 2006).

[168] G.W. Fitz, "A Study of Types of Respiratory Movements," *Journal of Experimental Medicine* 1, no. 4, (1896): 5.

were immutable human kinds, Vivekenanda was leveraging his newfound fame to provide American bodies with breathing techniques he claimed could transform them.

Over the next two chapters we will consider what breathing could reveal about the self in the late nineteenth century. First, here in chapter two we will consider how breathing was understood to relate to the soul during the period when the study of the soul was becoming an experimental science, as experimental psychology was being founded at the end of the nineteenth century. We have taken this temporal leap forward in order to consider another moment when, as at the end of the seventeenth century, materiality and spirit were under intense and far-reaching renegotiation. In chapter three, we will consider the side of things represented by Vivekenanda: an idea of breathing and the body in which spirit was master.

Along the way we will also particularly highlight an unmistakable tension between an idea of normal—and normative—breath, and the possibility that this breath, together with body and self, could be intentionally altered. How much do our bodies reveal who we are, and just how much can we change? Answers to these two questions were interdependent. They were answered in terms of descriptions of the body, and of the body's breathing in particular. Each of these possibilities, the immutable body and the transforming body, necessarily corresponded to a different *experience* of body and self—in particular, how it experienced itself in the face of change.

This chapter aims to set up the first pole of the dichotomy; we will see examples of the sense in which breathing was understood as one face of the two-sided coin of body and mind. As the breath was assumed to be a rich source of information about the mind, early experimentalists took their task to be simply tracing just what kind of associations

existed between mind and body. Given such a tight linkage in this context, what space could there be for substantive change? Preoccupied as experimental psychologists of the nineteenth century were with reading the code of the breath, little if any attention was given to the possibility of making a new story, altering the image in the mirror. It was almost as though the breath were occurring outside of time, outside of the possibility of change. In the terms of chapter one, we might say that early experimental psychology was more aligned with Bulwer than with Bacon. An immutable breath corresponded to an immutable self.

Thus, in this chapter I will argue that, at the end of the nineteenth century, the semiotics of breath did not include a theory of change. This kind of breathing was characteristic of a moment in which, I will suggest, the will was under threat and the movements of breathing were reconceived of as conditioned, reflex behavior. Attempts to emphasize the power of the will, as hinted at in William James' "The Energies of Men," were offered as a solution to the problem of fatigue. What exactly was the relationship between breathing and fatigue? A body that could not flexibly and robustly respond to its environment had a strong tendency to become fatigued and exhausted and to experience what was called nervous prostration. A second goal of this chapter, then, is to consider the interdependence of attention, fatigue, and respiration at the end of the nineteenth century.

Fatigue was, of course, one of the most pressing late nineteenth-century symptoms. A pervasive concern about dissolution, running down, and running out connected financial, mechanical, and bodily economies, and respiration was a significant

if not the guiding factor of the body's energy economy.[169] The physiology of respiration was an important part of one of the most wide-reaching intellectual projects of the nineteenth century: squaring all phenomena with the laws of the conservation of energy. As one historian of the biological sciences put it: "During the nineteenth century, the overall chemical and physical relationships of the respiratory process—which subsume the question of organic heat production—were brought into close agreement with the principle of the conservation of energy."[170]

But this was not only a task to be undertaken by those making physiological models of the body as such. Early experimental psychology, as much as physiology, was informed by—and had to conform to—Helmholtzian thermodynamics. Energy conservation and the fungibility of matter, work, and spirit applied as much to body as to mind. That is to say, theirs was a universe in which two seemingly incompatible laws were in effect: one that declared the unity and fungibility of matter, work, and energy (witness the conversion of heat into motion), and another that confirmed a dreadful suspicion that this energy would eventually run out, dissipate, become exhausted beyond the reach of rest. This chapter, then, connects the pervasive fatigue of the late nineteenth century to a certain view of the breathing body. This body had a difficult tension to hold. It had at once to face the dissolution of a metaphysics of *kinds*, a world populated with rigidly defined and never interpenetrating species, races, genders, and it had to do so as it realized that time and energy were running out. This itself was the tension between norms

[169] This aspect of respiration was studied by Francis Benedict Gano and by Wilbur Atwater, among others. An entire chapter could be written on the relationship of food and breath in late nineteenth-century studies of metabolism.

[170] William Coleman, *Biology in the Nineteenth Century, Problems of Form, Function, and Transformation* (New York: Cambridge University Press, 1979), 119. Quoted in Anson Rabinbach, *The Human Motor* (New York: Basic Books, 1990), 124.

and transformation. Was the breathing body imagined as a thing that could change itself? How was this possibility of transformation related to the imagination of the body's sources of energy?

As far as early experimental psychology's attempts to hold the tension were concerned, these primarily fell under the banner of what was infelicitously known as psychophysical parallelism. We will talk in more detail about the psychophysical project in chapter three, but for the moment suffice it to say that though it was in many ways narrowly experimental, preoccupied with instrumentation, and tended to a kind of naive materialism, in fact it had Romantic and orientalist sources and intellectual commitments. The body gave access to the mind not just for reductionist reasons, but because of a metaphysics of the identity of matter and spirit. As Gustav Fechner, the first to articulate the program of psychophysics, put it, they were two sides of the same coin. Yet American experimental psychology was inspired by a German predecessor that, as a sign of its Romantic roots, not only reserved space for but also valued "spirit" in the form of introspection (if a rigorously disciplined kind of introspection). American experimental psychology would, in a relatively short period of time, do away with introspection and the other Romantic residue it had inherited from the German program. How did the breath traverse these changing fortunes of spirit? In the third chapter, we will consider how breathing came to be included in the experimental program in the first place, which will lead us to consider how the breath was, by some, practiced as a mode of self and even social transformation.

The Great Period

It was in his 1886 *Beyond Good and Evil* that Nietzsche gave his diagnosis of the breathlessness of the moderns. They were were "short of breath" in every sense: tubercular, no doubt. But yet more damningly, lacking in breath in the sense of lacking in spirit: "We really have no right to the *great period*, we who are modern and short of breath." Like breath, "period" had multiple meanings; naturally a period meant an historical period, the one in which the moderns were living, for example. But in classical oratory, period also referred to the expressive potential of a single breath:

> A period in the classical sense is above all a physiological unit, insofar as it is held together by a single breath. Such periods are found in Demosthenes and Cicero, swelling twice and coming down twice, all within a single breath, are delights for the men of *antiquity* who, from their own training, knew how to esteem their virtue and how rare and difficult was the delivery of such a period.[171]

A training in the way to manage the breath, now forgotten, no longer valued, had at one time been the source of a great delight.

Moderns, and modern Germans, in particular, lacked the subtlety of the ancient world with its orators, who spoke meaningfully, and therefore rhythmically, supported by the "power of ancient lungs." Meaning itself depended on tempo and on rhythm, the ancient public delighting in "cresendos, inflections, and reversals of tone and changes in tempo."[172] The modern shortness of breath was a deathly, spiritless torture:

> How vexed one stands before the slowly revolving swamp of sounds that do not sounds like anything and rhythms that do not dance, called a "book" among Germans!…How many Germans know, and demand of themselves that they should know, that there is *art* in every good sentence—art that must be figured out if the sentence is to be understood! A misunderstanding about its tempo, for example—and the sentence itself is misunderstood.[173]

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[171] Nietzsche, *Beyond Good and Evil*, 247.

[172] Ibid, 183

[173] Ibid.

Modifications of tone and intentional, well-controlled unevenness of pace: this was the art of changing the breath that gave vocal expression joyful meaning. It was not a Great Period, and at the root of the modern loss of meaning, its lack of spirit, was an insensitivity and failure in the management and modification of the breath.

But whatever the state of their lungs, or the swamp of their literature, "modern" physiological models were in fact preoccupied with a certain kind of periodicity (and, one might even argue, a certain kind of spirit). Granted, this periodicity was far more ordered than Neitzsche's "rhythms that dance," but the exploration was nonetheless about the relationship of expression—perhaps as parcels of meaning—with the cyclical appearance and disappearance of the breath. Fitz's pneumograph was a modification of that of Étienne-Jules Marey who had first developed the device (about which more below). Interested as he was in time and motion, Marey's pneumograph emphasized the periodicity of the movements of respiration, and this distillation of motion and time into discrete units was projected into the mind by early experimental psychologists. Work by the German psychophysicist Lange, for example, had substantially convinced his colleagues that attention was a discontinuous process, that it had its own inherent rhythm, sometimes referred to as "attention waves."[174] While attention was in the rising and cresting phases of its wave, the senses were able to perceive with maximum acuity. By the arrival of a trough, the sensory stimuli of the world were experienced less vividly. The existence of attention waves was used to explain perceptual phenomena like the flickering of stars; it wasn't that the light of the star itself was varying in intensity,

[174] N. Lange, *Beitraege zur Theorie der sinnlichen Aufmerksamkeit und der activen Apperception,* Philosophischen Studien 4 (1887), 395.

instead it was the acuity of the viewer's attention that caused the apparent change in the quality of light. There was a sense in which a view of the mind that included internally generated attention waves put attention significantly outside of the realm of volition.[175]

Periodic behavior, like that of an attention wave, was significant because it gave insight into the energy metabolism and potential for fatigue of the organism. The Italian physiologist Angelo Mosso, for example, described the periodic behavior of respiration, attention, and fatigue in an analogous way. All manifested periodic, undulating behavior the oscillations of which originated in the "nervous centers." The regular respiration of sleep, for example, could be disturbed by even a slight noise. A pause in breathing following the noise might occur, followed by a deep breath, and then a few minutes of alternately strong and diminishing breaths, cyclically returning to regular rhythm over a series of breath cycles:

> To this phenomenon I have given the name of successive oscillations. The energy of the nervous centers is not always set free in a continuous manner, but has a tendency to periods of greater or less activity. When the equilibrium of the nervous centers is disturbed undulations arise which die away by degrees, or rather become the source of other undulations of increasing force; just as in sounding a heavy bell each pull of the rope accumulates energy, and thus the oscillations become more and more violent. What I have said with regard to respiration applies likewise to attention and fatigue.[176]

All of this was significant not just because of the inherent interest in describing the way in which the nervous centers controlled basic physiological functions. Perhaps yet more importantly, this oscillating discharge pattern was a visual key to the way that the organism might run down, run out of energy, and become fatigued. The inevitable decay

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[175] Angelo Mosso, about whom much more below, mentions in passing that Haller, the important eighteenth-century Swiss physiologist and anatomist, had claimed that the human attention *cannot* be voluntarily directed.

[176] Angelo Mosso, *Fatigue*, trans. M. A. and W. B. Drummond (New York: G.P. Putnam's Sons, 1904), 186-7.

was as predictable as the way the reverberations of a struck bell would be resolved into silence following a pattern of diminishing peaks of sound. So relentless was this unraveling that individual nerve cells alone were practically useless. Only a kind of socialized production, millions of cells working together, could outwork the entropic weariness of any individual:

> I have spoken at some length on these periods because they let us perceive with what rapidity the nervous centers are fatigued. I regard it as very probable that fatigue appears in a nerve cell of the brain after only three or four seconds of work. The prolonged activity of the brain, in spite of this very rapid exhaustion of its elements, is explained by the consideration that we have in the cerebral convolutions two thousand million cells which can do duty for each other.[177]

On the spectrum outlined in the first chapter between substance and motion, the model of nervous center-driven periodic respiration was a breathing the "use" of which depended primarily on its motion. (In chapter three we will consider a study that attempted to show, using the existence of attention waves, that the movements of the respiration were themselves the very movements of the attention). On the connection between motion and the lively activities of the organism, Mosso approvingly cited Lange's view: "only by means of muscular contraction is thought rendered possible."[178] Not unlike the James-Lange theory of emotion (it's the same Lange), which held that the physiological response of the body was the source of an emotion later to arise, this view held that it was not that a changing emotional state would cause a change in the breathing, or any other change in the body.[179] Rather, the movements of the body, including the movements of breathing, were constitutive not only of the life of the mind,

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[177] Ibid.,187

[178] Ibid., 194.

[179] James' famous example was that we *fear* the bear because we have begun to tremble and run from it. See William James, "What is an Emotion," *Mind* 9, no. 34 (1884).

but indeed of life itself. Mosso approvingly cites the work of Ribot on attention to help articulate this point:

> Is it the case that the movements of the face, body, limbs, and the respiratory modifications which accompany attention are, as is ordinarily supposed, effects, signs? Or, on the contrary, are they the *necessary conditions*, the *constitutive elements*, the *indispensable factors of attention*? We accept this second hypothesis without hesitation. If the movements were entirely suppressed, so likewise would attention be suppressed.[180]

As complex as all of this was, it invited a rather basic, if profoundly elusive question: What was the source of this movement, perhaps a movement of breathing, that was the experience of life itself?

Breathing and the *primum movens*

The problems of volition, the origin of motion, and the nature of normal breathing were all evident in Mosso's report of an ordinary encounter with a laboratory fish that appeared in his 1891 book *Fatigue.*[181] In actual fact, it was the *absence* of behavior on the part of the fish that interested Mosso. The fish, though alive, was not breathing with any regularity: "I must inform the reader that in the winter an eel's respiration ceases to be continuous, and becomes periodic."[182] Following the lead of Karl Ludwig and Etienne-

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[180] Angelo Mosso, *Fatigue*, trans. M. A. and W. B. Drummond (New York: G.P. Putnam's Sons, 1904), 193.

[181] Mosso, *Fatigue*. Mosso's work was of particular importance in late nineteenth century studies of attention, and according to the program that he developed and inspired others to follow, what was important for the physiologist was whatever "renders evident the physical fact which accompanies the psychic activity of the brain" (Mosso, *Fatigue*, 181). In particular, Mosso studied the movement of blood: "In my work *Fear* I have already shown, with the aid of the plethysmograph and the balance, how the act of thinking about something drives the blood towards the brain" (Mosso, *Fatigue,* 181). Though a recent article claims the "rediscovery" of this work by Mosso, lying dusty in an obscure Italian archive, it was not forgotten to William James, who gives an energetic account of it in his *Principles of Psychology*. Stefano Sandrone, et al., "Weighing brain activity with the balance: Angelo Mosso's original manuscripts come to light," *Brain* 137 (2014): 621-33.

[182] Mosso, *Fatigue*, 109.

Jules Marey, Mosso had enthusiastically adopted and developed the instrumentation and theoretical program of the graphical method, the main problem of which was to capture and be able to study motion—inherently a process, potentially a very fast one, and therefore difficult if not impossible to describe. The ideal would be to be able to create a trace or precise map of the movement without needing to interfere with it. In this instance, he used the method to track the periodicity of the eel's gulping water and passing it over its gills: "I constructed a kind of telegraph to the air, by means of which the respiratory movements of an eel can be recorded on the smoked sheet of a revolving cylinder."[183] (See Figure 2.) By whatever mechanism this "telegraph" sent its message, it relayed a description of an eel in "repose": the first four lines of Mosso's recording are flat. Though the fish did not appear to need to breathe, it wasn't sleeping. Just as a man in sleep or an animal in hibernation might toss and turn, or manifest small adjustments, the eel would move its eyes and fins from time to time. The eel, Mosso reported, needed to breathe at most a few times in a period of fifteen minutes. Sometimes it wouldn't breathe at all in that quarter hour. Mosso thought it strange that as far as *periodic respiration* in humans was concerned, it had primarily been reported and studied as a pathological event. But Mosso wanted physiology to admit of the phenomenon, observable in many different, and vibrantly living, organisms. Here was a healthy eel, for example, manifesting "periodic respiration" in an ordinary situation.

[183] Ibid., 109.

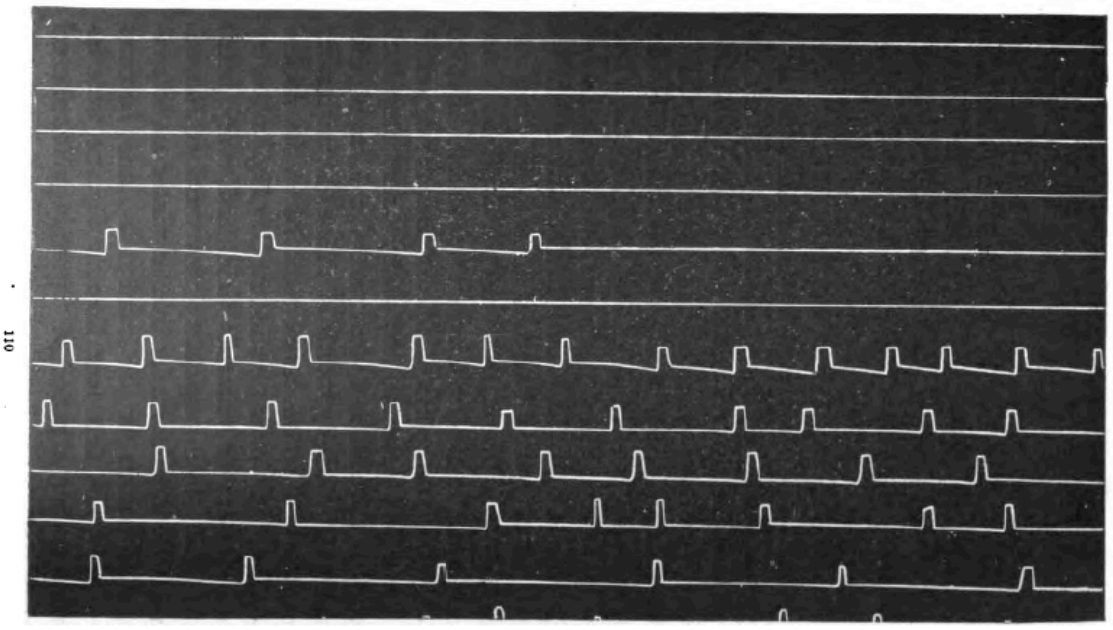

FIG. 14.—Augmentation in the frequency of an eel's respiration in consequence of vigorous movements which the animal was made to perform after the sixth line.

Figure 2. Mosso's tracing of the eel's respiration. Source: Angelo Mosso, *Fatigue*, trans. M. A. and W. B. Drummond (New York: G.P. Putnam's Sons, 1904).

The eel's breathing was so slow in fact that much of the tracing paper, covered in flat and unrevealing lines, had to be cut off. Nothing was happening there to bother with: "I suspended the observation and began to poke the eel with a stick in such a way as to force it to move, making it go up and down the aquarium for a couple of minutes."[184] Having made a few laps around its enclosure, the animal resumed its repose. Though it rested quietly for a while, the eel's respiration remained elevated, in fact at its maximum frequency. And stronger, too (though Mosso's "telegraph to the air" could not capture this kind of change). Mosso interpreted such behavior as arising from the "nervous" qualities of the animal's management of its respiration rather than its immediate metabolic needs.

[184] Ibid.,112.

It was certain that the chemical demands of exercise had, at least at first, made the animal breathe more. But that wasn't so much Mosso's interest—the exploration of this phenomenon had been the work of the last century; those were the chemically oriented questions of Spallanzani, Laviosier, and Priestly. The fish had been in "repose" but was then surprised, "excited," prodded by an external influence, and the breathing had shown it: "the excitement of movement increases the frequency of respiration."[185] There was something happening in the "nervous centers." The need for respiration and in particular the *pattern* of breathing could not be entirely accounted for by a simple chemical equation. Indeed the apparent periodicity of breathing, irrespective of particular environmental or behavioral demands, suggested that the mechanism was not only chemical, but was significantly driven by other interior forces as well.

With the stick, Mosso had himself provoked the response in the eel's body, its swim and its increased respiration rate. But by what mechanism did such an impulse travel from its source to its expression? And, more importantly, what was the ultimate source of such an impulse? Had it not been for Mosso, hoping to see more interesting traces on the smoked paper, what force *within* the organism might have excited such a response? These were the deeper questions inherent in the physiological investigations, and Mosso knew exactly the implications of his simple observation: "The origin of voluntary movement has always been the great stumbling block of physiology, and unfortunately it is a problem so important that all should occupy themselves with it, and especially philosophers."[186]

Mosso was seeking physiological answers to traditional questions of philosophy,

[185] Ibid., 111-12.

[186] Ibid., 37.

questions he felt were still lacking in significant answers. Earlier he had cited a long passage from Giovanni Borelli, the seventeenth-century natural philosopher, on exactly such questions: "When the animal spirits are at rest or asleep it is inconceivable that a voluntary act should take place, or the faculty of sensation be aroused. For this it is necessary that the animal spirits in the brain be awakened by some local disturbance such as is demanded by the nature of their property of movement."[187] Borelli is even pardoned by such a strident materialist as Mosso for invoking the wakening or sleep of the *vital spirits* as an explanation of voluntary motion; Mosso was entirely complimentary when it came to Borelli: "It's remarkable he approached so near the truth."[188] We can't reproach him for such "obscurity," Mosso says, because there is still no better account.

Mosso clearly is neither a vitalist, nor does he align himself with those he places in a category he calls "spiritualistic philosophers" (they should, he says, consider and "combat the propositions" of Borelli, for he is challenging the "orthodox conception of the will" that they espouse—a model in which the will is an immaterial power of the likewise immaterial rational soul).[189] In particular, Borelli had argued that many seemingly automatic processes of the body had originally been volitional, but over time had been brought under automatic control. Casting Borelli in a typical myth of the origin of science, Mosso recounts how he had broken with Aristotle, "recognized that the entire edifice of physiology has to be rebuilt," and had even gone so far as the well-nigh heretical extension of volition to the motions of the heart.[190] The Abbé Rosmini accused

[187] Qtd. in ibid., 37.

[188] Ibid., 35.

[189] Ibid., 38.

[190] Mosso quotes from Borelli: "It is not impossible that actions which are now accomplished by habit have once been voluntary, and we who are no longer aware of having willed them, believe them to be

Borelli of having confused the "sensitive principle" and the "reasonable soul" (sometimes referred to as the "vital principle," what traditionally did the willing), indeed introducing the distinction at the heart of "modern materialism." Yes, Mosso says: exactly.

On the matter of matter and *primum movens,* Mosso casts the early modern Borelli as entirely modern, in conversation with Spencer and Darwin: "But Borelli had already formulated this difficult problem in nearly the same terms as modern philosophers have adopted."[191] Anticipated by Borelli, they argued rightly, in Mosso's estimation, that volition had come first, had then became habitual, and was later rendered automatic and permanent in heritable reflex pathways. In the beginning, undoubtedly, was volition, but reflex motion had come to take the greater share of the responsibility for what moved an animal. Like a Newtonian mass, Mosso's eel would have continued to repose had an external mover not incited excitement. It happened, in that instance, that the will was Mosso's.

Instrumentation and Respiration

While it was unnervingly unclear whether physiology could reserve a special place for the willing of a reasonable soul distinct from its fleshy, reflexive sensing, the traces of the respiration were far more certain: scratches on smoked paper. Though he used respiratory tracings extensively throughout his physiological work, Mosso had not been the inventor of the pneumograph. Yet he had developed his own version of the

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involuntary. It is thus that the movements of the heart are accomplished without the consent of the will, and although we do not pay attention to them. We see besides that many other movements, which without doubt began by being executed under the control of the will, are eventually carried out without our being aware of it, and sometimes also without our desiring it." Ibid., 38.

[191] Ibid., 38.

instrument, just as Fitz had (and as many others who used it would). Experimental approaches to the breath had been made possible by Étienne-Jules Marey's original innovation in instrumentation which allowed physiologists and physiologically oriented psychologists to make direct, real-time tracings of the movements of the breath in animals and humans. The fledgling discipline of experimental psychology came to rely on these graphical methods to differentiate itself from philosophy and mysticism by establishing an experimental view of the self based on measurable responses to stimuli.

It was around 1865, well before the establishment of experimental psychology as a distinct discipline, that Marey became interested in respiration. He had previously developed the sphygmograph, a device that transduced the varying pressure and movement of the pulse at the wrist into a tracing recorded on a smoked paper-wrapped cylinder as it turned via internal clock mechanism. (See Figure 3.) The movements of the pulse, heretofore known palpably, through touch, could be effectively printed out in real-time (but saved for later reference).[192] Having completed substantial work on the heart and circulation, Marey became interested in respiration (among other basic body functions) and made several versions of the pneumograph.[193] (See Figure 4.) His first design held a spring encased in rubber against either the chest or the abdomen. The motion of the spring was passed through a series of progressively narrower tubes and recorded on a smoked paper cylinder, the kymograph. A later version used a silk cord to hold two tambours attached to a metal plate against either the abdomen or thorax. The vibrations captured by the tambours were then sent via rubber tubing to a recording

[192] Marta Braun, *Picturing Time: The Work of Étienne-Jules Marey (1830-1904)* (Chicago: University of Chicago Press, 1992), 18.

[193] Ibid., 20.

cylinder.[194] The pneumograph was one of many tools of the *graphical method,* which in this instance endeavored to make a precise, mirror recording of the movements of respiration.

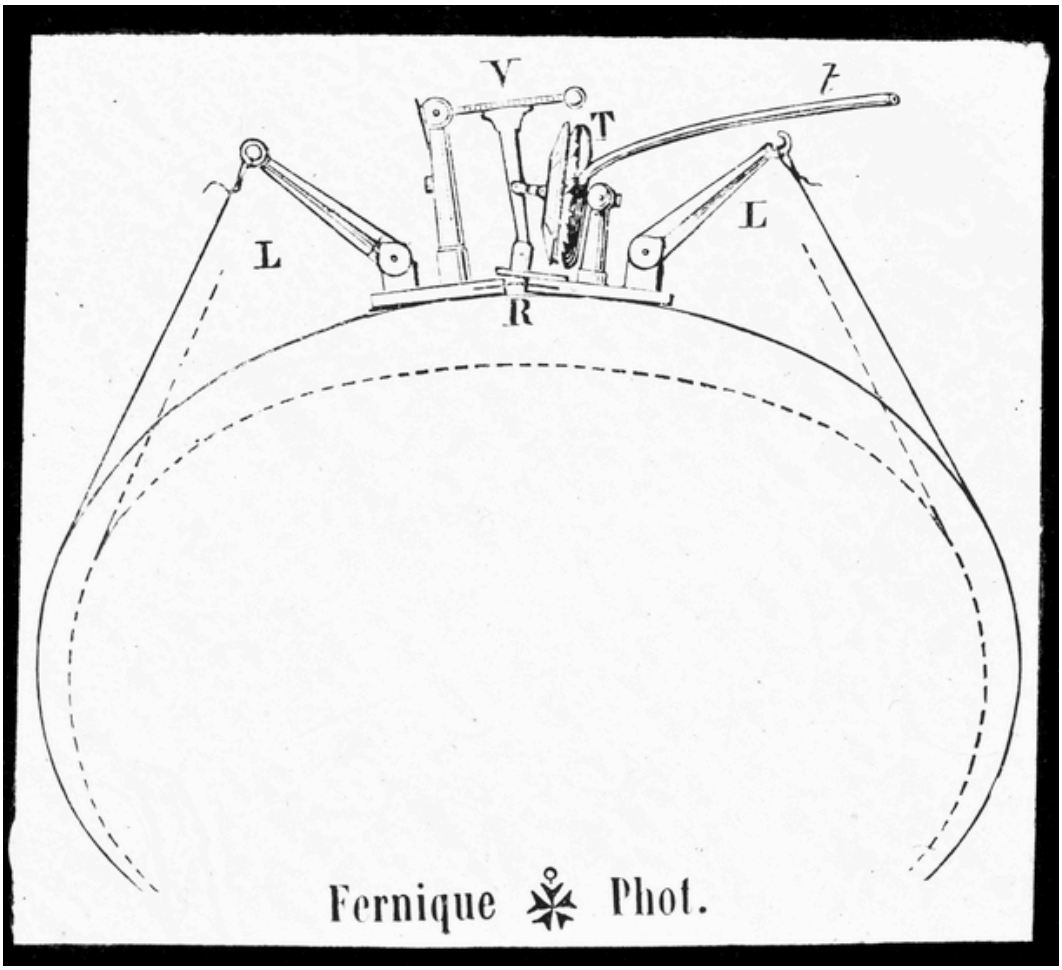

Figure 3. Appareil explorateur de la respiration. Source: Etienne-Jules Marey, undated. Services des Archives, Collège de France.

[194] William Dwight Whitney, *The Century Dictionary and Cyclopedia* (New York: The Century Co., 1889-1914).

Figure 4. Pneumographe. Source: Etienne-Jules Marey, undated. Services des Archives, Collège de France.

Breathing Kinds

What kind of bodily process was the breath? The way a heart beat or a kidney secreted urine was undoubtedly universal. And according to some accounts, breathing, too, had norms. The tension that pneumographic studies of respiration opened had been noticed by Mosso: What was a normal respiratory rhythm? Was periodic respiration pathological or not? And yet more importantly, who or what controlled the rhythms of breathing, made them start, stop, gave breathing duration in time? One set of answers to these questions emphasized a kind of determinism in the breath. Mosso, for example, traced rhythm to "nervous centers." But in other work, selves and their modes of breathing were timeless and immutable. First, then, I want to share an account of uses of the pneumograph by those outside of experimental psychology proper. This was where human kinds, most broadly, were classified according to the breath.

Ways of breathing were once a way of naming and knowing differences between people, and in the heyday of the pneumograph it was thought to be able to reveal differences in gender, levels of civilization, and so-called "race." A way of breathing revealed something natural, intrinsic, and unchanging about a person. And the implicit assumption underlying such universalism was that there were a limited number of ways to breathe. There was, to put it simply, something called normal breath. And of course breath was, at the same time, an experience and necessity shared by all, one universal human experience that separated the living and the dead. What did the breath once reveal, and how is it that human breathing was once rich in distinctions that are no longer to be found there?

Breathing differences required trained attention, and perhaps even precise

instrumentation to observe. Breathing styles might not be visible, even to the trained eye. John Hutchinson, who had devoted his life to investigation of the human thorax with particular mechanico-quantificatory late-enlightenment zeal, did not claim to be able to *see* breathing:

> The character of "*the breathing*" cannot always be told by the eye, but it can always be determined by the touch. If we stand behind a patient, when seated and leaning against the back of the chair or against our person, and pass the right arm over the shoulder, extending it over the anterior part of the chest, until the hand rests upon the abdomen over the umbilical region, we command a delicate index of the breathing movements.[195]

Whether or not subjects were able to breathe "naturally" with Hutchinson's exploratory arm draped across their chests and abdomens, observations were nonetheless made. In particular, males and females invariably manifested different ways of breathing:

> It will then be found, that in ordinary *male* breathing the abdomen fist bulges outwards; the ribs and sternum nearest the abdomen gently follow this movement, until the motion, like a wave, is lost over the thoracic region. The undulation *commences* at the abdomen. This is abdominal or diaphragmatic respiration…. In *costal* breathing the upper ribs move *first*, and the abdomen *second*. This is the ordinary breathing in women.[196]

What did it mean to say that a certain breathing pattern was "ordinary"? Hutchinson's was a normative kind of ordinary. In fact, for women or men to breathe otherwise would have indicated a kind of pathology: "Therefore that which is a healthy respiratory movement in women is pathological in men."[197] One's breathing, male or female, abdominal or costal, was given, natural. To change this given, to breathe now in the belly, now in the chest, was unimaginable.

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[195] John Hutchinson, "Thorax" in Robert B. Todd, *Cyclopedia of Anatomy and Physiology*, (London: Sherwood, Gilbert, and Piper, 1852), 1079.

[196] ibid., 1080.

[197] Ibid., 1082.

All of this had precedent in the scholarly medical tradition. The influential Dutch physician Hermann Boerhaave, cited as the authority on sex difference in breathing by Hutchinson (among others), had considered the flexibility of respiration. He opened his extended discussion of respiration with the fundamental observation that it "continues without the influence of the mind" and is partly "vital or spontaneous" and partly voluntary.[198] The movements of respiration were not like the beating of the heart, he perceptively observed, for while the heart could indeed be caused to speed up or slow by intentionally altering the breathing, there was no way to change the motion of the heart directly, intentionally. Though he had recognized respiration to be an action at once volitional and automatic, there was little *plasticity* of the motions of breathing themselves, in the form of the muscles recruited, and where in the body the motions of breathing were taking place. The changeability of breathing seemed relegated, simply, to whether they was happening or not, a matter over which an individual could exercise some limited control. That a particular man or woman in a given time or situation might breathe *differently,* for example, recruiting different muscles to perform that basic action, was not imagined. There was a limit to how much the breath could be modified. There was such a thing as a way of breathing, natural to the kind of person you were.

In Hutchinson's view, for example, women couldn't help but breathe according to the female breathing pattern. In fact, women barely breathed abdominally at all. Not even a little bit: "The movement over the abdomen of the female is so small, that the number of the respirations cannot be counted by the hand resting on that region as it can be on the

[198] Hermann Boerhaave, "Of Respiration" in *Dr. Boerhaave's Academical Lectures on the theory of physic*, Vol. V, sec. 623 (London: Printed for W. Innys, 1742-46), 390.

male."[199] Why should such a thing be? Hutchinson borrowed Boerhaave's explanation:

> The question of why women breathe costal, and men abdominal, we cannot pretend to answer. We doubt its being caused by any tight costume, for we found the same to exist in twenty-four girls between the ages of eleven and fourteen, none of whom have ever worn any tight dress. This peculiarity may be a reservation against the period of gestation, when the abdomen cannot allow of so free a descent of the diaphragm.[200]

This distinction did not seem to be a matter of habit, of clothing, or of training. Such a difference was necessary as a protection against the various strains that pregnancy would place on a female body. How could a woman breathe abdominally when that space in her body would be occupied by a developing fetus? The difference had to be natural rather than acquired since it was already visible in sleeping children, surely the most natural and unaffected of all people: "If you observe a boy of a year old and a girl of the same age, sleeping in the same bed, you will perceive that when the girl breathes the whole thorax ascends towards the throat, where as in the boy the thorax and clavicles have little motion."[201]

The *observation* of sex difference in breathing, bolstered by anatomical descriptions, was repeated without question until at least the end of the nineteenth century. But in 1887, Thos. J. Mays, M.D. delivered "An experimental inquiry into the chest movements of the Indian female" before the Philadelphia College of Physicians. His intention was to show that in the supposed state of nature, before the corrupting influence of civilization, males and females had in fact breathed in the same way. He summarized Boerhaave's observation that in males, abdominal or diaphragmatic

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[199] Hutchinson, "Thorax", 1080.

[200] John Hutchinson, *The Cyclopaedia of Anatomy and Physiology*, ed. Robert B. Todd (London: Longman, Brown, Green, Longmans, & Roberts, 1835-59), s.v. "Thorax," 1081.

[201] Ibid.

breathing is most prominent, while females tend to what was then called "costal" breathing (or thoracic, above-the-diaphragm, breathing). Neither Mays himself, nor Hutchinson, whom he cites as an authority, questioned that Boerhaave had indeed observed a difference between the breathing of males and females. Instead, Mays simply wondered if the difference was inborn or acquired by such habits as restrictive female dress. Science was lucky to have what Mays considered to be living specimens of the human body before civilization and in varying stages of the civilizing process. These were American Indian schoolgirls in Boston: "It occurred to me than an observation of the respiratory movements of females of a wild race, who had never been subjected to the constriction produced by civilized dress, would assist in solving this problem."[202] And so he thanked the directresses of the Lincoln Institution for providing him access to the movements of 82 "chests," those of the Indian girls at the school. The results, not surprisingly, revealed his hypothesis that the gender divergence apparent in breathing was a cultural artifact rather than a natural given. Indeed, even the degree of the influence of civilized culture could be observed in the breathing patterns: "Those who showed the costal type, or a divergence from the abdominal type, came from the more civilized tribes, like the Mowhawks and Chippewas, and were either one-half of three-fourths white; while in no single instance did a full-blooded Indian girl possess this type of breathing."[203] The relative presence or absence of Indian blood supposedly corresponded to a degree of civilizational influence. All of which was confirmed in the breathing pattern.

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[202] Thomas J. Mays, "An Experimental Inquiry Into the Chest Movements of the Indian Female," *The Therapeutic Gazette,* May 1887*,* 297.

[203] Ibid., 297.

In 1890 at his Battle Creek Sanatorium laboratory, using yet another version of the pneumograph, John Harvey Kellogg repeated and felt he had confirmed Mays' results, but this time with a broader range of subjects including several non-human ones:

> hundreds of women, including not only civilized women, but twenty Chinese women, and twenty-five Indian women of different tribes, most of whom were of the primitive Yuma tribe— women who had never worn any other clothing than small bark aprons before and behind. Among the civilized women were women of fashion, reared in luxury, laboring women, French and Italian peasant women, and artist's models. I have also made tracings of male and female dogs. As a result I find that men and women breathe alike, as do the males and females of other species, when the clothing worn is not such as to interfere with the respiratory movement.[204] (See Figure 5.)

[204] J. H. Kellogg, "Graphic Methods of Recording Diseased Conditions of the Lungs, and a New Form of Pneumograph," *Transactions of the Annual Meeting of the American Climatological Association* 7 (1890): 61. In spite of several attempts to demonstrate otherwise, claims that there existed anatomical and other differences between the breathing of males and females persisted. A 1913 study on breathing and oral reading, for example, claimed: "Girls are in many cases better readers than boys. This has usually been thought due to indifference on the part of the boys, but the suggestion here given is that the boys do not have certain co-ordinations of the respiratory organs which are essential for good reading." C. Truman Gray, "The Relation of Breathing to Oral Reading," *Journal of Education Psychology* 4 (1913): 41.

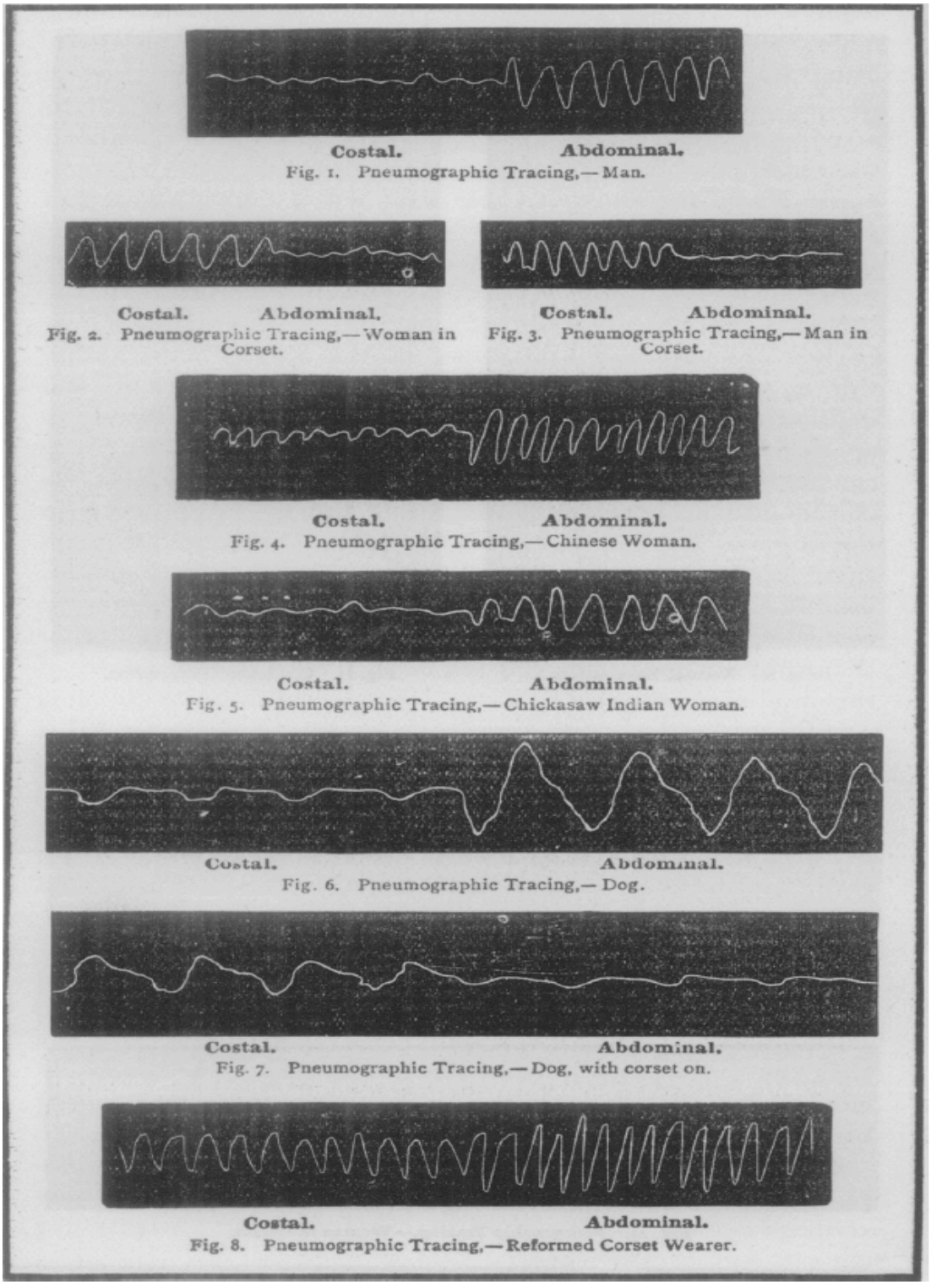

Figure 5. J. H. Kellogg's use of breathing tracings to distinguish nature, cultures, and kind. Source: J. H. Kellogg, "Graphic Methods of Recording Diseased Conditions of the Lungs, and a New Form of Pneumograph," *Transactions of the Annual Meeting of the American Climatological Association* 7 (1890).

Studies like those of Mays and Kellogg assumed rigid boundaries around kinds of human bodies, and therefore assumed that the breathing of those bodies would likewise be characterized by patterns natural to such kinds. In questioning long-held convictions about gender and normal breathing, the possibility of "civilization" writing on bodies certainly entered the conversation. But all the same, the idea of a normal, natural breathing was the standard against which the influence of civilization was measured. Kinds of dress, for example, could mold the body against nature, causing unhealthful, unnatural contortions of body and breath. These modifications of the breath were in the family of the diseases of civilization rather than the breathing of a great period.

Breathing in American Experimental Psychology

While the primary purpose of the pneumograph was to capture the breathing of different human kinds, it also promised a view into the sources of human experience, into what was referred to as the "psychical." Fitz, Mays, and Kellogg were differentiating human kinds during the period of the founding of the discipline of American experimental psychology. And experimental psychologists took an interest in the breathing and what it might reveal about the mind. The experimental exploration of connection between respiration and what was sometimes referred to as the "psychical" was in fact a commonplace of the newly emerging discipline and scholarly literature of university-based experimental psychology. Rather than making a case for the significance of breathing as a partner of the mind, early studies mainly tried to work out the details of this interdependence. Here again we will see a prevailing determinism about the rigid connection between breathing and kinds of people, or, in this instance, qualities of

emotional and mental experience.

The decade between 1890 and 1900 represents a very significant period in the founding of American experimental psychology. In 1890, for example, there were few university laboratories, but by 1900 there were seventeen.[205] In 1887 G. Stanley Hall founded the discipline's first American journal, *The American Journal of Psychology*, and by 1894 the discipline had grown sufficiently for the sprouting of a rival faction in the form of Cattel and Baldwin's *Psychological Review*, which published works by those *not* wanting to be affiliated with Hall and Clark University. American psychological studies that used the pneumograph to examine respiration began to appear in the newly founded journals by the end of the 1890s. The sources and philosophical commitments of psychophysics will be taken up in more detail in the next chapter, but for the moment it's worth mentioning that these papers were expressly inspired by the psychophysical school of Wilhelm Wundt. Almost all of the German language works that were cited in later American works on respiration and the mind can be traced in some way to Wundt's theoretical and experimental program. Many such papers on respiration and the mind appeared in his journal *Philosophische Studien,* and anything published there was closely affiliated with Wundt's Leipzig laboratory (the journal under this name was published from 1881 to 1903).[206] If the work itself had not been completed in his laboratory, then it was carried out by close colleagues or recent students of Wundt's at other locations.

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[205] Deborah Coon, "Standardizing the Subject: Experimental Psychologists, Introspection, and the Quest for a Technoscientific Ideal," *Technology and Culture* 34, no. 4, Special Issue: Biomedical and Behavioral Technology (October 1993): 757-783.

[206] Apparently Wundt wanted to call his journal *Psychologische Studien* right from the beginning, but tellingly this name was already being used by a publication for those interested in esoteric, occult, and psychic phenomena. Wundt had to wait until 1906 for the title to become available. Perhaps its predecessor was not sufficiently well-established to carry any misleading associations for its readers. Or perhaps by 1906 the new discipline of psychology had sufficiently staked its turf and terminology.

Wundt himself put his energies into the writing of programmatic, theoretical, and methodological statements that appeared in the journal, while reports of research under his umbrella were presented by others.[207]

In 1898, "The Influence of Forced Respiration on Psychical and Physical Activity" appeared in G. Stanley Hall's newly founded *American Journal of Psychology.*[208] This was the first of many papers in the early American experimental psychology literature to touch on the relationship of breathing and the mind. And while its author was one of the few to consider the possibility of altering respiration, it does not do so with a view to "transformation" of the mind or self. Instead, it is a fine example of the view of the one-to-one mapping of breathing and the mind that I want to suggest was characteristic of this genre.

Its author, one Guy M. Whipple, thanks Hall for suggesting the topic and for the compelling discussions of it in Hall's lectures on "Cosmology."[209] Hall had studied with Wundt, and had been briefly at his Leipzig laboratory in 1879, the year of its founding, though apparently Hall found the lectures incomprehensible and switched to physiology.[210] The depth of Hall's engagement is further brought into question by the often cited if gossipy story that his long chapter on Wundt that appeared in his 1912 *Founders of Modern Psychology* was almost entirely fabricated (causing no small

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[207] Edwin G. Boring, *A History of Experimental Psychology* (New York: Appleton-Century-Crofts, Inc., 1950), 347.

[208] Guy M. Whipple, "The Influence of Forced Respiration on Psychical and Physical Activity," *American Journal of Psychology* 9, no. 4 (July 1898): 560-571.

[209] Ibid., 560 n. 1. Though the Clark University G. Stanley Hall papers include listings for a course Hall taught called "Cosmology," no notes or evidence of the content of this course remain.

[210] Arthur L Blumenthal, "Wilhelm Wundt and Early American Psychology: A Clash of Cultures" in *Wilhelm Wundt and the Making of a Scientific Psychology,* ed. R.W. Rieber (New York: Plenum, 1980), 130.

consternation to Wundt himself when the German translation appeared).[211] But the faithful rendition of Wundtian psychophysics isn't really at issue here; instead the point is to get a sense of the way that early American experimental psychologists were thinking about, and working with, breathing.

Whipple's subjects performed two minutes of "forced breathing" (each subject carried this out somewhat differently, but all breathed at varying depths of chest, thorax, and abdomen, and all breathed between twenty and thirty-six times per minute). The forced breathing made the subjects dizzy, caused them to see black spots swim before their eyes, and made their feet and hands prickle and tingle. Often they also felt "a secondary effect of exhilaration" that went away as soon as they relaxed the breathing rate. Within a minute of relaxing the breathing (during which time a natural apnoeic pause of up to two minutes was observed), tests of physical and metal "conditions" were given. [212] These included discriminating between different shades of gray, adding numbers, sorting cards into two piles, testing grip strength, and testing reaction time to sounds among a host of other variables.

The execution of the experimental protocol did not come off without unforeseen challenges. There were six subjects, one of whom struggled with the tests even before he did any rapid breathing. He performed so poorly sorting cards that "a substitute test was provided, consisting simply of making small crosses with a pencil at maximum speed for 30 seconds. This was not a very satisfactory test, but showed, so far as it showed

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[211] Boring cites Wundt's own assessment: "von Anfang bis zu Ende erfunden." (*Erlebtes und Erkanntes*, 155), in Boring, *A History of Experimental Psychology*, 344.

[212] "It is also an important fact that the same rate and depth of respiration, which in forced breathing gives rise to apnoea, when it occurs as a natural concomitant of muscular exercise, excites no fatigue and is followed by no apnoea." Whipple, "The Influence of Forced Respiration on Psychical and Physical Activity," 562. [See Marcet]

anything, the same negative results as the other."[213] There were other moments of experimental error. During the memory portion of the study, nonsense syllables were briefly flashed and then elicited for recall. When it was revealed that a Japanese subject was sometimes memorizing the syllables in English, and sometimes in Japanese, his results were discarded (the curious question of what it might have meant to memorize a meaningless sound in one language or another goes unexplained). And still other results had to be left out: "Owing to a loss of some records, the mean variations in the *individual* reaction times of all the subjects cannot be given."[214] Which is to say, some of the data was lost.

The challenges of experimental science notwithstanding, Whipple felt that he had showed that forced breathing "seem[s] to point to an improvement of the muscular mechanism [throwing cards accurately into two piles was unaffected], as [sic] the expense of the mechanisms of control and of the higher functions such as arithmetic, discerning colors, memory, reaction time, generally."[215] There was no mechanism for such an effect given. Nor was any complex theory of consciousness, feeling, or emotion elaborated. But the study was, Whipple claimed, rich in implications: "They [the experiments] have been somewhat rough in character, intended to blaze a path in a new direction and to find general bearings than to make exact determinations of particular points."[216] As seemed was often the case when it came to breathing, so full of rich potential, certain knowledge of the phenomenon was certain to come. Later. Most

[213] Ibid., 566.

[214] Ibid., 566 n.1.

[215] Ibid., 571.

[216] Ibid., 563.

importantly, Whipple aimed to determine the effect of rapid breathing on the body and on the "higher functions," as though there were one, natural, timeless relationship.

The Wellesley professor of psychology Eleanor McCullogh Gamble somewhat apologetically used a report of her "results of somewhat fragmentary tests upon two frightened cocker spaniels" to more directly address the particular problems associated with capturing samples of natural breathing in order to correlate them with attention and the emotions:

> It is true not only that respiration, unlike circulatory phenomena, is largely under voluntary control, but also that in a pneumographic test the attention of the subject is necessarily called to his breathing by the nature and position of the apparatus. There is, therefore, great danger both that the subject of scientific training will breathe according to theoretical considerations—or will try not to do so, which is quite as bad—and that the alert adult who is tested many times over will breathe according to past self-observations. This risk is avoided when average or when typical results from a large number of untrained subjects are secured. An additional advantage in the case of children is the fact (recognized by Binet) that they may be roused to very real emotions, even under laboratory conditions. In this investigation, genuine emotion was very rarely secured except in the case of the children, the whist-players, and the dogs.[217]

The object, it seems, was to find correlations between specific, "genuine" emotions and specific, "natural" breathing patterns. The way that these were thought to manifest in almost Marey-like quantized species is suggested in the images from the Columbia MA thesis of Antionette Feleky, who carried out a fairly typical attempt to correlate emotions with respiration using pneumographic tracings.[218] (See Figure 6.)

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[217] Eleanor McCullogh Gamble, "Attention and Thoracic Breathing," *The American Journal of Psychology* 16, no. 3 (July 1905): 263.

[218] Antionette Feleky, "The Influence of the Emotions on Respiration" (M.A. thesis, Columbia University, 1914).

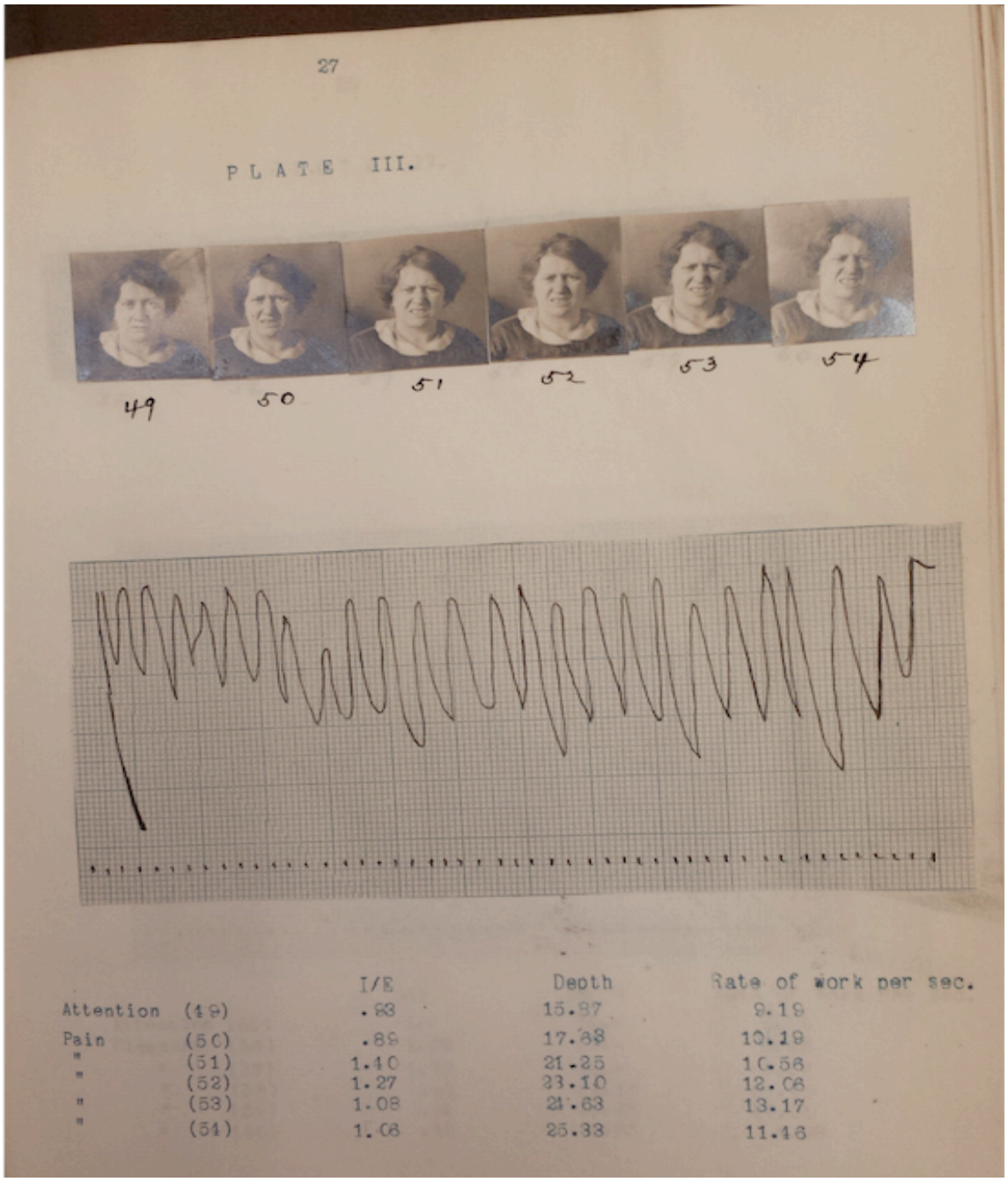

Figure 6. The correlation between the experience of pain and respiration. Source: Antionette Feleky, "The Influence of the Emotions on Respiration" (M.A. thesis, Columbia University, 1914). Columbia University Archives.

Respiration and Emotion in Pigeons

Around 1905, it wouldn't have been at all unusual to find a title like "Respiration and Emotion in Pigeons" in an American journal of psychology. In fact, one John E. Rouse published a paper under exactly this title.[219] It had been his doctoral work carried out under Hugo Munsterburg at Harvard Psychological Laboratory. (The laboratory is sometimes called William James' Laboratory, but by the time of Rouse's work, James had recruited the German but nonetheless application-minded experimentalist Munsterberg to be its director.)[220] Rouse had been awarded the doctorate for showing first that his pigeon preferred blue light (it moved toward blue and away from other colors when exposed simultaneously to different colors on each side for thirty minutes), and that the bird's respiration increased significantly when it saw this supposedly favorite color. As other researchers in his discipline would have, Rouse felt comfortable inferring from the animal's color preference that it was experiencing something like pleasure. Since animals could not "introspect" as human beings could, the psychologist might construct the results of such introspection by analogy with his or her own experience.[221]

The pigeon was placed in a "nest" specially engineered with a plate at its bottom to measure breast movements. It wasn't necessarily a comfortable place for the bird to rest: "The animal's feet were so troublesome that it was found to be best to secure them in an easy position by means of tape fastened to hooks behind."[222] (Neither the pigeon's

[219] John E. Rouse, "Respiration and Emotion in Pigeons," *Journal of Comparative Neurology and Psychology* 15, no. 6 (1905): 494-513.

[220] Jeremy Blatter, *The Psychotechnics of Everyday Life: Hugo Münsterberg and the Politics of Applied Psychology, 1887-1917* (Ph.D. thesis, Harvard University, 2014).

[221] Thomas Hardy Leahey, *A History of Psychology,* 4th ed. (New Jersey: Prentice Hall, 1997), 324.

[222] Rouse, "Respiration and Emotion in Pigeons," 496.

emotional nor any other kind of response to having its feet taped to hooks was discussed in spite of Rouse's explanation that he was using a bird species as their emotional complexity exceeded that of even dogs.)[223] Before settling on color, Rouse experimented with other kinds of sensory stimuli including pistol shots, ringing bells, and various smells presented to the animal, all of which presented their own problems: "Oil of bergamot and lily of the valley produces no appreciable reactions. A slight sensitiveness was shown to asafoetida (see fig. 4)… Turpentine and ammonia produced marked reaction, which consisted in quickening and *deepening*, which great irregularity. In some cases the expiration was clearly active and greatly emphasized."[224]

At first, the gunshots made the pigeon jump, displacing the sensitive measuring device (about which more below). But eventually the bird just stopped responding to the sounds entirely, and the respiratory curve likewise registered no change. Meanwhile, there was concern that stimulation of the bird's beak with the tray on which the odors were presented or perhaps the smells themselves would trigger the same arrest of respiration that wetting the beak of diving birds had been shown to do.[225] And so Rouse settled on color.

As part of his justification for the use of color, Rouse offered a sort of bridge between the pigeon's behavior and its emotional experience: "For the short flashes of light probably gave the animal *glimpses* of its prison, *increased desire* to escape, etc., in a word, *meanings*, which involved heightened, rather than depressed, breathing activity,

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[223] "Both daily observation and numerous expressions in literature indicate the highly developed emotional life of birds. All other lower animals, even dogs, are inferior to them in this regard." Ibid., 494.

[224] Ibid., 500.

[225] "It is a significant fact that stimulating the beaks of some diving animals with water, results in a considerable arrest of breathing." Ibid., 501.

and worked directly against the dulling tendency of repetition."[226] Whether or not it was because the blue light gave the trapped bird a sense of possible freedom, quickening its breath in anticipation, Rouse's data showed that blue light caused an increased rate of respiration. And based on these findings, he determined that when the pigeon experienced pleasure rather than unpleasantness, its respiration concurrently increased.[227] Pleasant experience corresponded to an increased rate of respiration.

Rouse concludes with a generalization from his breathing pigeon to human beings. The connection between the two apparently distinct creatures was made as the respiratory behavior just seemed so very similar:

> Hence, we should probably be justified in inferring, on the basis of two sets of data, that *increased respiratory activity is a sign of agreeable stimulation* in pigeons as in man, and this especially if we recall that the amplitude of the animals breathing curve, when varying at all, generally became shallower, and that frequently certain minute irregularities of contour were noticed, *as often occurs in human respiration during stimulations of a pleasant character*.[228]

The study was unique and innovative only in one respect—that it used pigeons rather than human subjects. With the exception of the pigeons, then, Rouse's work was altogether boilerplate, a typical attempt to correlate simple phenomena of the breathing with simple emotional or cognitive categories or (apparent) experiences. The only reason his work is not entirely forgotten is that John B. Watson in his 1916 *The Place of the Conditioned Reflex in Psychology* used what he called "Rouse's respiratory apparatus" to an entirely different end than that with which Rouse had designed and used it: to study

[226] Ibid., 512.

[227] Ibid., 509.

[228] Ibid., 509.

the conditioned "respiratory reflex."[229]

The Relations Between Certain Organic Processes and Consciousness

Prior to what would be almost a decade of attempts to fill in the details of the purported rich linkages of respiration and the mind, an early paper by Watson's soon-to-be dissertation advisor had tried to discard the idea. Though the authors presented themselves at the outset as cautiously optimistic, they ultimately claimed that knowledge of a detailed connection between respiration and the mind, if there was indeed such a connection, was practically inaccessible. Theirs was a tempered version of what would eventually be Watson's reduction of respiration from a potentially revealing window into the mind to nothing more than a hollow reflex. More engaged with the German literature than other American authors, James Rowland Angell and one of his former students, Helen Bradford Thompson, attempted to bring some kind of order to what they claimed were inconsistent conclusions about breathing.[230] Together they took up "organic processes"—which in their experimental protocol meant respiration and pulse—and "consciousness" in the hopes of clarifying a confused state of affairs. Their work appeared a year after Whipple's paper in the rival journal established for those *not* in alignment with Hall's program. Angell and Thomson both reviewed other studies and carried out some of their own using pneumographic recording. Work to date, they summarized, had relied on the Wundtian categories of "pleasant" and "unpleasant" sensations and emotions (as would many works to come, such as those by Rouse and

[229] James B. Watson, "The Place of the Conditioned Reflex in Psychology," *Psychological Review* 23 (1916): 89-116.

[230] James Rowland Angell and Helen Bradford Thompson, "A Study of the Relations Between Certain Organic Processes and Consciousness," *Psychological Review* 6, no. 1 (1899): 32-69.

Gamble). German, French and Italian work by Mosso, Lehmann, and Féré, for example, had attempted to identify corresponding dilation or constriction of blood vessels, among other physiological correlates, at these opposite poles of possible "psychical" experience. But this body of work, according to Angell and Thompson, had not succeeded in finding any such *consistent* physiological correlates of complex experience:

> An inspection of the literature dealing with the relation of these processes [respiration and circulation] to consciousness reveals a condition of disagreement among investigators, both as regards fact and theory…Within the bounds of its pretensions our formula, if correct, will have the value of a centralizing, harmonizing principle for a mass of facts which, from many points of view, appear self-contradictory and unintelligible.[231]

Their solution was to remove any of the particular "content" of consciousness from the equation. Rather than a particular breath or pulse pattern characteristic of pleasure or pain, Angell and Thomson folded everything into the organism's capacity for maintaining equilibrium in the face of various kinds of shocks, disturbances, and interruptions. The sudden interruption by a distressing thought of a friend's illness, a disagreeably loud noise, the irritating smell of capsicum; all these threatened the delicate balance of the attention. Bodily processes varied, they claimed, together with the relative degree of stability of attention. They discarded Wundt's binary of "pleasant/unpleasant" and replaced it with "regular/irregular." A "regular" or even flow of attention would correspond to "regular" respiration and pulse curves, while discontinuities in the attentive equilibrium would be mirrored in respiratory discontinuities. They avoided the particularities of the variables other researchers had strayed into while observing the breath—rate, amplitude, depth—and turned to averages represented as "regular" or "irregular." Though breath did seem to be related to attention (about which, more below),

[231] Ibid., 32.

there was no richness of the mind to be found mirrored in the precise movements of the breath. Erasing, or at the very least, removing emphasis from the connection between breathing and the mind, they at once disregarded any possibility of modification of the breath. Using Rouse's respiratory apparatus, James Watson would take this hesitant claim to its full conclusion.

The Varieties of Conditioned Reflex

The following image is "Figure 5" of the paper in which Watson attempts to show a methodology that can finally replace *introspection* in psychology.[232] (See Figure 7.)

[232] Watson, "The Place of the Conditioned Reflex in Psychology."

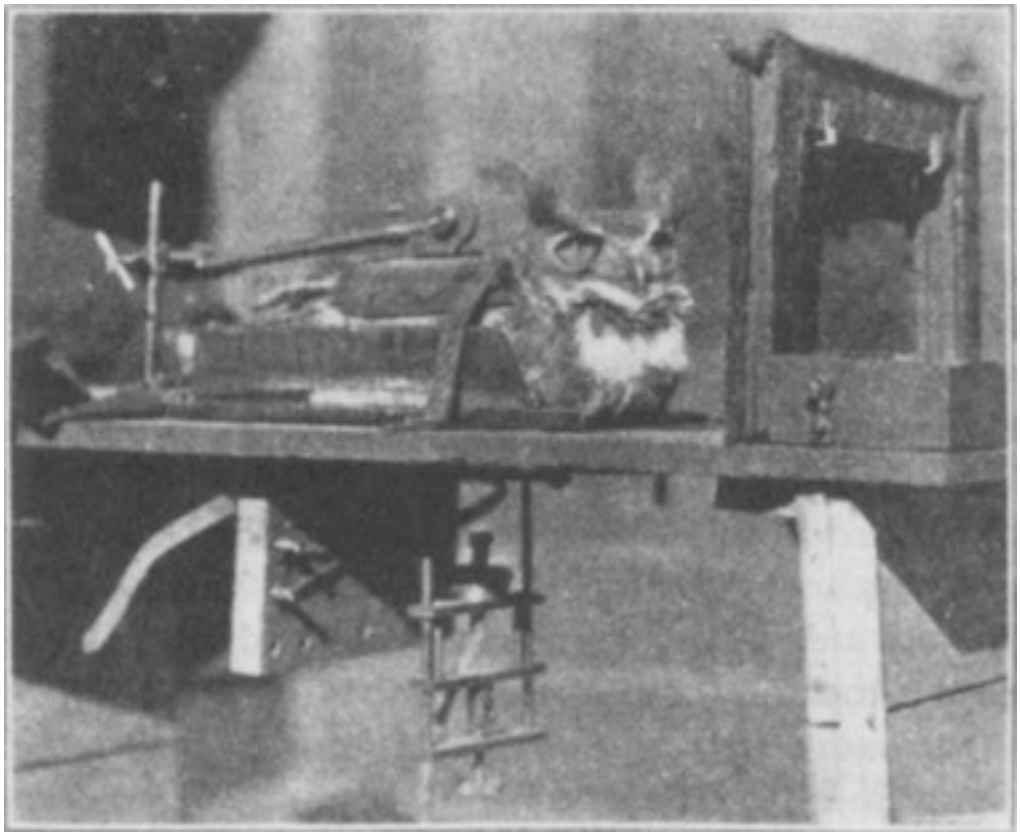

Figure 7. Watson's use of Rouse's "respiratory apparatus."

[original caption]: "Figure 5. Method of obtaining respiratory reflex in all birds. The great horned owl is shown resting comfortably in a padded wooden saddle. Underneath the floor of this apparatus Rouse's respiratory apparatus is shown, sliding on vertical rods. A V-shaped button is shellacked to the receiving tambour, which is adjusted lightly against the bird's chest. The owl's feet are attached to a punishment grill." Source: James B. Watson, "The Place of the Conditioned Reflex in Psychology," *Psychological Review* 23 (1916): 107.

In his 1916 paper "The Place of the Conditioned Reflex in Psychology," Watson was extending the phenomenon of Pavlovian conditioning to all subjects, human and animal, and extending it yet further to account for the vast majority of behavioral phenomena. Rouse had casually assumed a world of intention, meaning, and emotion for

the pigeon, and had assumed that the bird's breathing could reveal all of these. As far as Watson was concerned, the breathing was no longer a rich sign in and of itself. In his 1916 paper, the owl, six chicks, a beagle of "very mixed breed" and an eight-year old child had all been trained to associate a bell sound with the "punishment" of an electric shock (or "faradic stimulation" as Watson euphemistically called it), and after training to display "the reflex" on hearing the bell alone. These reflexes were retraction of the foot or finger or what Watson called "the Respiratory Reflex." The respiration was, he said, very sensitive and the conditioned reflex could be clearly seen on a respiratory tracing. In particular, the ringing of the bell caused deep inspiration, and an overall slowing of the rate of breathing.[233] Watson was interested in the breathing no more than he was interested in the motion of the toe or finger: these were just the measurable signals indicating that the connection between bell and punishment had been made. There was no particular or interesting connection between breathing and the emotions; indeed a subject need not have any emotions, nor associate any kind of "meaning" with a stimulus: "We give no more instruction to our human subjects than we give to our animal subjects. Nor do we care what language our subject speaks or whether he speaks at all. …The data which we collect in this way, while they have no bearing on a Wundtian type of psychology, serve (as far as they go) every practical scientific need of a truly functional psychology."[234]

Jung's Pneumograph

Before leaving the pneumograph, there is one more issue to consider. Perhaps,

[233] Ibid., 106.

[234] Ibid., 101.

one might think, part of the reason that early experimental psychology's studies of respiration sought to connect "normal" breathing to a closed set of "normal" kinds of psychical experience was because there was no idea of depth in the mind; the mind in early experimental psychology did not include an unconscious. To suggest that there was more to it than this, that what we have is a different view of the possibility of self and body transformation, let us consider Carl Jung's work with the pneumograph.

Already having read the dream book, in 1906 Jung wrote to Freud admitting that a dream he had published and attributed to a friend was actually his own. In the dream, a horse is raised high above the ground on a cable, only to fall, hitting the ground below. In his letter, Jung explained that the dream revealed his desire to travel to America in order to advance his career, but that he was prevented by his wife's perpetual pregnancies. In the year following the birth of his second daughter, Anna, he nonetheless began to make his international reputation, co-authoring several articles with Frederick Peterson and Charles Ricksher, Americans studying at the Burghölzi hospital in Zürich,[235] which were published in English language journals.

Jung's austere if enthusiastic work ethic and his unusual capacity resulted in his continual promotion through increasing levels of clinical and academic responsibility during his first five years at Burghölzi. In 1905, already both a clinical director and lecturer in the university (the latter title carried more prestige than ours does), he established a laboratory of "experimental psychopathology" the research program of which relied heavily on the use of word association tests.[236] Unlike previous uses of both association in studies of the mind, Jung was interested not in the conscious but

[235] Frank McLynn, *Carl Gustav Jung* (New York: St. Martin's Press, 1996), 85.

[236] Ibid., 70.

unconscious associations made by patients; the hesitation, delay, or physical reactions to a particular word were not realized by the test subjects themselves, but were clearly visible to the observers.[237]

The conventional experimental techniques (association, the pneumograph, galvanometer, and kympograph recordings) were thus used in the service of a very different theory of mind. Out of this laboratory work came the two co-authored papers which the galvanometer and pneumograph as "indicator of psychic processes."[238] Unlike other studies that relied on the techniques of either word association or the pneumograph (Pavlov, Wundt), Jung's interest was in revealing associations produced by but not available to the study subject (patient). That is to say, he was interested in revealing an unconscious.

Jung felt that the pneumograph was less revealing than the galvanometer, since, as he put it starkly: "breathing is an instrument of consciousness."[239] As for the galvanometer, it was new and the literature on it "scanty," though in the Burhölzi laboratory Jung and various collaborators had been working with it for more than a year. All evidence suggested that it worked by measuring the electrical conductivity of sweat, but there were still "features presented which are as yet quite inexplicable."[240] For

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[237] Ibid., 70.

[238] Frederick Peterson and C.G. Jung, "Psychophysical Investigations with the Galvanometer and Pneumograph in Normal and Insane Individuals" in *The Collected Works of C.G. Jung*, ed. Herbert Read et al., Vol. 2 (Princeton: Princeton University Press, 1973). Originally published in *Brain: A Journal of Neurology*, no. 118 (1907): 153-218.

[239] I'm wondering if the basic orientation to breathing is that it is more voluntary than involuntary. "As the respiration is greatly under the control of the will, to obtain the requisite accuracy in observations of this nature it would be necessary to adopt some measures by which it might be counted for several minutes at least in succession, the subject of the observation being either unconscious of what is going on, or having his attention diverted from it." Robert B. Todd, ed., *Cyclopaedia of Anatomy and Physiology* (London: Sherwood, Gilbert, and Piper, 1836-59), s.v. "pulse," 181.

[240] Peterson and Jung, "Psychophysical Investigations with the Galvanometer and Pneumograph," 497.

example, the galvanometer did not record large deflections during regular breathing, but a large or deep inhalation or exhalation, or intentional breathing did cause significant deflections. It was not clear if this was related to "psychic influence" or simply exhaustion.[241]

Writing in 1907, and entirely appraised of the relevant work in the German literature, Peterson and Jung could claim that "The relation of the respiratory innervation curve to psychic processes in both normal and pathological conditions has not yet been thoroughly investigated."[242] This wasn't merely a matter of the need to accumulate more studies, however. It was, instead, a limitation inherent in respiration itself:

> There does not seem to be the intimate and deep relationship between the respiratory function and the unconscious emotions that exists between the sweat glandular system and these emotions. It is a matter of everyday experience that the respiration is influenced by our conscious emotions, especially when they are strong, as instanced in such expressions as "bated breath," "breathless astonishment," etc. Such inhibitions of breathing are noticeable in many pneumographic curves, particularly in association with expectation and tension. *But perhaps the emotions of the unconscious, roused up by questions or words that strike into the buried complexes of the soul, reveal themselves in the galvanometer curve, while the pneumographic curve is comparatively unaffected*. Respiration is an instrument of consciousness. You can control it voluntarily while you cannot control the galvanometer curve.[243]

It was not possible to connect breathing directly to "the buried complexes of the soul," those hidden repositories that would produce visible emotions if opened with the proper keys, words, questions, images. Apparent connections could be otherwise explained. A patient in acute catatonia had no fluctuations on a galvanometer, but did show significant respiratory changes when his name was called. For Jung this was

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[241] Ibid., 498.

[242] Ibid., 506.

[243] Ibid., 512.

evidence of the old and deep connection between the speech and respiratory centers: "In this instance the call by name was a stimulus that acted as in a simple reflex process, and led to motor manifestations in the respiratory muscles connected with the motor speech center." It was just like the eye closed in response to a flash of light.[244]

Quite the opposite of revealing hidden contents, Jung's work with the pneumograph and galvanometer suggested to him that breath tracked *conscious* states, and not hidden ones. Breathing was a physical manifestation that the "conscious" mind could control, while sweating was more occult. Even if it was not "willful" breathing, the act of continuing to think or perseverate on an emotional stimulus no longer passing through the body (as evidenced by the galvanometer) could be seen in a respiratory tracing. It was possible to see evidence of some emotional stimulus in the respiratory curve, but this was clearly more under the influence of conscious process than the galvanometer, which was "an index or measure of acute feeling-tone." The pneumographic traces could show "traces of conscious reminiscence."

Jung and Peterson felt that Mosso, one of the first to try to correlate sensory stimulation with pneumograph recordings, had been unable to come to any significant or certain conclusions. Other work was equally inconclusive and ridden with artifacts to which the researchers were not sensitive. Of all studies of respiration and psychic processes, the work by Martius and Minnemann was most "thoroughly iconoclastic and yet excellent." It enumerated the sources of inconstancy of the respiratory curve that had been mistaken for significant by other researchers: the subject's embarrassment, self-consciousness, lack of interest, age, temperament, or peculiar tendency to react to or

[244] Ibid., 513.

dwell in states of affect. All that Jung and Peterson could conclude was that strong emotions seemed to quicken, lengthen the breath while making it more shallow.[245]

Of course Jung would not become known for his experimental work. But the patients whose respiration and galvanic skin response he studied at the Burgholzi were the kind of patients on whom the early cases of psychoanalysis were based. That is to say, these psychiatric patients of the late nineteenth century were characterized by the *physicality* of their mental suffering. Their complaints were precise, visible, intolerable states of the body. They vomited every night at midnight. They swooned, fainted, fell to the floor. They became catatonic. They laughed uncontrollably.[246] This kind of body evokes the body sensation model of the experimentalists; this is an embodied malaise of the mind. Psychoanalysis, of course, had its first famous cases from such patients. But the "talking cure" grew into a treatment for the mind rather than the body. It is too simple to to say that there is no body in psychoanalysis, but the body is not the precisely sensing body of the experimentalists.

The Disappearance of the Pneumograph

Commonly used for a time, the pneumograph—and the entire idea of direct, real-time recordings of the respiration—eventually fell out of favor. By 1935, more than forty years after the pneumograph was first used in experimental psychology, a London

[245] Ibid., 508. The work Jung discusses is Martius and Minnemann, *Beitraege zur Psychologie und Philosophie* (Leipzig: W. Engelmann, 1905).

[246] Richard Sennett interestingly claims that this kind of patient no longer exists: "The clinical data on which classical psychoanalysis was built have in part disappeared." Sennett, "Narcissisim and Modern Culture," *October* 4 (Autumn, 1977): 70-9. He suggests that concrete physical instantiations of psychic suffering have been replaced by "malaise endemic to character states, an inability to feel or to become aroused; a persistent sense of illegitimacy which is at its strongest when one is being rewarded as legitimate; a sense of being dead to the world" (71).

psychiatrist who used the technique to study the difference between "normal" and "psychotic" subjects had to explain: "Towards the beginning of this century considerable interest was taken in the character of the respiratory curve. The chief object in view was to ascertain whether certain states of mind were accompanied by characteristic types of respiratory record."[247]

Explanation was required since the use of respiration by psychophysics was widely believed to have been a failed endeavor. Karl Bühler, for example, writing in the early 1930s on Wundt's theory of gesture, gave his assessment of the situation: "The psychophysics of Fechner and Wundt sets out on its journey with proud sails, trustful in the newly discovered methodology of experimentation with impressions and expressions. But today the sea has become calm around them. The results of the investigations on pulse and breathing by experimenters in Wundt's laboratory are commonly rejected."[248] It is certainly not insignificant that such an assessment comes from Karl Bühler, a founder of the Würzburg school that had introduced the idea of "imageless thoughts" which Wundt famously called a "sham."[249] But it wasn't simply personal antipathy, if the almost total disappearance of what had been a steady stream of experimental studies

[247] Arthur Paterson, "The Respiratory Rhythm in Normal and Psychotic Subjects," *Journal of Neurology and Psychopatholy* 16, no. 61 (July 1935): 36-53.

[248] Karl Bühler, "The Psychophysics of Expression of Wilhelm Wundt," in Wilhelm Wundt, *The Language of Gestures* (The Hague: Mouton, 1973), 30.

[249] Kenton Kroker,"The progress of Instrospection in America, 1896–1938," *Studies in History and Philosophy of Biological and Biomedical Sciences* 34 (2003): 77–108. The "imageless thought controversy" as it is known, is often credited with marking the end of the use of introspection (in its various forms) as a method in psychological research, for introspection in Titchener's laboratory seemed to show there were *no* imageless thoughts, only sensations and feelings, while the same (or sufficiently similar) method in Külpe's laboratory showed that there *were* imageless thoughts. Thomas Hardy Leahey, *A History of Psychology*, 4th ed. (Upper Saddle River: Prentice-Hall, 1997), 205. Perhaps such historical accounts have to a significant degree followed the narratives of the participants themselves, for this was how the imageless thought controversy was used by Watson in his classic text founding behaviorism (ibid.). I believe that Coon gives a somewhat different story, pointing more to the need for an industrially applicable psychology than to "internal" intellectual sources of change.

of respiration and the mind is any indicator. Psychophysics, and with it pneumographic access through breathing to the mind, was a thing of the past.

Attention And Its Physical Conditions[250]

In the final part of this chapter, I want to consider how the dominant view of respiration was related to the problem of fatigue—and to the possibilities for overcoming fatigue, a diagnosis which was often applied both to the individual and to the social body. Understanding fatigue was of urgent importance. Though Mosso claimed Marx had written the most "remarkable" book in the socialist literature, he had not definitively proved the physiological mechanism whereby machines caused exhaustion in those who operated them. This required studies of the body of the most rigorous kind: "Fresh investigations are necessary, made by independent men, by physiologists free from all preconceptions whether political, humanitarian, or social."[251] Writing a physiology that could underpin Marx's *Capital,* Mosso took for his main subject the "usury" of fatigue, and he claimed that of all the discernible, measurable functions of the body, it was breathing that most clearly changed as a result of—or concomitantly with—fatigue: "of all the functions of the body, respiration is that which is most visibly modified in the course of fatigue."[252]

For the energy economy that the breathing regulated was also the energy economy of the mind. Beyond simply breathing slowly and deeply in sleep, or hard and fast during exertion, the breath was implicated in late nineteenth-century anxieties about fatigue. The

[250] This is the title of chapter VIII of Mosso's *Fatigue*.

[251] Mosso, *Fatigue,* 173.

[252] Ibid., 106.

fatigue of the body that had been brought by the new technological regimes was not the kind that one simply slept off. It was a fatigue of the entire being, one experienced psychically as much as physically. And so what was the breathing of this fatigue of modernity? In order to find an answer, we must first take a diversion through another variable of the body that preoccupied not only Mosso, but many in the period during which he worked: attention. Respiration and fatigue were connected though the attention. And in order to see how, we need to return to the work of Angelo Mosso.

What, for Mosso, was the connection between respiration and attention?[253] "Respiration is modified during attention: of this fact I sought to convince myself by placing round the thorax an apparatus which registers the respiratory movements."[254] Over a self-observation period of more than four hours, Mosso studied the relationship in himself, repeating the same results multiple times. The thorax in question was, of course, Mosso's own. He relaxed in a chair, while the pneumograph belt around his body recorded movements of the abdomen and thorax. As he entered a state of what he called "dispersed attention," his breathing would become more frequent, but weaker. He knew he had entered fully into this state when in his consciousness appeared "ideas of which I did not know the origin nor the connection with the preceding ideas."[255] Though he had sat down with the intention of keeping his mind "blank," these images "forced

[253] It's worth noting that the Victorian classification of the attention was a particular one. Jung and Peterson, in their 1905 work using galvanometer and pneumograph (see above), rehearse the standard understanding of attention, which might seem to us a little peculiar. In particular, it's a definition or categorization that allows experimental access to attention: "Attention is, as Bleuler has pointed out, nothing more than a special form of affectivity. Attention, interest, expectation, are all emotional expressions." Frederick Peterson and C.G. Jung, "Psychophysical Investigations with the Galvanometer and Pneumograph in Normal and Insane Individuals."

[254] Mosso, *Fatigue,* 181.

[255] Ibid., 182.

themselves." They were bizarre images, "which I should regard as the beginning of a dream had so much of my consciousness not been still awake as to be able to keep watch over myself, and to recall from time to time the aim of my repose."[256] Whenever such a moment arose in which he recalled his intention to keep his mind blank, that is to say, whenever, if for a moment, he was paying attention, Mosso would click a button that would in turn make a mark on the smoked paper cylinder recording his respiratory movements. "Scarcely was this mark made when my respiration became deeper and slower."[257] The breathing pattern of focused attention was markedly slower than that of dispersed, wandering attention.

Mosso also studied the connection between respiration and attention in subjects other than himself. One Dr. Rondelli was almost exactly like the fish. Seated in the comfortable chair, he managed to read for a while as the pneumograph behind him traced a normal curve. It wasn't long, however, before the pneumograph began to record slight variations as his attention began wandering away from the book. Soon, his eyes closed, the book "trembled in his hands," and he began to doze. His respiration concurrently became *periodic*: "That is to say, there were moments in which the respiration became very superficial and seemed almost to cease, and others in which it became gradually stronger and then diminished with great regularity."[258] In the case of wandering attention, the respiration would have a tendency to likewise become "periodic," uneven in strength and rhythm. Like the quality of the attention itself.

Attention and fatigue were connected through their mutual relationship with sleep

[256] Ibid., 182.

[257] Ibid., 182.

[258] Ibid., 183.

and wakefulness. Inattention of any particular sense—being so rapt in thought that ambient sounds could go unheard, for example—was almost like a *sleep* or extreme fatigue of the hearing. And yet extreme attentiveness was likewise a kind of sleep of the senses. Attention could be modulated between the senses in different amounts, or, at the strange extremes, either entirely withdrawn from the senses so that no sign of the external world was known (as in ecstasy), or entirely turned outward such that the "sphere of inner representations" would itself fall asleep, taking a sense of interiority and the capacity for reflective thought with it.[259] The attention, then, was a kind of measure of the wakefulness of the organism; a person, seemingly awake, might in fact have "regions of the brain responsible for certain impression" be simultaneously sleeping, or at least dozing.[260]

Knowing the precise nature of the fluctuations in attention (not to mention the species of attention itself) was of utmost importance in revealing the detailed energy economy of the organism. It was inattention, with its irregular and weak breathing, that cost the organism. Attention did not, ultimately, require energy to maintain, but instead was an energy-saving measure:

> Attention which at first sight appears to be a strain on the intellect, turns out, on the contrary, to be a marvellous saving of energy. What would happen to us, or to the animals, if all the impressions from the external world were to remain impressed upon the memory at the same time and with equal intensity? A mechanism to enable us to limit such impressions and to make a selection of those we wished to retain was a necessity. We are present at the constant change of the contents of our mind without their leaving any trace which fatigues us permanently.[261]

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[259] G.T. Fechner, qtd. in Mosso, *Fatigue,* 179.

[260] Mosso, *Fatigue,* 180.

[261] Ibid., 195.

The cause of fatigue was attending equally to all impressions and, without any prudent filtering, unknowingly allowing all of the incoming impressions to leave a trace in the mind. Such traces "fatigue us permanently." Was it possible to erase or never form such traces in order to resolve fatigue entirely? Let's briefly consider the way Mosso and his contemporary, the French physiologist and psychologist, Théodule-Armand Ribot, thought about perfect attention (and the breathing—or lack thereof—that occurred together with it).

Morbid States of Attention

Since the time of Hobbes, Ribot recounted, it has been a "common truism" that consciousness only exists through change: "*Idem sentire, et non sentire, ad idem recidunt.*"[262] At the logical extreme of grades and kinds of attention, from totally involuntarily dispersed through intentionally one-pointed, could there be a kind of attention in which consciousness remained without a glimmer of change in its perceptual field? The extreme and "morbid states" of human attention and their concomitant physiological and expressive modes were of great interest to writers on attention. For certain kinds of constitutions, the focusing of a strong attention in a single direction could produce extreme effects. Like Lemnius in the seventeenth century, in the nineteenth, both Mosso and Ribot considered the physiology of ecstasy as a special case of extremely focused attention. Mosso described "Very excitable persons" who, "when they look attentively at any object whatever for several consecutive minutes or when their mind is immersed in mystic thought, such as religious contemplation, fall without being aware of

[262] Théodule Ribot, *The Psychology of Attention,* 5th rev. ed. (Chicago: Open Court Publishing Co., 1903 [1890]), 95.

it into a peculiar sleep, which is called hypnotic or ecstatic." Ribot, who like Mosso, was devoted to determining the material and physiological correlates of psychic experience, included a section on *ecstasy* as a special case of attention in his 1889 *The Psychology of Attention.* (Ribot also wrote, interestingly, *La Philosophie de Schopenhauer* and *The Diseases of the Will*, among many other works).

For Ribot, there was nothing about the documented cases of ecstasy that could not be explained in terms of a particular state of the body: "I must request the reader, not to allow himself to be led astray by the mystic phraseology in which the observation is couched…we shall be able…to translate the same into the language of contemporaneous psychology."[263] Though St. Theresa's *Inner Castle* was a single account of an unusual individual, it was the work of a "very delicate mind" and an "able observer." Ribot describes the progressive focusing of Theresa's attention as she passes through seven degrees of prayer. The ecstasy in the sixth degree or stage, the prayer of rapture, is the last one before the final "monoideism." the attainment of the "uniform consciousness." But this sixth stage is of most interest to us for the absence of breathing and the relative absence of the senses:

> The body grows cold; speech and respiration are suspended, the eyes close; the slightest motion may cause the greatest efforts…The senses and faculties remain without…Although usually one does not lose all feeling (consciousness), still *it has happened to me to be entirely deprived of it*; this has seldom come to pass, and has lasted but a short time.[264]

All that might remain was a vestige of the hearing, as though sounds were arriving from far, far away. For the concentration of the attention had powerfully silenced the senses, and with it suspended the respiration. In St. Theresa's account, the only thing that

[263] Ibid.

[264] St. Theresa qtd. in ibid., 93.

separated stage six from Union with God and the total "abolition of consciousness" was in fact the final absence of even this trace of sound.[265]

Attention focused on an object, but not too tightly, made the breathing slow, but regular. Diffuse, wandering attention wreaked havoc with the breath, sending it in all directions, just like the wandering mind. The more tightly, closely, the attention closed in on a particular point of vision, the slower and lighter the breath became. Until, absent all change in the field of perception, the breath itself ceased to change and in fact disappeared entirely. Was all of this automatic? As it was for the fish?

The nature of breathing and attention were key pieces in the renegotiation of the boundary between will and reflex in the human body. Interested as they were in whether or not there was a faculty of human will, the psychic and physiological nature of attention was a matter of great interest for the late nineteenth-century physiologists and experimental psychologists. Part of this connection makes sense by analogy; like breathing, attention appeared to be at once under voluntary and involuntary control.[266] Like the breath, attention could be willfully directed, allowing the mind to stay with a difficult-to-understand passage, or to recite a long line of text meaningfully, with appropriate emphasis. And yet, attention could also direct itself, moving among objects as needed. It could also be experienced as quite beyond the will, both when it was pulled into complete absorption, or when, as though hijacked by a mysterious invader, attempts

[265] Almost as though it were a necessary ingredient of late nineteenth-century works on the physiology of attention, Mosso, too, briefly touched on the physiology—or perhaps even seeming transcendence of the natural—in the swoon and ecstasy of St. Catherine, which he described in terms of its representation in the frescoes by Sodoma at the cathedra of St. Dominic in Siena: "No other artist has ever illustrated in such masterly fashion the sublimity of that attention which in contemplation of a divine image transcends the bounds of ordinary nature." Mosso, *Fatigue,* 189.

[266] Though always questioning the right balance of volition and automaticity, Mosso mentions the view of the influential eighteenth century Swiss anatomist and physiologist, Albrecht Haller, to the effect that attention is actually *not* a process available to the volition. Mosso, *Fatigue,* 188.

to direct attention were abruptly and definitively interrupted. Reading a book, one could, with a start, realize pages had gone by unconsidered while a childhood memory had taken the center stage of the mind.

According to Lorraine Daston, it was precisely the fact that attention was entangled with the will that made it of such interest at this moment in particular. Though *Fin de Siécle* psychiatry codified and studied weakness of the will as a particular set of pathologies in need of treatment, the continued existence of such a uniquely human thing as will was very much open to discussion.[267] Daston connects the interest in attention with the broader crisis of volition and the will that was underway in the face of materialism, and mechanistic and reductionistic models of body and self, not the least of which were certain interpretations of Darwinism. She emphasizes the role of attention in the theories of volition: "In particular, the importance of the concept of attention within late-nineteenth century psychology stems from its critical function in theories of volition: to integrate experimental findings on reflex action and other forms of involuntary behavior with the traditional notion of an active, self-determined subject."[268]

Reflex physiology was at once a solution to the problem of the will and the problem of fatigue. Reflex responses are not produced *de novo*, but are formulaic copies of previous solutions to common situations. It is energetically costly to solve familiar problems as though they were new. And so as successfully as the reflex view resolved those problems, there was something exhausting about the absence of the will, about the

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[267] Byron J. Good, "Emil Kraeplin on Pathologies of the Will," in *Toward an Anthropology of the Will,* ed. Keith M. Murphy and C. Jason Throop (Stanford: Stanford University Press, 2010), 158.

[268] Lorraine Daston, "British Responses to Psycho-Physiology, 1860-1900," *Isis* 69, no. 2 (June 1978): 192. She goes on: "At an epistemological level, the various schemes of parallelism, monism, and occasionalism set forth by British psychologists to resolve the Cartesian polarity between brute matter and conscious mind represent similar compromise efforts" (192).

absence of the possibility of manifesting something new, surprising, for the first time. This, at least, was what William James had to say about fatigue. Oddly enough, to see what was beyond conditioning, beyond reflex, required conditioning, the establishment of new reflexes, of the most extreme kind. In particular, he prescribed an intentional reconditioning of the rhythms of the breath.

William James and The Energies of Men

About the oft-invoked notion of "fatigue," William James wrote that the very word covered a great deal of ignorance. Under this obfuscating heading resided a multitude of forms of human distress, all of which had been, for lack of more refined investigations, loosely grouped under "a diminished supply of mental energy."[269] The various textures of "oscillations of level of mental energy, differences of tension, splittings of consciousness, sentiments of insufficiency and of unreality, substitutions, agitations and anxieties, depersonalizations" had been erased under one name for ignorance: fatigue.[270] But what really stood behind these many manifestations of varying "amounts of energy available for running one's mental and moral operations"?[271] There was a sense in which James doubted these pathologies really lay at the heart of the matter; the phenomenon of "second wind" was one piece of evidence.

Physical and other kinds of exhaustion could be, in extraordinary situations or in cases of extraordinary will, overcome. Encountering what was simply a first layer of fatigue, a feeling of having "worked enough," a person would put a challenging task

[269] William James, "The Energies of Men," *The Philosophical Review* 16, no. 1 (1907): 1.

[270] Ibid., 1.

[271] Ibid., 2.

aside. But if an "unusual necessity" forced the discomfort to be tolerated until it reached a kind of crisis, it could suddenly disappear and leave a person "fresher than before."[272] Through layer after layer of seemingly insurmountable fatigue, ever deeper sources of unknown energy could be discovered. What could account for this phenomenon? There were actually vast energy reserves available to human beings, kept under the lock and key of self-control, that control itself governed from some mysterious place between physiology and psychology. Beyond the first wave of fatigue that would cause most to lay down intellectual, moral, or physical work, there were second, third and fourth "winds," hidden sources of energy, available only under certain sorts of situations, or accessible only through certain states of mind.

Extreme states emotional or circumstantial were sources of access to these deeper repositories. In love, in grief, "in wars and shipwrecks," people could, intermittently, be shocked into finding their second, third, and fourth winds. But such events were unreliable, intermittent, and often undesirable. It was for this reason that the "best practical knowers of the human soul had invented the thing known as methodical ascetic discipline to keep the deeper levels constantly in reach."[273] In a world inhabited by bodies that had come to imagine themselves as subject to the laws of thermodynamics, subject to the dissipation of energy, James' solution (perhaps not entirely unlike that of other versions of the "Victorian Will") was a certain kind of asceticism, the cultivation of the will. The most "venerable ascetic system" of all—greater, he claimed, even than Ignatius Loyola's spiritual exercises—was the "Yoga system in Hindustan."[274]

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[272] Ibid., 9.

[273] In William James, "The Energies of Men," *The Philosophical Review* 16, no. 1 (1907): 1-20.

[274] Ibid., page number.

James hadn't tried yoga himself. Instead, he claimed, he was simply reporting the experience of a European friend, a morally and intellectually gifted man, who had suffered terribly and interminably from a "circular process of alternate lethargy and over-animation." He would alternate intense activity and productivity with extended periods "prostrated" in bed. None of the many physicians he consulted could be of any use to him and so, out of desperation alone, he decided to follow Vivekenanda's program of Hatha Yoga, as well as the Swami's admonition: "Practice hard: whether you live or die by it doesn't matter." The results of this experiment he sent to James in a letter of more than sixty pages.[275]

The regimen began with a progressively more spare diet, paired with *asana* or postures: sitting on the floor, trying to kiss the knees without bending them, touching the upper back with joined hands, touching the toe of one foot to the ear of the other side of the body. Not only was the food entirely lacking in sensual comforts, the exercises "almost broke the limbs," but likewise the attention was not allowed to escape into any imaginations of relief: "Then concentration of thought on different parts of the body, and on the processes going in within them. Exclusion of all emotions, dry logical reading, as intellectual diet, and working out logical problems…I wrote a Handbook of Logic as a *nebenprodukt* of the whole experiment."[276] Most important, however, making all of the other austerities possible, were the breathing exercises:

> Because we are unable to will at once the most difficult things, we must imagine steps leading to them. Breathing being the easiest of the bodily activities, it is very natural that it offers a good scope for exercise of the will. The control of thought could be gained without breathing-discipline, but it is simply easier to control thought simultaneously with the control of breath. . … When I have accustomed

[275] Ibid., 10.

[276] Ibid., 11.

> myself to breathe ten times a minute, I learn to believe it will be easy to breathe six times a minute. Thus I have actually learned to breathe at the rate of once a minute. How far I shall progress I do not know.[277]

A worse prostration than ever came after a few weeks of the intense program. But James' friend was overcome with a determination as never before: "All the time breathing exercises: keeping the breath in and out up to two minutes, breathing in different rhythms and positions. Also very much prayer and Roman Catholic practices combined with the Yoga, in order to leave nothing untried and to be protected against the tricks of the Hindu devils!"[278] After arising from bed on the morning of August 20, no new prostration ever came. In fact, not only had the tendency to fall into lethargy been overcome, but James' friend felt he had "mastered sleep and hunger, and the flights of thought, and came to know a peace never known before, an inner rhythm of unison with a deeper rhythm above or beyond…and above everything…rhythmical respiration, which produces a state of mind without thought or feeling, and still very intense, indescribable."[279] By some ironic turn, conditioning brought one person through conditioning and out of the fatigue that was its necessary companion.

Conclusion

In his classic essay "Clues: Roots of an Evidential Paradigm", Carlo Ginzburg described a new kind of immaculately detailed attention to the way the genuine painter painted an ear, for example, that powerfully revealed an astonishing number of forgeries that had been taken for originals (this was even known as the "Morellian method" after

[277] Qtd. in ibid., 13.

[278] Qtd. in ibid., 10.

[279] Ibid., 12.

its originator). But where there are eyes to see, we are always revealing ourselves. And we reveal ourselves most clearly when we are unaware that we are, in fact, doing so, though our "inadvertent little gestures."[280] The key to a deeper pattern—the essence of a great painter—was found not in some ungraspable essence, but in the most mundane, material details, visible if one had the skill and patience to see the small motions made while the attention, awareness, of the observed was resting elsewhere. Akin to such small motions are the details of "everyday" breathing.

Though the theoretical apparatus that framed the use of the pneumograph for the most part did not include any particular "depth" in the mind, nonetheless it relied on a kind of reading of the traces of the breath which were a precise copy of the motions of respiration.[281] There were undoubtedly signs to be interpreted there, but they pointed to one natural, universal breathing (even if there were multiple species, each with its own norm). The possibility of change was the possibility of the new. And though the pneumograph could trace the precise, potentially capricious movements of an individual breath, those movements were read as referring to an unchanging collective subject. And, perhaps not coincidentally, to the fatigue and wandering attention of that body. Perhaps it was true that modern breath had no capacity for "cresendos, inflections, and reversals of tone and changes in tempo."[282] The possibility of change and the nineteenth century preoccupation with the cultivation of willful breath—and the resistance to such cultivation—will be the subject of chapter three.

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[280] This is Morelli's phrase, cited in Carlo Ginzburg, "Clues: Roots of an Evidential Paradigm" in *Clues, Myths, and the Historical Method,* trans. John and Anne C. Tedeschi (Baltimore: Johns Hopkins University Press, 1992), 98.

[281] On ideas of the unconscious before Freud, see Angus Nicholls and Martin Liebscher, eds., *Thinking the Unconscious: Nineteenth-Century German Thought* (Cambridge: Cambridge University Press, 2010).

[282] Nietzsche, *Beyond Good and Evil*, 183.

Chapter Three: Breathlessness and Transformation

At the end of January 1898, the front page of *The New York Times* reported an apparent death and resurrection at will.[283] The public performance had taken place just the day before, in the presence of at least forty doctors and members of the press invited to the buildings of the San Francisco College of Suggestive Therapeutics. There they had witnessed Prof. P.A. Bernard "simulate death so closely as to defy detection even by the severest tests." Having successfully "thrown himself" into a state of self-produced anesthesia, Bernard had his ear sewn to his cheek and his upper lip to his nose by an attending surgeon, who finally ran a large hatpin through his tongue. Bernard didn't scream or flinch. In fact, he didn't show signs of life; he neither perceptibly breathed nor had any detectible heartbeat. It was a spectacle of the power of human willfulness over the body and seemingly over death itself.

The New York Times article emphasized the potential significance for anesthesia of Bernard's "self-induced hypnosis" (a virtually identical text appeared simultaneously in many other major American papers).[284] It named Bernard as "Prof." but did not elaborate on what training had given him the capacity to die and resurrect at will.[285] Nor

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[283] "Anesthesia By Hypnotism: Severe Tests Endured by Prof. P.A. Bernard in San Francisco," *New York Times*, Jan. 29, 1898. Bernard's performance was also reported in *The Indianapolis News*, "Hypnotized Himself. The Remarkable Exhibition Given by Prof. P.A. Bernard," January 28, 1898.

[284] Bernard's performance was also reported in many American newspapers. Among these: "Hypnotized Himself. The Remarkable Exhibition Given by Prof. P.A. Bernard," *The Indianapolis News*, January 28, 1898; "Hypnotism in Surgery. P. A. Bernard Had His Upper Lip Sewed to His Noes and Said That He Felt no Pain," *The Sun,* Baltimore, MD, January 29, 1898, p. 6; "Surgery without Pain. Prof. Bernard Demonstrates That in His Case Anesthetics Are Unnecessary," *New Haven Evening Register*, January 28, 1898, p. 7; "Has it Come to This? Hypnotism Made Use of in Place of Anesthetics - Severe Tests," *Springfield Daily Republican*, January 29, 1898, p. 5.

[285] For more on Bernard, see Hugh B. Urban, "The Omnipotent Oom: Tantra and Its Impact on Modern Western Esotericism," *Esoterica* 3 (2001): 218-59.

did it offer any account of what kind of method Bernard might have used, or speculate on the physiological possibility of such a feat.

Though Bernard vaguely invoked technical authority by claiming the title "professor," he also brought physicians to testify to the state of his body. Bernard purported to have mastered his own physiology—indeed he displayed the mastery over it—though in another sense he knew very little about it. Bernard's explanation of how he accomplished the feat was as follows: "One can form a mental picture upon his brain that to him is as real as a painting upon the wall, and he holds on to this by means of a certain system of breathing, until it is molded right out of the plastic material of the soul."[286]

In the spring following the winter's performance, Bernard together with one D. McMillan, M.D., the surgeon who performed the sewing, wrote a long debriefing that appeared in *The Washington Post* under the heading "Special Correspondence to the Sunday Post." Bernard reported that his simulation of death and intentional descent into a state of insensibility was nothing less than the result of "long persistence in the fixed determination to subjugate matter." The cessation of breathing—and with it, apparently, any and all capacity to experience body sensations—was brought about through a breathing technique that Bernard mentioned but did not give in any great detail. One could not have followed his instructions to achieve the same state, and yet there it was on page 5 of the *Washington Post*:

> My self-induced state is brought about by being able to regulate, manage, and control the breath in inspiration, retention, and exhalation. … In producing these states, the breathing is at first by deep inspirations, and a turning upward and inward of the eyes. This is always accompanied by deep concentration, the sinking of the thoughts into the center of the being: in other words, the concentration of consciousness to a single point within the being: in other words,

[286] "Puzzle to Physicians," *The Washington Post*, May 1, 1898, p. 5.

the concentration of consciousness to a single point within the being.[287]

In his portion of the article, D. McMillan, M.D, emphasized that Bernard's performance of scientific death while alive brought into doubt physicians' ability to properly separate the living from the dead. Neither the cessation of breathing nor the cessation of heartbeat seemed to determine if someone was dead or alive. In fact, the possibility that any physiological signs could definitively show the distinction was called into question:

> The self-induced state of hypnosis performed by this young man is one of the best counterfeits for death I have ever witnessed, and it clearly proves to physicians that the only sure proofs of death are tests of electricity and advanced decomposition. … Cold, rigid limbs, cessation of the heartbeat, and stoppage of breathing not being sure signs of death.[288]

With this, a major American newspaper had printed the opinion that the only point at which a person could be determined to be dead was when the body began to decompose. There was, it seemed, an experience and appearance of life that was indistinguishable from death. There was the possibility of will entirely mastering matter, even unto and beyond death—one entailing a kind of resurrection of the very body itself. Bernard claimed that the key to this kind of self-knowledge was "a certain system of breathing."

This chapter considers the notion of a self that could master its own materiality. While Bacon had imagined "custome" mastering *nature*, at the turn of the century some

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[287] Ibid. It would be interesting to consider the "register shift" that occurred in the arrival of non-Western forms of body practice as they arrived in the West. Some were formerly scholarly traditions, and some were transmitted orally via teacher-disciple relationship; on arriving in the West, a distinctly do-it-yourself attitude prevailed, which naturally represented a significant shift in forms of authority. Green makes this point with respect to the modernization of yoga in India: "Whether with regard to Sufi manuals, Yoga treatises, Tantras or even works on magic, the arrival of print transformed the nature of this knowledge as social capital. The most fitting examples are to be found in the new Indian genre of the printed 'do-it-yourself' guide to meditation, which in contrast to more traditional works on either Sufi or Yoga practice effectively replaced the living master with the book. Print, then, stood at the centre of the transformation of an earlier ecumene in which the symbolic capital of certain forms of knowledge had been guarded through the social barriers presented by traditions of secrecy and controlled initiation. Here, then, is the emphasis on self-transformation and the individual will that is described in Francis Robinson's contribution to this volume." Nile Green, "Breathing in India, c. 1890," *Modern Asian Studies* 42, no. 2 (2008): 287.

[288] "Puzzle to Physicians," 5.

sought to subjugate not *nature* so much as *matter* itself. And the breath between matter and mind, or what they called spirit, was the key. The strangeness of Prof. Bernard, seventh degree trantrik or whoever he was, rested on more than simply his apparent capacity to play dead in a very convincing manner.[289] I argue, rather, that he represented a peculiar, foreign mode of self-knowledge, and of being a body.

After briefly discussing representations of breathlessness, we will consider the model of self-knowledge that Bernard's performance implicitly criticized, with reference to Mosso's program of self-experiment, understood as a partial exemplar of that model. Then we will return to look more deeply into the sources, context, and broader inspirations of the psychophysical project that we touched on in its American experimental version in chapter two. This is important because the Western history of a body that changes itself is, by the mid- and especially late nineteenth century, a story about the meeting of traditions that had largely evolved along separate lines. A particular brand of Orientalism, in both academic and vernacular forms, is found at the beginnings of the same psychophysics that would, leading through Angell, end up in Watson's erasure of the content of breathing.

The second half of the chapter considers two examples, one academic and one decidedly not, pertaining to the reception of this new view of breath and the body. The first example is that of a new religion, Mazdaznan, a kind of "total institution" that flourished both in Europe and in the United States from the turn of the century through the 1940s. It gave its practitioners detailed instructions for the mastery of matter by spirit, a process in which intentional breathing was at the center. Secondly, we will consider

[289] [source]

how Victorian Sinologists approached the problem of the soteriological—or transformational—breathing exercises that they found in ancient Chinese works. Chinese soteriological breathing was to the Protestant mind a kind of heresy; salvation, after all, was to be enjoyed in the soul's next life, which was a life of the spirit, not in eternal life of the flesh, as seemed promised by Taoism. Throughout the chapter, the alternately calm and anguished faces of transformed breath guide us.

Breathlessness

Bernard explained his feat using what would have been familiar language of the training of the will (if to perhaps unfamiliar or surprising ends): "There is a wide difference between volition and will. It requires a regular course of occult training to build up this latter. To build up will to vibrations that act on the astral or ethereal plane, first subdue moral weakness and be a complete master of self."[290] In spite of the obscurity of Bernard's reference to "vibrations acting on astral or ethereal planes" and a distinction between volition and will that it seemed to unstably depend on "the will" would not have seemed at all mysterious to a reader of *The New York Times*. As Roger Smith, in his work on the will in British experimental psychology, has rightly noted, "Reference to the will was utterly pervasive in Victorian writing—in the novel, moral tracts, philosophy, political debate, theology, policy questions about education, crime and poverty—everywhere, in everyday and intellectual life alike."[291] The complex of moral and physiological aspects of the will was so often invoked that the word "Victorian" itself

[290] Ibid.

[291] Roger Smith, *Free Will and the Human Sciences in Britain, 1870-1910* (London: Pickering and Chatto, 2013), 9.

came to be "synonymous with a moralistic emphasis on the power of will."[292]

Such will could take one very far, into human moral realms beyond animal and instinct; it was not, however, thought to extend its power beyond breathlessness. As one influential French physiologist who wrote particularly on "bodily exercise" put it: "Breathlessness is the *ne pas ultra* imposed on us by the instinct of self-preservation. The severe suffering which accompanies it is a true cry of distress on the part of the organism to which the consciousness cannot shut its ears with impunity."[293] Breathlessness was the ultimate need of the organism; no other unmet need could kill so swiftly and certainly. There was no imagination of breathlessness without horror.

In his 1890 work on the physiology of exercise, Lagrange devoted three lengthy chapters to breathlessness in its many aspects. In his view, it was perhaps the most important species of fatigue, and though it had not been described in any medical dictionary or physiological textbook, there was no phenomenon "more interesting from the point of view of the hygienic and therapeutical results of muscular exercise."[294] As we have seen, Lagrange placed breathlessness, which in his view was primarily the shortness of breath of exercise or a pathological manifestation such as asthma, on the pain spectrum. It was paradoxical, Lagrange thought, that the adaptation of increased respiration, clearly of life-extending and preserving benefit to the organism under particular circumstances, could in itself become a life threat: "The instinct in virtue of which the respiratory movements are modified during violent exercise is then so intimately bound up with the preservation of the individual, that it seems astonishing at

[292] Ibid., 7.

[293] Fernand Lagrange, *Physiology of Bodily Exercise* (New York: D. Appleton and Co., 1890), 109.

[294] Ibid., 67.

first sight that it can produce ill effects, and hinder the accomplishments of the functions over which it presides."[295] The extreme pain of breathlessness was an indicator of its power over life and death.[296]

Lagrange also claimed that the lungs were the "most impressionable of all organs." He gave extended attention to the influence of emotions on respiration in various subjects, more and less "impressionable." Perhaps it was this treatment of breathing, breathlessness, and the emotions that inspired R. Tait McKenzie, a professor of the new discipline of physical education, and, as it happened, an amateur sculptor, to put Lagrange's classification of breathlessness as a species of fatigue together with Charles Bell's and Charles Darwin's work on the anatomy and taxonomy of expression.[297] McKenzie created a series of sculptures that illustrated the stages of the peculiar fatigue of breathlessness, representative of his derivation of an image of the facial expression of breathlessness (see Figure 8); it was, he wrote, a composite of Charles Bell's work on the "anxiety associated with bodily distress" together with the addition of "gaping mouth and

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[295] Ibid., 91.

[296] Echoing the apocryphal story of Ladas the Spartan who dropped dead just as he was presented with his palm of victory, Lagrange cites the case of a valiant carrier pigeon: "Most of the animals which die suddenly during too violent work succumb to breathlessness…this time its speed exceeded our expectation, and seven hours after the time at which it was set free the valiant little bird appeared; we gave a cry of admiration, but the poor pigeon paid for its glorious prowess with its life. Just when it was about to settle on the pigeon-house we saw it flap its wings, turn, and fall helpless on the roof, where it was dashed to pieces. The poor pigeon had exceeded the measure of its strength: it died on breathlessness from having flown too quickly." Ibid., 109.

[297] The history of the understanding of human expression as infinitely varied, subtle, and textured as opposed to universal and anatomically determined is, needless to say, not a simple one. The anatomy, physiology, and evolutionary biology of expression (formerly "the passions") was a place where views of the location of the proper boundaries between animal and human, nature and culture were in constant negotiation. How many emotions were there and to what extent could civilization and cultivated willfulness mask emotions that might otherwise revealingly erupt? Was precisely this human capacity to willfully mask the body the sign of human uniqueness? See Stephanie Dupouy, "The Naturalist and the Nuances: Sentimentalism, Moral Values, and Emotional Expression in Darwin and the Anatomists," *Journal of the History of the Behavioral Sciences* 47, no. 4 (Fall 2011): 335-358. See especially pp. 355-6.

expanded nostrils."[298] He anatomized breathlessness in the following way:

> The face of the breathless man is unmistakable. The smoothness of the forehead is broken by wrinkles spreading out over the inner end of the updrawn eyebrows. The general direction of the eyebrows is just the reverse of that seen in violent effort. They are drawn upward and inward by what the French call "the muscle of pain," whose action is seen in the expression of grief, mental distress, anxiety, or bodily pain. The upper lids in breathlessness droop and half cover the eyeball, giving a look of great lassitude to the suffering expressed by this region. The nostrils are widely dilated, and the mouth gapes, with lips retracted in the mad struggle for air. The raised upper lid adds to the look of sorrow and pain, while the down-drawn mouth angle, the tongue closely pressed against the teeth, the sunken cheek, and the open mouth, all go to increase the exhausted, haggard look so characteristic of this state, in distinction to mere bodily pain or mental suffering.[299]

[298] R. Tait McKenzie, *Exercise and Education in Medicine* (Philadelphia and London: W.B. Saunders Company, 1915).

[299] Ibid., 23-4.

Fig. 4.—The typical face of breathlessness as seen in any race above 200 yards (modeled from life by the author)

Figure 8. The Agony of Breathlessness. "Fig. 4 – The typical face of breathlessness as seen in any race above 200 yards (modeled from life by the author)." Source: R. Tait McKenzie, *Exercise and Education in Medicine* (Philadelphia and London: W.B. Saunders Company, 1915), 24.

Measuring Self-Knowledge

Let's consider the "standard view" or the psychophysical model of self-knowledge against which Bernard was demonstrating, consciously or not. That view is perhaps best understood with reference to Mosso's project. In keeping with Mosso's commitment to finding the material correlates of all kinds of experience, he practiced self-experiment and self-observation, and, in turn, considered the evolutionary possibility

of the kind of knowledge yielded by his practice. Had the body evolved to the point that it had the capacity to know itself? The very processes of self-study and observation, Mosso determined, were a kind of luxury, and from an evolutionary perspective, an accident. This was the reason that instrumentation was needed to see oneself. The experimental apparatus of early psychology acted as mirrors to show inaccessible selves, and because of the close relationship of body and mind, such mirrors could reveal "psychical" faces.

Instrumentation was necessary since this was a basic problem of the knowledge of self and other. Sensations existed in dazzling variety and, according to Mosso, "there are shades and gradations which we cannot express."[300] That which could not be expressed could not be measured, and measurability was what Mosso most desired. Immeasurability followed from the fundamental inaccessibility of knowledge about one's own total state of being. The viscera were all fundamentally insensible, as were all the other internal organs. Educated people might not even know the locations of the various organs in the abdomen and chest; except in the case of a terrible "inflammation," one might not be particularly aware they were even there. Access to the brain was most wanted, but this organ, too, was insensible. This Galen had known, and it was this fact that allowed the skull to be opened in Mosso's "brain pulse" experiments, as in other surgical operations. What could be felt and known about one's own body was only what was needed for the organism to respond safely in its environment: only the skin, the boundary between inside and outside, was directly available, offering reports of pleasure or pain. We can accurately judge, Mosso says, only what takes place outside ourselves. It was for this reason that Mosso approached his own body in self-experiment as though it were foreign,

[300] Angelo Mosso, *Fatigue*, trans. M. A. and W. B. Drummond (New York: G.P. Putnam's Sons, 1904), 217.

outside of himself.

It may be of use here to provide an example of the kind of self-knowledge that Mosso prized and considered within the realm of possibility. Unexpectedly called away to Rome, Mosso invited a recent graduate to give a lecture in his place. Though he would only have three days to prepare, Dr. Mariano Patrizi was a physiologist of "so much ability that I did not fear putting him to this trial in presence of a large audience." It was convenient that Patrizi, perhaps inspired by Mosso, had been "engrossed" for some time with a detailed study of his own internal temperature. The night before the lecture, he revised until 1 a.m. and slept fitfully if at all until 5 a.m. "The thermometer," he wrote, "betrayed my agitation, my rectal temperature at six am being 37.8, whereas in ordinary circumstances at the same hour it is never above 36.9."[301] He tried to touch up some of his drawings on the localization of the centers of language, but his hands trembled too much. By 10 a.m. his temperature had not changed. His respirations at eighteen per minute were also much higher than usual. Using the hydrosphygmograph, which was apparently at hand, he took a pulse tracing from the right forearm which revealed that his heart was beating more quickly than usual, with "decided verticality of the systolic ascent…steep descent of the diastole, and the most manifest dicrotism."[302]

A few moments before entering the lecture hall pulse and respiration were counted at 136 and 34, respectively. He reported, "I experienced a sense of pressure and constriction at the epigastrum, and I noted an increase in salivation which obliged me to expectorate every few minutes."[303] He managed to get through the seventy-minute

[301] Mosso cites a letter he says he received from his former student Dr. Patrizi. Mosso, *Fatigue*, 255.

[302] Patrizi, cited in Mosso, *Fatigue*, 256.

[303] Ibid., 257.

lecture. Covered in sweat, he headed straight from the lecture hall for the lab. The hydrisphygmograph revealed his pulse was down to 106, but his temperature was up higher than it had ever been in any daytime measure. Using the ergograph, Patrizi lifted a weight with the middle finger of his right hand at regular, short intervals (every two seconds). The amount of work he did lifting the weight was less than that registered in the recording he must have made just before his lecture, at the height of his "agitation": "I had evidently not entered upon the period of depression of force….subjectively I was aware that the excitement was about to vanish and give place to depression."[304]

As though studying a helpless, distressed (or stressed) animal, Patrizi did not make any attempts to calm himself or to alter the cascade of stress reactions that he so meticulously documented. In spite of his apparent distress, Patrizi had the presence of mind to collect extensive and detailed information on himself. Some part of himself remained sufficiently in command of his instruments to take self-measurements. But this part did not take any action on his behalf.

The Steam of the Mind

In each large-scale shift in the meaning of the mechanical body since Descartes, the change in question had rested significantly on the understanding of the source of motion. An Aristotelean external Prime Mover had in the eighteenth century given way to a body that God had created preloaded with a lifetime of vital force within; that is to say, the body came with "batteries included." But the view of the origin of movement coming from an *internal* source led to a broad fascination with the problem of the *perpetuum*

[304] Ibid., 257.

mobile. What was to say that this motion could not go on forever? The oft-repeated story of how the French academy of science was so glutted with reports of perpetual motion machines that they had to impose a blanket rejection of all such works, encapsulates this moment well.[305]

But come the mid-nineteenth century, something different was stirring; there was *energy*, appearing now as coal, now as heat, now as steam, now as forward motion, speed, force, work. It made all forms of physical materiality at root the same. But not only this: it revealed *force* and *work* to be forms of materiality, too. This revelation entirely changed the meaning of materialism, and resulted in a new view of the self and mind. When matter became energy, perhaps matter shifted closer to what people had formerly thought of as spirit. And what had formerly been thought of as spirit, according to one view, a kind of volitional heat that made things move, was found to be material, too. It was almost as though the materiality of the body was simply turned, by conservation, into the steam of the mind and its expression.

Anson Rabinbach invokes Bachelard's striking formulation of this peculiar materialism of the late nineteenth century: *dematerialized materialism*.[306] When the foundational nature of matter was revealed to be one appearance of the universal currency *energy*, it resolved a tension that had divided matter from apparently less tangible elements. As is well known, the impact of Helmholtz's thermodynamical laws

[305] Anson Rabinbach, *The Human Motor: Energy, Fatigue, and the Origins of Modernity* (New York: Basic Books, 1990).

[306] Ibid., 48. Rabinbach quotes Bachelard: "The very fact that energy changes matter results in a peculiar shift of scientific language from metaphor to abstraction." Gaston Bachelard, *The New Scientific Spirit,* trans. Arthur Goldhammer (Boston: Beacon Press, 1984), 68-69.

had a profound impact beyond physics alone,[307] on, for example, the study of the mind.

Rabinbach claims that it was Gustav Fechner, commonly referred to as a founder of experimental and quantified psychology, who first undertook the extension of the conservation of energy into psychology. He notes as well that Fechner's student Wundt unfolded his own experimental program on the same premise that mental and physiological systems equally needed to fulfill the requirements of the thermodynamical laws.[308] Rabinbach cites what sounds like an unequivocal statement from Wundt: "will, the senses, the associations and apperception all rigorously follow the principles of energy conservation."[309] Wundt's *psychophysical parallelism*, at least in the claims of its theoretical formulation, was not a reduction of the psychical to the physiological, nor an evaporation of the physiological into the psychical. The imposition of the demands of energy conservation actually forced a real reckoning on the question of body and mind. Though he espoused psychophysical parallelism, Wundt did not think that it was possible to account for psychical energy in the same way as one might measure force, motion, or heat. If there could indeed be such psychical and physical balance sheets, these absolute amounts would not necessarily be related.

In Judd's English translation of Wundt's *Outlines of Psychology*, the sentence Rabinbach quotes reads in the following way:

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[307] While there is some debate about how personally close Helmholtz and Wundt were, they did work in the same physiological institute at Heidelberg for thirteen years between 1858 and 1871 (it was in 1875 that Wundt was called to a chair in philosophy at Leipzig and given space to create his experimental laboratory there). Edwin G. Boring, *A History of Experimental Psychology* (New York: Appleton-Century-Crofts, Inc., 1950), 319. The inevitable entanglement of the new understanding of energy and the experimental approach to the mind was overdetermined. They would necessarily have had to come into conversation, even if Wundt and Helmholtz hadn't been physically occupying the same space as colleagues.

[308] Rabinbach, *The Human Motor*, 66.

[309] Wilhelm Wundt, *Grundriss der Psychologie* (Leipzig, 1914), 400. Qtd. in Rabinbach, *The Human Motor*, 67.

> The muscular movements of an extended volitional act, the physical processes that accompany sense-perception, association, and apperception, all follow invariably the principle of the conservation of energy. But the mental values and ends that these energies represent may be very different in quality even while the quantity of these energies remains the same.[310]

That is to say, the physical side of a particular "mental value and end" is conserved in its various transformations, while the "quantity" (however such a measure might be obtained) of the mental value and end itself would be very different. There was no conservation of quantities across psychical and physiological processes.

Wundt makes the same point again at the end of a long section on "Application of the Principle of the Conservation of Work to the Vital Processes and the Nervous System" in which he turns at last to the "Relation of Nervous to Psychical Processes." Until this point Wundt has discussed the application of the conservation of work in the special case of the "physiological mechanics of nerve substance." It takes many pages for him to describe how the conservation of force, work, and energy applies to many of the known aspects of "innervation," conduction, to the "vital processes" and the "nervous system." After all of this he tries to assert a view of the relation between the "molecular" and the "psychical" that affirms their interconnectedness while not allowing one to be reduced to the other:

> Psychical processes refuse to submit to any one of our physical measures of energy; and the physical molecular processes, so far as we are able to follow them, are seen to be transformed, variously enough, into one another, but never directly into psychical qualities…. such a relation between the two departments is entirely compatible with their separate independence, with the impossibility, at any time or by any means, of the reduction of the one to the other.[311]

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[310] Wilhelm Wundt, *Outlines of Psychology*, trans. Charles Hubbard Judd (Leipzig: W. Engelmann, 1897), 322.

[311] Wilhelm Wundt, *Principles of Physiological Psychology*, trans. Edward Bradford Titchener (London: S. Sonnenschein and Co, 1910), 102.

Psychophysics did not mean a reduction of the "psychic" to "physics." Both Fechner and Wundt aspired to a genuine equality of the two (some account for this anti-materialism and anti-reductionism by citing the lingering aroma of *Naturphilosophie*). Much could (and has) been said about the differences between the experimental programs of Fechner, Wundt, and their American interpreters. What interests us here is what we can learn about the project of psychophysics that will shed light on how late nineteenth-century experimenters of this school might have been thinking about respiration. The American experimental psychological studies of respiration that we considered in chapter two were inspired by the psychophysical work being carried out in German laboratories.

Part of this view of the relatedness of breathing and mind had to do with the new views of energy conservation. But it wasn't so simple. At the very beginnings of the broadly influential psychophysics, we find threads that connect Helmholtzian conservation, on the one hand, and Orientalism, on the other.

The Daylight View: Fechner's Zend-Avesta

Almost a decade before the appearance of his *Elemente der Psychophysik* (1860), Gustav Fechner laid the philosophical foundations of psychophysics in a book to which he gave a conspicuously unoriginal and yet entirely surprising title: *Zend-Avesta: oder über die Dinge des Himmels und des Jenseits* (1851). In particular, *Le Zend Avesta* was the name that had already been given by Anquetil Duperron to a 1771 translation into French of the texts of Persian Zoroastrianism. (Duperron had ostensibly "found" the long-lost texts while in India, while on a mission primarily focused on determining the

location of the Garden of Eden).[312] Duperron's translation, the first appearance of ancient Persian texts into any European language, was known in Germany, certainly to Schelling and to Schopenhauer who were contemporaries of Fechner's.[313] Duperron's *Avesta* included hymns, prayers, and ritual instructions, the vast majority of which were concerned with purity, in its religious, legal, and hygienic aspects. The topics covered were so broad and esoteric, however, that when in 1898 James Darmesteter translated the text freshly for Müller's *Sacred Books of the East*, he was at a loss to articulate any particular organization throughout the *Avesta*, which did not he attribute to his own lack of understanding. Rather, to his mind, "The main cause of this disorder was, of course, that the advantage of order is rarely felt by Orientals…"[314]

There is, however, a rigid ordering principle underlying the structure of the *Avesta,* which is introduced through the creation story with which the book opens. We learn there that Ahura Mazda, the God of Light, has created all of the good lands and countries, every land "dear to its people." But when Ahura Mazda created the rivers, Angra Mainyu, "who is all death," counter-created the serpents in the river. When Ahura Mazda created the strong, holy land of Mouru, Angra Mainyu created plunder and sin. When Ahura Mazda created lands beautiful and deep, with inhabitants longing and asking for the good and bright, Angra Mainyu, who is all death, created the winter.

Indeed, it was likely not the detailed instructions on how to purify a fire defiled by the dead, or the method of atonement for the murder of a water dog, that were memorable

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[312] Amir Irani-Tehrani, "Persian Figures in German Letters (1700–1900)" (Ph.D. diss., New York University, 2008), 42.

[313] Michael Heidelberger, *Nature from Within: Gustav Theodor Fechner and His Psychophysical Worldview* (Pittsburgh: University of Pittsburgh Press, 2004), 12.

[314] *The Zend-Avesta*, trans. James Darmesteter, in *The Sacred Books of the East,* ed. Max Müller*,* Vol. III (Oxford: Clarendon Press, 1880), xxi.

for European readers of the *Avesta*. We can have some sense of which aspects of the book were impactful by considering that the French translation of the *Avesta* resulted in the coining of a neologism: *dualisme*. It is for this reason that the English word "dualism" does not date before the 1790s. The writer who first used it, Thomas James Mathias, does so self-consciously, adding the parenthetical comment: "(a little more French jargon)."[315] Our ordinary word "dualism" was introduced as a direct result of the arrival of the *Avesta* and the world of opposing extremes of light and dark, purity and impurity, that it described. Both were contained in precisely equal measure in creation; they had been co-created.

So the book was known in Fechner's circles. Almost immediately on its appearance, a German translation was made from Duperron's French edition.[316] But there is a further reason to explain why one of the first experimental psychologists and the one to introduce quantification to the study of the mind appropriated (or misappropriated) the title of an ancient Persian religious text, one that would later appear in Müller's S*acred Books of the East*, for the manifesto of his new program for research. It was a personal reason.

Already with a voluminous body of work behind him, Fechner rose to the position of professor of physics at the age of thirty-three. His frenzied pace of work was not sustainable, however. As the hagiography has it, with eyes destroyed from staring into the sun as part of his color studies, Fechner collapsed into bed with a terrible case of "habit-

[315] Thomas James Mathias, *The pursuits of literature: a satirical poem in four dialogues. With notes ... A new edition. Revised and corrected with many additions* (London: T. Becket, 1797).

[316] *The Zend-Avesta*, xix.

neurosis" and did not get up for some three years.[317] Having resigned his chair, he remained isolated, silent, and in pain. Whatever the original cause of his illness, his eventual recovery was sudden and complete. During an early post-prostration walk in his garden, Fechner realized that all matter—substance itself—was living and conscious, a point of view he called, again inspired by the Light and Dark of the *Avesta,"*the daylight view." This new vision of the daylight resulted in the first of seven works, *Über die Seelenfrage* (1861). It was intended, he wrote elsewhere, to tell his sleeping readers: "Steh' auf!": Wake up![318] In 1848 he published *Nanna oder das Seelenleben der Pflanzen*, followed three years later by a text of his own revelation, one he named to convey its sacredness: *Zend-Avesta*.

Based on William James' extended critiques in *The Principles of Psychology* or Boring's introduction to the English translation of *Elemente der Psychophysik,* a reader would not be aware that Fechner, while ostensibly the founder of a "materialist" psychology, had written extensively on the souls of plants and on life after death. In one of many disparaging assessments of what he called the "microscopic psychology," James said:

> This method taxes patience to the utmost, and could hardly have arisen in a country whose natives could be *bored*. Such Germans as Weber, Fechner, Vierordt, and Wundt obviously cannot; and their success has brought into the field an array of younger experimental psychologists, bent on studying the *elements* of mental life, dissecting them out from the gross results in which they are embedded, and as far a possible reducing them to quantitative scales.[319]

Fechner's attempt to come to the "deepest and most elementary" relationship between

[317] Edward Boring, "Editor's Introduction" in Gustav Fechner, *Elements of Psychophysics*, trans. Helmut E. Adler (New York: Holt, Rinehart, Winston, Inc., 1966), xiii.

[318] Gustav Fechner, *Über die Seelenfrage* (Leipzig: C.F. Amelang, 1861), v.

[319] William James, *The Principles of Psychology* (Cambridge, MA: Harvard University Press, 1981 [1890]).

mind and body had come, according to James, to "just *nothing*."[320] James was referring in particular to Fechner's famous *massformel*, a mathematical relationship that was meant to hold universally and to be able to predict the mathematical relationship between a perceived sensation and the intensity of a stimulus. It was experimentally derived, using the finest instrumentation available; yet for James it was an "idol of the den, if ever there was one."[321] While in other works criticizing psychophysics James would launch substantive philosophical and methodological critiques, here he just called Fechner "a Gelehrter of the ideal type":

> It would be terrible if even such a dear old man as this could saddle our Science forever with his patient whimsies, and, in a world so full of more nutritious objects of attention, compel all future students to plough through the difficulties, not only of his own works, but of the still drier ones written in his refutation. Those who desire this dreadful literature can find it; it has a "disciplinary value"; but I will not enumerate it even in a footnote.[322]

In 1904, however, James would call Fechner's mind "one of those multitudinously organized cross-roads of truth, which are occupied only at rare intervals."[323] James wrote a generous introduction for the English translation of Fechner's *Büchlein vom Leben nach dem Tode*, or *The Little Book of Life After Death* (the German edition appeared in 1836, and the first of two English translations in 1882). which was largely based on Fechner's *Zend-Avesta.* James suggested that an account of the

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[320] "In 1860, Professor G.T. Fechner of Leipzig, a man of great learning and subtlety of mind, published two volumes entitled *Psychophysik,* devoted to establishing and explaining a law called by him the psychophysic law, which he considered to express the deepest and most elementary relation between the mental and the physical worlds… Fechner's book was the starting point of a new department of literature, which it would be perhaps impossible to match for the qualities of thoroughness and subtlety, but of which, in the humble opinion of the present writer, the proper psychological outcome is just *nothing.*" James, *The Principles of Psychology*, 504.

[321] James, *The Principles of Psychology*, 518.

[322] Ibid., 518.

[323] William James, "Introduction," *The Little Book of Life After Death*, by Gustav Fechner, trans. Mary C. Wadsworth. (Boston: Little, Brown, and Company), vii-xix.

"somewhat oracularly uttered sentences" of *Life after Death* required a more full acquaintance with Fechner's "general system." According to James, Fechner's "general system" could be traced back to his revelation in the garden; all matter was *matter*, and yet at once *mind*. Ideas did not come out of an unknown unconscious, they were tangibly present in the "daylight" of extended, material, stuff. James tried to prepare an aspiring reader of *Life after Death* with the following summary:

> Once grasp the idealistic notion that inner experience is the reality, and that matter is but a form in which inner experiences may appear to one another when they affect each other from the outside; and it is easy to believe that consciousness or inner experience never originated, or developed, out of the unconscious, but that it and the physical universe are co-eternal aspects of one self-same reality, much as concave and convex are aspects of one curve.[324]

In what sounds suspiciously like the reintroduction of the kind of dualism that he might have hoped to erase, in Fechner's full explication, there was to be both an "inner" and "outer" psychophysics. Given that "inner" psychophysics did not involve material bodies, it was only the "outer" one that could be executed in a laboratory, though both "inner" and "outer" were, somehow, meant to obey the *massformel*. "Inner psychophysics" did not, understandably, become a research program.[325]

Within psychophysics, the Light and Dark of the *Zend Avesta* shaped Fechner's model for the mind and body. The world itself—like the spirit breathing bodies that inhabited it—was the solution to the existence of polar opposites. Mind, flesh, light, dark: none of them existed independently.

Fechner's revelation of psychophysics was intended to mean that matter could be studied in order to understand spirit without any reduction of one to the other. Both

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[324] Ibid, xii.

[325] David K. Robinson, "Fechner's Inner Psychophysics," *History of Psychology* 13, no. 4 (November 2010): 424-33.

Fechner and Wilhelm Wundt, who inherited and carried on Fechner's project, attempted to implement this view in an experimental program for the study of the mind, first in Germany. As we saw in chapter two, that program was later translated by American interpreters. The influence of this new view of spirit, and in particular the view of it inspired by the *Zend-Avesta*, was reflected in practice, as well as in experimental programs. After considering how it might have been that *breathing* in particular became a staple of psychophysical studies, we will return to consider the influence of the *Avesta* as body practice.

An Indologist in Wundt's Laboratory

Toward the end of 1889, *Science* published an English-language summary of a recent paper that had appeared in Wundt's new journal of experimental psychology, *Philosophische Studien.*[326] Though Wundt's psychophysics was a project that required the detailed measurement of physiological variables, this was the paper that introduced Wundt himself to the psychological significance of respiration, to which he had not previously given any particular attention. In the reviewed work, one Dr. Professor Leumann of Strassburg reported the results of recording the physiological data—respiration and pulse—of gymnasium boys as they read poems of different meters. The English-language review in *Science* was found under the heading "Thought and Breathing."

If such a link seemed bizarre or abstract, the anonymous reviewer quickly made it familiar to any reader: the shortness of breath brought about by running could make it

[326] Anonymous reviewer, "Mental Science: Mental Activity in Relation to Pulse and Respiration," *Science* 14, no. 355 (Nov. 22, 1889): 347-48.

hard not only to *sound* words, but even to *access* them in the mind. This was analogous to the process by which the pulse and respiration would slow in accordance with the mind in instances of drowsiness and eventual sleep. These ordinary phenomena, the reviewer claimed, did not lack for physiological explanation. The underpinnings of a link between mind and breath were commonplaces of physiology: "That the blood circulation in the brain is an important factor in its healthy activity, and that the intermittent supply of the same recorded by the pulse, and the intermittent purification of the blood by the lungs in breathing, must also play important parts in the maintenance of mental action."[327] Leumann's paper was a gesture, if preliminary, toward explicating the exact nature of these relationships. It was also an exploration of how this simple, undeniable observation might be extended to more unseen aspects of the mind.

Leumann studied boys in a Strasburg gymnasium and found pulse rates during the reading of poetry to vary at different numbers of feet per minute. The faster a student read, the higher his pulse was found to be:

> Even in one person, experimented on from midday till evening, the dependence of normal reading of metrical compositions on pulse-frequency was proved; the rhythmical intervals in scanning corresponded to the pulse intervals. Leumann supposes that to be the most general and normal song-metre, whose feet correspond to the pulsations, and its lines to respiration. And in fact, the Indo-Germanic original metre consists of four times four trochees, an arrangement agreeing with that view.[328]

The reviewer felt that this finding was corroborated by experiments in the timing of *association* which showed the average time to be 0.7 or 0.8 seconds. It could not be an accident that this was also the period of a normal pulse beat.[329]

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[327] Anonymous reviewer, "Mental Science," 347.

[328] R. Barrett Pope, "Thought and Breathing", *Nature* Vol. 41, no.1057 (Jan. 2, 1890): 209.

[329] Anonymous reviewer, "Mental Science," 348.

Perhaps most significantly, the reviewer referred also to Lange's "attention waves," which Leumann used in his work. A star, just barely visible, comes in and out of sight according to the pace of the observer's "wave of attention." According to studies variously using electric shock, flashes of light, and bursts of sound, these attention waves cycle every fifteen to twenty four times per minute (every 2.5-4 seconds): "a rate strikingly similar to the rate of breathing."[330]

A January 1890 review of Leumann's work in the *American Journal of Psychology* was far more critical, calling it a "lay" contribution, "suggestive rather than positive, its object being to call attention to the desirability of noting pulse and respiration rates in connection with psychometric determinations."[331] His attempt to connect respiration and "waves of attention," it was remarked, was only a "distant analogy." The anonymous reviewer wanted to know if these "waves of attention" were longer in naturally slower breathers than in naturally more rapid breathers.[332] Leumann had not convinced him of this relationship, or any other one. The anonymous reviewer did not qualify his claim that Leumann was a "lay" contributor. No American account of Leumann's work gave any indication of who he might be—an experimental psychologist, or perhaps a physicist, an associate of Wundt's, one would have assumed.

The actual state of affairs was much more interesting. Leumann was an Indologist, in particular a scholar of Jainism and early Buddhism, of the Pali language and literature—one of the greatest of his day. A recent catalog of his work testified to the

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[330] Ibid.,348.

[331] Anonymous reviewer, "Psychological Literature" (review), *American Journal of Psychology* 3, no. 1 (Jan. 1890): 135.

[332] Ibid, 135.

continuing value of his contributions: "Ernst Leumann was a veritable pioneer of Jaina studies so much so that 60 years after his death much of his work, whether published or not, is by no means outdated or superseded, but continues to be regarded as breaking new ground."[333]

Perhaps the presence of a philologist in an experimental laboratory wasn't actually all that surprising, given the disciplinary fluidity of early experimental psychology as it sought to define itself in distinction from philosophy. Wundt's new journal, *Philosophische Studien,* was a publication intended in part to establish the disciplinary authority of psychology, and to distinguish it from philosophy, on the one hand, and occultism or spiritualism, on the other. Apparently Wundt had originally wanted to call his journal *Psychologische Studien,* but that name was currently in use by a journal devoted to "mysticism."[334] Though early experimental psychology's home was undoubtedly Germany in this period, it was nonetheless a fledgling profession; there were few laboratories and little funding.[335] Wundt's journal, then, had as one of its goals to demonstrate how instrumentation and experiment, in addition to introspection, made psychology unique and worthy of existing independently.

Not revealing his academic identity, Leumann did not make any explicit connection between his work as a Sanskrit scholar and his introduction of the relationship between thought and breathing to experimental psychology. But even without knowing

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[333] Albrecht Wezler, "Foreward," in *Catalogue of the Papers of Ernst Leumann in the Institute for Culture and History of India and Tibet, University of Hamburg,* ed. Klaus Bruhn and Birte Plutat, (Stuttgart: Franz Steiner Verlag, 1998).

[334] Jeremy Gray, *Plato's Ghost*: *The Modernist Transformation of Mathematics* (Princeton, NJ: Princeton University Press, 2008), 394. The *Philosophische Studien* was published under that name until 1903. See Boring, *A History of Experimental Psychology*, 327.

[335] Mitchell G. Ash, *Gestalt Psychology in German Culture, 1890-1967: Holism and the Quest for Objectivity* (Cambridge, New York: Cambridge University Press, 1995), 17-20.

that Leumann would have known about Indian theories and practices of breathing, the conversation that followed the appearance of reviews in *Nature* in January, February, and March of 1890 was all about yoga (or something like it). Between many enthusiastic accounts of the concealment strategies of various species of *anomoura* crabs, and the derivation of a hydrodynamic equation for the movement of oil on disturbed water, one R. Barrett Pope reported that Prof. Leumann's research had reminded him of "the religious observance among the Hindus." R. Barrett Pope had his information on the subject, he revealed, from his reading of Prof. Monier-Williams's recent work on Buddhism.[336]

Consulting Monier-Williams's text *Buddhism, in its Connexion with Brahmanism and Hindusim and in its Contrast with Christianity* reveals discussions of "cramping of the limbs," "suppression of breath," "imprisonment of breath," and "suspended animation."[337] Though of all the eight "requisites" of yoga, the suppression and regulation of the breath is the hardest for Europeans to understand, it was not without precedent. Swedenborg had taught that thought and feeling began with and followed respiration. Thus Swedenborg appeared in the pages of *Nature*, via R. Barrett Pope and Monier-Wiliams. "It is strange," they both quote Swedenborg as saying, "that this correspondence between the states of the brain or mind and the lungs has not been admitted in science."[338]

The conversation in *Nature* did not entirely lack for more humble contributions:

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[336] R. Barrett Pope, "Thought and Breathing," *Nature* 41, no. 1057 (1890): 297.

[337] Monier Monier-Williams, *Buddhism, in its Connexion with Brahmanism and Hindusim and in its Contrast with Christianity* (Cambridge: Cambridge University Press, 2010 [1888]), 240. **DOI:** 10.1017/CBO9780511706912. Monier-Williams vs. Müller—they were both vying for the Boden Chair of Sanskrit at Oxford in 1860.

[338] Monier-Williams, *Buddhism*, 242.

tooth extraction, W. Clement Ley reports "in connection with Prof. Leumann's recent researches into the relations between changes in respiration and changes in certain cerebral functions," can be aided by controlled breathing. Rapid and deep breathing of periods of four to six minutes results in giddiness and loss of consciousness, during which a "short" operation can be performed: "The patient, while unable to move his arms, opens his mouth at the order of the operator. I have heard of no casualties or evil effects from this mode of treatment."[339]

Whether or not as a sole result of scholarly distress at seeing Emmanuel Swedenborg mentioned in the same breath as yoga, the final contribution to discussion of Leumann's paper was from none other than the president of the International Congress of Orientalists, Max Müller. The Feb 6, 1890 issue of *Nature* included his lengthy and copiously documented account of yogic breathing practices and their goals: "I send you some abstracts from the Sanskrit Yoga-sutras which treat very fully of the pranayama, or the expulsion and retention of breath, as a means of steadying the mind."[340] Following his account of the contents of Sutra 37 of the first chapter of the Yoga sutras, Mueller emphatically concluded that it is only in some "minor work on Yoga" that the therapeutic or sanitary benefits are discussed: "In America some spiritualistic doctors prescribe the same practice for curing diseases."[341] In India, on the other had, the practice of *pranayama* is only intended for a "higher object" which he describes as the "abstraction of the organs from their natural functions." Breathing in Indian tradition, in distinction to American medical and other practice, is a preliminary to the other practices of

[339] W. Clement Ley, "Thought and Breathing," *Nature* 41, no. 1058 (1890): 317.

[340] F. Max Müller, "Thought and Breathing" *Nature* 41, no. 1058 (1890): 317.

[341] Ibid., 317.

"steadfastness, contemplation" and meditation ("an almost cataleptic trance"): "These three are supposed to impart powers or *siddhis* which seem to us incredible, but which nevertheless are attested by the ancient Yogis in a very *bona-fide* spirit, and deserve examination, if only as instances of human credulity. I say nothing of modern impostures."[342]

Let's consider one of these "modern impostures" that Müller might have had in mind in his criticism, one entailing an attempt to sublimate the flesh both for the sake of the purity and health of the body, as well as for the salvation of the whole person through attention to the body, and the breath in particular. Though the first texts of this new embodied religion appeared at the turn of the century, the battle of matter and spirit as it pertained to the creation of new selves that raged around the founding of the Bauhaus in the early 1920s is where we will begin.

Mazdaznan Breathing

> Move the arms outstretched to the side of the body, even a trifle to the back. Now exhale. Inhale and exhale… This exercise may be taken three times a day, but do not take it oftner to begin with, nor with more than seven breaths. It is a very powerful exercise…after some time, you will notice, when entering a darkened room, a peculiar phosporescent glow at the finger-tips. You do not want to become enthused and run about the neighborhood… boast[ing] about the wonderful benefits you are receiving. [Your friends] will come to you as you have come here, to learn, and they will sit at your feet with eagerness to learn, as Mary at the feet of the Master was anxious to take in His glorious sayings. And the end of it all will be that that they will beg of you to take them to the fountain, that they may also drink of its purifying waters.[343]

Not everyone was begging to be taken to the fountain. In particular, the 1921

[342] Ibid.

[343] Otoman Zar-Adusht Ha'Nish, *Mazdaznan: Health and Breath Culture (First Six Exercises)* (London: Open Editions, 2012 [1940]), 35-6.

takeover of the Weimar Bauhaus kitchen by members of the Mazdaznan, a young, neo-Zoroastrian religion, was not to everyone's taste. In his role as master of the *Vorkurs*, the foundation course in techniques and materials required of all students, Swiss painter and Mazdaznan devotee Johannes Itten set the artistic agenda in the very early days of the Bauhaus.[344] He had also managed to take over the menu. Alma Mahler Gropius (perhaps not coincidentally in a downswing of her perennially challenged marriage to Walter Gropius) suffered "billious attacks." She claimed Itten himself was also suffering such attacks, even if he would not admit it.[345] Followers of Itten and his version of Mazdaznan, bald and clad in wine-colored linen robes, floated through the halls, announcing themselves wherever they went in clouds of garlic. Livers notwithstanding, the most common complaint was simple hunger as the Mazdaznan hygiene program taught that through proper breathing in general and in particular the breathing exercises performed by all the students under Itten's direction at the beginning of each of his classes, the need for food and sleep would be decreased.

Paul Citroen, who was a student in Itten's 1922 *Vorkurs* (he is best known for pioneering photomontage in the early 1920s), was entirely entranced by his teacher:

> We had the greatest respect for him. There was something demonic about Itten. As master he was either ardently admired or just as ardently hated by his opponents, of whom there were many. At all events, it was impossible to ignore him. For those of us who belonged to the Mazdaznan group—a unique community within the student body—Itten exuded a special radiance. One could almost call it holiness. We were inclined to approach him only in whispers; our

[344] From Citroen's account, we have reason to believe that Itten's program, for a time, at least, had gained significant traction: "By developing the preliminary course from the outset and directing almost all the workshops in the spirit of the Mazdaznan doctrine, Itten had an enormous influence on the organization and teaching work of the Bauhaus, with the result that many observers identified the college with Mazdaznan." Norbert M. Schmitz, "Mazdaznan at the Bauhaus—the Artist as Savior," in *Bauhaus,* ed. Jeannine Fiedler and Peter Feierabend (Cologne: Koenemann Verlgsgesellschaft, 1999), 121.

[345] Nicholas Fox Weber, *The Bauhaus Group: Six Masters of Modernism* (New Haven: Yale University Press), 56.

> reverence was overwhelming, and we were completely enchanted and happy when he associated with us pleasantly and without restraint.[346]

Itten's Mazdaznan, in its breathing, chanting, pure and spare diet, fasting, and ritual bathing, was a path of purification.[347] In spite of the rigorous self-discipline involved, there was a swell of fresh and energetic enthusiasm around the path and promise of Mazdaznan. Within the student body, the followers of Itten and his Mazdaznan teachings were prominent, active, and well-organized. There were lectures, group practice and exercise sessions, gatherings for the performance of ritual, planning and organizational meetings, and shared meals.[348]

When he founded the Bauhaus in 1919, Walter Gropius had imagined a creative community united in values distinct from the broader social order.[349] Borders were becoming established, however, *within* that nascent community on the basis of distinctions between the pure and the impure, the ignorant and the initiated. Breathing exercises were practiced not only to purify and relax the body in preparation for creative

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[346] Paul Citroen, "*Mazdaznan* at the Bauhaus," in Eckhard Neumann (ed.), *Bauhaus and Bauhaus People* (Van Nostrand Reinhold: New York, 1993), 44-45.

[347] In the works of the founder of Mazdaznan, Otoman Zar-Adusht Ha'nish, we find the following kinds of injunctions: "You now have four exercises to perform daily, to be taken in the order given. We now proclaim that this exercise in connection with the previous ones, followed daily, will aid in overcoming all obnoxious habits, such as flesh-eating, liquor-bibbing, smoking, chewing, drugging, and the like. You must necessarily build up a character that will be strong enough to see the folly of your position, and help to overcome all evil habits in a perfectly natural way by simply outgrowing them, until you find yourself freed, never again to wallow in their filth and degradation. In time you will become very particular as to what you eat and drink, taste or smell, because of the extreme delicacy of the senses. The odour of liquor or tobaco, and the effluvium of burning grease and flesh will become nauseating, because you have been lifted to a higher plane, where purity of food and environment are necessary for a harmonious existence. Purity of body will produce purity of mind, and the ideas flowing therefrom will be of an elevating nature. There will be no longer a desire to enter into conversation about the neighbours and acquaintances, and associations with gossip and hypocrisy will be strenuously shunned. Selfishness will be overcome and harmony with nature and all mankind will prevail." Ha'Nish, *Mazdanan: Health and Breath Culture*, 28.

[348] Citroen, "*Mazdaznan* at the Bauhaus," 45.

[349] Hans Maria Wingler, *The Bauhaus: Weimar, Dessau, Berlin, Chicago* (Cambridge: MIT Press, 1978 [1969]), 31.

work, but also for protection from potentially dangerous exterior influences. In this way the practices served to create clear borders around those who had been inducted into the purification methods, as well as to establish a need to be protected from nefarious elements in the uninitiated larger world. Those on the inside knew something that others did not. This superior knowledge mandated practice—and self-defense—without ceasing. Citroen described one such boundary-making breathing practice which is reminiscent, perhaps, of the world of chapter one of this thesis, in which nefarious, unseen spiritual influences were thought to be transmitted through the breath:

> I remember meeting a disagreeable person. Muche [Itten's main pupil] introduced him to me, and I started the appropriate breathing exercises immediately to make any contact with him impossible, to undercut any influence he might possibly have on me. The fellow noticed nothing of this, but Muche, who saw my nostrils flaring, was amused. … We thought we could see through any person, because our method gave us an advantage over the unsuspecting.[350]

Other advantages resulted from cultivating mastery over the needs to which most regular people were subject. One wonders what kind of events community meals might have been, given the Mazdaist injunction to eat as little as possible—a principle that led inevitably to mandating frequent, rigorous, and lengthy fasts. Citroen reports that the school owned a garden on a hill near Weimar where members of the community would spend these long periods of fasting. There were raspberry bushes and fruit trees; there was also no one around to disturb their "pious singing."[351] Mazdaznan singing exercises

[350] Citroen, "*Mazdaznan* at the Bauhaus," 47.

[351] One explorer on visiting the London Mazdaznan temple wrote to his mother: "It is so hot, one really does not know what to do. And yet I am supremely happy. I have discovered a new religion with its headquarters on Regent Street. …This was followed by the best hymn I have ever heard: all—except me—did physical exercises with their hands ending with a rhythmic beating of the breasts—for I was the only man present. 'Ev'ry inhaled breath brings life, exhalation ends all strife, Keep your nostrils wide and clear, Tongue relax! God's name revere, Inhale gladly, inhale long, Exhale slowly, exhale strong, Then with ev'ry indrawn breath, Realize there is no Death. Keep your chest out, chin drawn in, Set thy thought on God within. Now relax your body well, As thru nostrils you exhale. Keep your solar plexus in, While your mind is fixed within. Have your mind well focused, fixed, On some object, Don't get mixed." Perhaps the

included precise breathing instructions: they were, in fact, breathing exercises. Prayers of varying lengths were said on a single breath in order to cultivate the ability to manage progressively longer and more complete exhalation. Everyday speaking, on the other hand, was to be done with continual awareness of any unnecessarily forceful exhalation.[352] Weeding was a favorite activity since "we were dedicated to rooting out the weeds of the whole world, the enemies of creativity."[353] But more than robes, shaved heads, garlic or ritual purifications, it was disagreement on the nature of creativity that would eventually prove definitively divisive within the fledgling Bauhaus.

The disagreement between Gropius and Itten first centered on the kitchen alone, but eventually reached into more precisely articulated, programmatic territory as they came to see one another as "enemies of creativity." By 1923, Itten had been forced to resign his position, a great success and relief for Gropius who had tasked himself with removing all vestiges of "mysticism" and saving the Bauhaus from becoming a "haven for eccentrics."[354]

For Gropius, vision was not otherworldly. He wrote a letter framed as a response to Master Itten's "demand" that the institution declare its allegiance to one of either individual creativity or economic viability. Gropius rejected Itten's stark binary: the Bauhaus had the responsibility of "educating people to recognize the basic nature of the

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best thing was the reading of the pearl, for the good lady—dressed up in white satin—gave short explanations as she went along. She began by saying 'our object is the materialization of spirit,' and she concluded by describing how after death the body would accuse the soul of misleading it!!." Qtd. in Bradford Verter, "Dark Star Rising: The Rise of Modern Occultism: 1850-1950" (Ph.D. diss., Princeton University, 1997), 184.

[352] Otoman Zar-Adusht Ha'Nish, *The Power of Breath: The Magic Key of Self-Development* [Rev. ed.] (Los Angeles, Bern: Mazdaznans, Humata, 1958), 18.

[353] Citroen, "*Mazdaznan* at the Bauhaus," 49.

[354] In 1923 Itten resigned and was succeeded by Laszlo Moholy-Nagy.

world *in which they live*….to combine the creative activity of the individual with the broad practical work of the world!"[355] Itten had created a false dichotomy, Gropius charged, between what he termed the "economically oriented outside world" and the work of the creative individual. Such a distinction would only hold up, he responded, in the mind of one who had retreated entirely from the world. But for one who "remains in this world, the forms of his work will show its rhythms all the more as he strives to understand its challenges."[356] This world was both source and destination for creativity.

The Mazdaznan philosophy and practice that so influenced Itten personally as well as in his pedagogy in the *Vorkurs* was permeated with the kind of rigid dualisms he brought before Gropius. Its hygienic practice and its theory of creativity followed from the core difference between light and dark, an inheritance from the *Zend Avesta* and Zoroastrian tradition from which the Mazdaznan claimed to descend. The opposition between Light and Dark was embodied in meticulously practiced distinctions between purity and impurity, and in a theory of expressive practice that made no requirement for manifestation on this (or any other) material plane. The Mazdaist philosophy rigidly separated matter and spirit, like light and dark; these elements were of fundamentally different orders in Itten's view: "Experiencing is a faculty of mind and spirit. If it concerns phenomena of a coarse material kind, then it is the physical faculties which produce the experience; on the other hand, if it relates to sensitive spiritual phenomena, then it is the spiritual faculties that produce the experience."[357] Subtle experience,

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[355] Walter Gropius, "The Viability of the Bauhaus Idea" in Hans Maria Wingler, *The Bauhaus: Weimar, Dessau, Berlin, Chicago* (Cambridge: MIT Press, 1978 [1969]), 51.

[356] Walter Gropius, "The Viability of the Bauhaus Idea," Notes of February 3, 1922, in a circular to the Bauhaus Masters from Collection Gropius. Qtd. in Wingler, *Bauhaus,* 51.

[357] Johannes Itten, "Analysis of Old Masters," from the almanac "Utopia. Documents of Reality," (Weimar:

sensitivity, finer perception: these were of spirit.

It was then, most importantly, *spirit* that governed matter. The material world was subservient to mind, to intention, to will, and to spirit. Proper breathing—the material representative of that spirit—alone could shape the muscles; the body was powerless to ignore the "command of the mind." Breathing was the agent and medium through which that mind commanded the body:

> We see hundreds of our pupils going home, after working or shopping all day, gliding like the gowns of flying angels down the street. … They know they can prove that by their exercising, they are developing the muscles as well, although no particular attention to their development is given. It is the natural result of proper breathing in the correct position, with a concentrated mind.[358]

The cultivation of the body, with the eventual effect on its movements and its shape, was the primary goal; the secondary aim of developing muscles would be pursued as a matter of course. An exercise illustrated at the beginning of this section was taught in this way:

> In this exercise, you throw your arms out in front of you by the power of the will, which is the thought of "Be it so" or "Let there be." By the command of the mind, with muscles of the whole body relaxed, spine firmer than ever, and an air about as independent as any monarch or potentate, the functions of the body must respond.[359]

(For more examples of breathing exercises, see Figures 9, 10, and 11. All three images depict "Exercise Five" from Hanish's *Health and Breath Culture.*) The prevalence of spirit over matter at the heart of the Mazdaznan philosophy informed Itten's understanding of both perception and expression, as is evident in his writings on art and pedagogy. The entirety of the act of making art was encapsulated in the directness and intensity of one's own "internal" experience. The interiority of the solo, creative

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Bruno Adler, Utopia Press, 1921). Reprinted in Wingler, *Bauhaus,* 49.

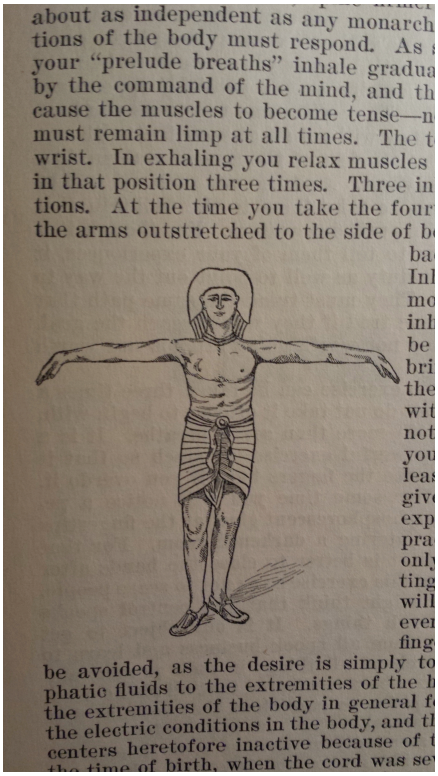
[358] Ibid., 31.

[359] Ibid., 32.

individual was the locus and destination of cultivation. Itten's essay "The Old Masters" is therefore unsurprisingly characterized by an absence of mentions of any old master: "We say: to experience a work of art is to re-create it. Because, intellectually speaking, there is no great difference between a person who experiences a work of art and a person who outwardly represents an experienced form in a work."[360] Itten's imagined "person" is not unlike Borges' Pierre Menard, who so deeply understood Cervantes that he wrote *Don Quixote* at once verbatim and *de novo*. But unlike Menard, Itten didn't see the need to put pen to paper or brush to canvas.

[360] Ibid., 49.

Figure 9. Morning exercises on the roof of the Itten School, Berlin 1931. Exercise Five: from *Health and Breath Culture*. Source: Johannes Itten-Stiftung, Kunstmuseum, Bern, reprinted in Otoman Zar-Adusht Ha'Nish, *Mazdaznan: Health and Breath Culture (First Six Exercises)* (London: Open Editions, 2012 [1940]), 46.



about as independent as any monarch
tions of the body must respond. As
your "prelude breaths" inhale gradua
by the command of the mind, and th
cause the muscles to become tense—n
must remain limp at all times. The t
wrist. In exhaling you relax muscles
in that position three times. Three in
tions. At the time you take the four
the arms outstretched to the side of b
ba
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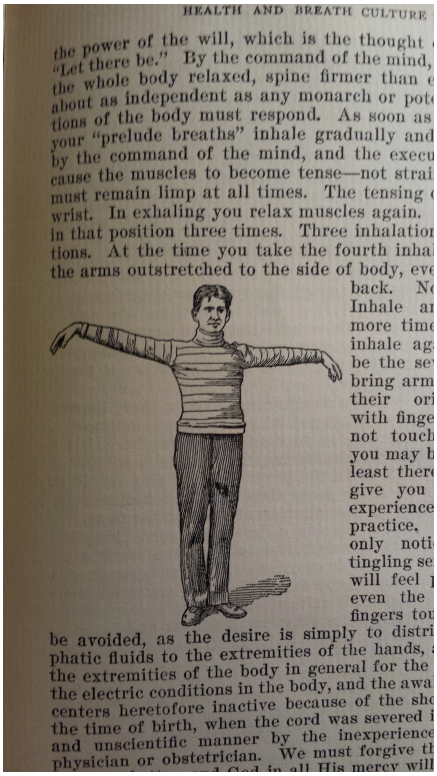
fing
be avoided, as the desire is simply to
phatic fluids to the extremities of the h
the extremities of the body in general f
the electric conditions in the body, and th
centers heretofore inactive because of t
the time of birth, when the cord was se

Figure 10. "Exercise Five" from the 1914 edition of *Health and Breath Culture*. Source: Otoman Zar-Adusht Ha'Nish, *Health and Breath Culture* (Chicago: Mazdaznan Press, 1914).



HEALTH AND BREATH CULTURE

the power of the will, which is the thought
"Let there be." By the command of the mind,
the whole body relaxed, spine firmer than
about as independent as any monarch or pot
tions of the body must respond. As soon as
your "prelude breaths" inhale gradually and
by the command of the mind, and the execu
cause the muscles to become tense—not strai
must remain limp at all times. The tensing
wrist. In exhaling you relax muscles again.
in that position three times. Three inhalatio
tions. At the time you take the fourth inha
the arms outstretched to the side of body, ev
back. N
Inhale a
more time
inhale ag
be the se
bring arm
their ori
with finge
not touch
you may b
least there
give you
experience
practice.
only noti
tingling se
will feel
even the
fingers tou
be avoided, as the desire is simply to distri
phatic fluids to the extremities of the hands,
the extremities of the body in general for the
the electric conditions in the body, and the awa
centers heretofore inactive because of the sh
the time of birth, when the cord was severed
and unscientific manner by the inexperience
physician or obstetrician. We must forgive th

Figure 11. "Exercise Five" from the 1902 edition of *Health and Breath Culture*. Figure is a cartoon of Ha'Nish. Source: Otoman Zar-Adusht Ha'Nish, *Health and Breath Culture According to Mazdaznan Philosophy (sun-worship)* (Sun-Worshiper Publication Co., 1902).

While in conversation with Gropius, Itten had framed a fundamental misalignment between creative and economic values. But what was ultimately at stake for Itten was metaphysics, and in particular, his conviction that spirit—or what he often called experience—trumped all forms of material expression. In *Design and Form*, a later synthetic work outlining his pedagogical principles, Itten quotes letters he received from those who happened to have visited his classes. In his chapter on the pedagogy of "expressive forms," Itten concludes and summarizes by citing a letter of one Oskar Schlemmer, reporting to a friend on his attendance at Itten's class on Grunewald's *Weeping St. Mary Magdalene*:

> Itten teaches analysis at Weimar. Shows photographs from which the students are to draw this or that important element; usually the movement, the principal line, curve. He then points out a Gothic statue to them; followed by the weeping St. Mary Magdalen of the Grunewald Altar; the students try hard to distill an essential feature from this very complex situation. Itten looks at the attempts and thunders: "If you had any artistic feeling, you would not make drawings in the presence of this most sublime expression of weeping, which symbolizes the Grief of the World; you would just sit and cry your hearts out."[361]

It's not hard to see how Itten could have been as enthralling to a certain set of students as he was infuriating to others (perhaps those trying to learn to draw, sculpt, paint or weave). His main role in the early days of the Bauhaus was, of course, to design a program for successful teaching—a goal the very possibility of which he questioned in his textbook:

> Question: Are teaching and comprehending possible at all? We shall never get to the bottom of a thing. Neither substance nor form nor movement can be taught, can be comprehended. Perception alone is perceivable.
> Modesty and great humility before Him, the Incomprehensible, help us bear the gravity of this insight.[362]

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[361] Ibid., 111.

[362] Ibid., 49.

That he represented the Bauhaus's "romantic period" was something Itten later explicitly denied. To his mind, the duration of time in which his approach prevailed was nothing less than the *universal* period of the school: "These first Weimar years are wrongly described as the romantic period of the Bauhaus. In my opinion, these were the years of universal interests."[363] By the time of the Dessau Bauhaus (1925), the program was defined in opposition to everything that had been taught in its first foundation course. The departure of Itten represented the end of what one historian has called the "occult birth pangs" of the Bauhaus.[364] According to Galison, the anti-metaphysical program of Vienna Logical Positivism and Bauhaus high modernism came to be so closely aligned in part thanks to a common enemy of "mysticism": "If the Bauhaeusler and logical positivists needed an external force to drive them even closer together, the anthroposophists and mystics did so in the beginning while the Nazis and nationalists served that purpose in the later period."[365]

For Itten, Mazdaznan represented a solution to the deep questioning occasioned by the horrors of the war and its continuing repercussions: he had become quite disillusioned with the world. He read non-Western philosophy. He read Spengler. He began to deeply question technology, the Enlightenment, progress. Where was it all

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[363] Johannes Itten, *Design and Form—The Basic Course at the Bauhaus* (New York: Reinhold Publishing Corporation, 1964), 11-12.

[364] Norbert M. Schmitz, "Mazdaznan at the Bauhaus: the Artist as Savior." In Jeannine Fiedler and Peter Feierabend, eds. *Bauhaus* (Cologone: Konemann Verlagsgesellschaft, 1999), 120-125.

[365] Peter Galison, "Aufbau/Bauhaus: Logical Positivism and Architectural Modernism," *Critical Inquiry* 16, no. 4 (Summer 1990): 749. Anthroposophy was the school of self-proclaimed successor of Goethe, Rudolf Steiner, who was, for a time, closely associated with the Theosophy of Helena Blavatsky. In "Aufbau/Bauhaus," Galison argues for near identity of the programs of the Post-Itten Bauhaus and the Logical Positivism of Carnap and Hempel: "The logical positivists were more prominent as visitors to the Dessau Bauhaus than members of any other single group outside art and architecture. Further, the two movements faced the same enemies—the religious right, nationalist, anthroposophist, *voelkisch*, and Nazi opponents—and this drove them even closer together, toward the conjoint life they had in mind." Ibid., 710.

leading? And at some point he became a devotee of one Otoman Zar-Adusht Ha'nish, the "master" of the Mazdaznan, and author of its many volumes of songs and hygienic and spiritual guidance.[366]

Who was Ottoman Zar-Adusht Ha'nish? A hagiographic piece from a 1944 *Mazdaznan Mangazine* answered: "It is not our privilege to know the place of his birth, for he himself has said: 'As to our birthplace and who we are, none will ever know.'"[367] The wide variety of mutually contradictory accounts of his origins attest to this fact. The self-styled "Master" did however reveal, the text continues, that "[a]t our birth we had a tree planted and we were presented with a lion cub, as is not unusual in Oriental Royal Families." In other places, however, he more explicitly claimed to have been born in "the Persian court," to German and Russian parents.[368] At yet other times he claimed to have been trained in a Zoroastrian order in Tibet, and at still others to have been made a priest following thirty years of training in a temple in Tehran. *The San Francisco Chronicle*, for its part, suspected he was actually from Wisconsin: "By many cult followers he is said to be a native Persian and to have been born seventy-two years ago. It was said that a Milwaukee, Wis. Musician, whose name is Hanisch, was ready to testify for the

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[366] "The terrible events and the shattering losses of the war had brought in their wake confusion and helplessness in every walk of life. …My attention was drawn to Spengler's book *The Decline of the West*. I became aware of the fact that our scientific, technological civilization had reached a critical point. I did not believe that the slogans 'Back to the Crafts' or 'Unity of Art and Technology' were capable of solving our problems. … I was ridiculed at the time because I did breathing and concentration exercises. Today many people consider an interest in Eastern philosophy quite natural. These first years of the Weimar Bauhaus were wrongly called its Romantic period. In my view they were the universalist years." Itten, *Design and Form,* 9.

[367] [Untitled], *The Mazdaznan Magazine,* London, 1944. Reprinted in Ha'Nish, *Mazdanan: Health and Breath Culture*, 37.

[368] *"*A wise Man From Persia," *Otago Witness*, Issue 2657 (February 15, 1905). Reprinted in Ha'Nish, *Mazdanan: Health and Breath Culture*, 37.

Government that the high priest was his son and was about 40 years old."[369] The German Brockhaus Encyclopedia, meanwhile, reported that he was born in Posen, then Germany, December 19, 1854.[370] Perhaps he was right: we will never know the place of his birth.

The account of Ha'nish/Hanish's German roots is, however, further corroborated in a curious story told by Karl Jung in lectures he gave on Nietzsche's *Zarathustra* in the 1930s. In particular, Jung is trying to understand how Nietzsche would have known anything about Zoroastrianism:

> I found an allusion to the peculiar fact that Nietzsche as a young man studied in Leipzig, where there is a funny kind of Persian sect, the so-called mazdaznan and their prophet is a man who calls himself El Ha-nisch. But that man is said to be a German from the blessed land of Saxony named Haenisch, a well-known Saxon name; as a matter of fact, the professor of Oriental languages here told me that when he was studying Persian in Leipzig, this man was in the same seminar. He is certainly not the originator of the Mazdaznan sect; it is of older origin. They took over certain Persian ideas from the Zend-Avesta, particularly the hygienic rules which they applied in a more or less mechanical way, accompanied by metaphysical teaching also taken from the Zend-Avesta which, as you know is a collection of sacred books of Zoroastrian belief.[371]

Why Hanish made breathing exercises a central part of the Mazdaznan hygienic program is not clear. There are certainly no particular breathing instructions in the *Zend-Avesta*. Breathing played only a small part in German physical culture as inherited from Ling's Swedish Gymnastics.[372] Like other breathing teachers who would be directly or indirectly inspired by the breathing of the Mazdaznan, including Elsa Gindler, Genvieve Stebbins, and F.M. Alexander, Hanish made it very clear that the breathing exercises of

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[369] "Disciples Burn Incense in Court: Followers of Hanish perform rite s leader's book is read, but are checked." *San Francisco Chronicle*, November 28, 1913.

[370] Schmitz, "Mazdaznan at the Bauhaus," 121.

[371] C.G. Jung, *Nietzsche's Zarathustra: Notes of the Seminar Given in 1933-39* (Princeton, NJ: Princeton University Press, 1988), 4.

[372] Heikki Lempa, *Beyond the Gymnasium: Educating the Middle-Class Bodies in Classical Germany* (Lanham: Lexington Books, 2007).

Mazdaznan were not simply "physical culture":

> Yet before taking up the exercise proper, it will be well to state that the work is not to be likened to what is called physical culture, although the latter has taken from it certain positions and material, but lacks the most important part of it all—concentration and the application of Breath power corresponding to the position taken. Athletics are good for those whose occupations are confining, and who have not sufficient opportunity of moving about. But something more is needed to cover the whole ground…you are to breathe, and concentrate upon Breath, thus keeping your mind functions steadied.[373]

While it did not explicitly claim that the way the body breathes is a social thing, the spirit-over-matter breathing practice of the Mazdaznan was a disruptive—and at times creatively disruptive—force in relation to various standing social orders.

The work of tracing the actual scope of influence of Hanish and his Mazdaznan is yet to be completed.[374] The Mazdaznan movement, about which nothing scholarly (or of any other genre) has been written, apparently published, established communities, and influenced followers in not only Germany and Switzerland, but eventually in Chicago, where Ha'nish seems to have settled by 1902, and later in Massachusetts and California, where temples and print houses were established.[375] His American period is well documented in hundreds of newspaper reports as Mazdaznan and Hanish were the source of one scandal after another.

In 1913 Hanish was accused of "sending the text-book of the cult by express in

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[373] Ha'Nish, *Mazdanan: Health and Breath Culture*, 13.

[374] It is plausible that Hanish was a typesetter and printer, given the attention to typeset and printing evident in the early American Mazdaznan publications. Mazdaznan-affiliated and published accounts claim that Hanish was an advisor and friend of Marx and Tolstoy. They also claim that he inspired Ford's engine, Edison's light bulb, Luther Burbank's fruits (Hanish called Burbank the modern Zarathustra, supposedly), the League of Nations, and scenic railways to encourage better breathing. There is some evidence that Hanish might have been an influence on Edison—or at least that there was a light bulb called *Mazda*. [Untitled], *The Mazdaznan Magazine* (London, 1944). Reprinted in Ha'Nish, *Mazdanan: Health and Breath Culture*, 37.

[375] Widener's collection of Mazdaznan publications includes items printed in all of these places.

violation of the interstate commerce law" and *The San Francisco Chronicle* reported that his disciples were prevented in their attempt to burn incense in court for the entire two-day duration of the reading of the volume to the jury.[376] There were later charges of financial irregularities, of nude dew bathing, and of sorrel eating:

> There was also testimony that Dr. Ha-Nish set type on some of his own books in Chicago, that Mrs. Shaw contemplated giving $40,000 for a Mazdaznan temple in Denver, that she took dew baths on the lawn in a loose wrap, that she told Winifred Dutton of Dorchester, when he ate meat, that he was eating his uncle and aunt and other relatives, and that Mrs. Shaw's husband, before he died, declared he hoped his wife would be arrested while taking one of her dew baths.[377]

There were also claims that Mazdaznan members attempted to hypnotize witnesses:

> While Mrs. Dittman was testifying, T.W. Kittredge atorney (sic) for Mrs. Dutton, rose and accused Mrs. Mary Elizabeth Ruth Hilton, alleged high priestess of the Lowell Mazdaznan temple, with attempting to hypnotize the witness and to prevent her from continuing in her testimony. The court ordered a recess and at its conclusion Mrs. Dittman explained how Mrs. Hilston had been gazing fixedly with her left eye in line with the left eye of the witness, following one of the alleged laws of the Mazdaznans to get one mind under the control of the other. Mrs. Hilton was ordered to take a seat farther back in the court room.[378]

As within the nascent Bauhaus, the peculiarities of life lived according to Mazdaznan created insiders and outsiders, the pure and the impure. Itten went to battle for the primacy of the individual's experience over and above any worldly expression. Hanish himself put it this way, in terms of the breath: "The Mother Breath also decides the conditions and environments of existence, and you only free yourself from this ban of slavery by establishing your Individual Breath, and to this end you take up this work."[379]

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[376] "Incense was burned when the reading of the cult's text-book was begun, but the rite was stopped by baliffs." *San Francisco Chronicle*, November 28, 1913.

[377] *Boston Daily Globe*, October 14, 1908.

[378] *"*Priestess Tries to Hypnotize Witness," *The Hartford Courant,* October 14, 1908.

[379] Ha'Nish, *Mazdanan: Health and Breath Culture*, 13.

The end of the practices and lifestyle of the Mazdaznan were to establish the "individual breath" against the enslaving winds of conditions and environment.

Scholars Who Hold Their Breath

Oscar Wilde opened his 1890 review of a then recently published translation of the *Zhuangzi* with a rather Zhuangzi-like paradox: the problem with modern progress, he said (claiming to quote an unnamed Oxford theologian), was that it progressed forward instead of backward. The pathologies of modern life had been best diagnosed by a sage born "the fourth century before Christ, by the banks of the Yellow River, in the Flowery Land" (perhaps the very one pictured on the tea trays and painted screens of respectable suburban homes). Wilde praised Zhuangzi highly: "The most caustic criticism of modern life I have met with for some time is that contained in the writings of the learned Chuang Tzu, recently translated into the vulgar tongue by Mr. Herbert Giles, Her Majesty's Consul at Tamsui."[380]

Against competitive examinations, missionaries, penny dinners for the people, Humanitarian Societies, and dull lectures about duty to one's neighbor, Wilde set the mirror-like equanimity of the sage who did absolutely nothing besides gaze at the universe, utterly unconcerned with taking any particular position with respect to what he saw or with changing the opinions of anyone else. But Wilde at the same time claimed that "self-culture" was what Zhuangzi understood that moralistic and meddlesome moderns did not:

> It is clear that Chuang Tzu is a very dangerous writer, and the publication of his book in English, two thousand years after his death, is obviously premature, and

[380] Oscar Wilde, "A Chinese Sage," *Speaker,* February 8, 1890.

> may cause a great deal of pain to many thoroughly respectable and industrious persons. It may be true that the ideal of self-culture and self-development, which is the aim of his scheme of life, and the basis of his scheme of philosophy, is an ideal somewhat needed by an age like ours, in which most people are so anxious to educate their neighbours that they have actually no time left in which to educate themselves.[381]

Wilde's Zhuangzi at once valued non-doing and the practice of self-cultivation. Or at least this was a tension that modern readers of *Zhuangzi* found in the text, and perhaps not surprisingly, given a broader conflict between the assertion of the will in the form of self-culture, on the one hand, and, on the other, the acquiescence of the will in falling into rightful place in the natural order. The true sage, Wilde concluded, ignores self, reputation, and action, but is able to do so through a kind of enlightened selfishness, a virtuous self-development, and, as we will see below, in particular self-cultivation through breathing practice. Philanthropists and governments, though they charged dissenters with selfishness, were "aggressive busybodies" who left quagmires of confusion in their wake.

In the ancient *Zhuangzi* modern readers found reflection of their own concerns. Of particular interest to us is the way that the Protestant readers of *Zhuangzi* understood *work* or doing and not-doing, and *working on onself*, or "self-culture" as Wilde put it in the nineteenth-century vernacular. Both of these were actually questions about salvation, soteriological questions. Both touched on the body and its breathing. Work was entangled with salvation (although it was an entanglement somewhat out of sight), and in turn both work and salvation were mixed up with the conundrum of self and community.

This "scheme" of self-culture and self-development strayed dangerously into the territory of other, better-guarded pieties. Herbert A. Giles' *Chuang Tzu: Mystic, Moralist,*

[381] Ibid.

and Social Reformer had appeared in 1889, just about a year before James Legge's translation of the same text as part of Müller's *Sacred Books of the East* series. And while Legge's forthcoming volume still existed mostly in rumors about its eventual appearance, Giles was already criticizing it: "As to Chuang Tzu, his work can in no sense be called 'sacred'."[382]

Indeed, Wilde's review had made Zhuangzi sound more like a subversive and disruptive political revolutionary than a saintly author of sacred works. But what did "sacred" mean at this historical moment? During the same decades in which the pneumograph was being used by Mosso, Fitz, Kellogg, and Mays, the German-born Oxford-naturalized Sanskrit scholar Max Müller was editing more than fifty volumes of translations in a series called *The Sacred Books of the East,* published by Oxford University Press between 1879 and 1910. And of course, experimental psychology was not the only human science being founded at the end of the nineteenth century; Müller's *Comparative Science of Religion* was also claiming to being able to make new inroads into knowledge of what Müller referred to as the "the soul."

Müller—a well-known Victorian public intellectual with a caricature in *Vanity Fair*, and Charles Darwin's opponent in widely discussed public debates over the origin of language—was not unfamiliar with the probing of the mind via the body that was being undertaken by physiologically and experimentally oriented psychologists. He argued, however, that the data collected under the auspices of his own new science of religion might offer more "accurate observation of the movements of the soul." Such

[382] Herbert A. Giles, trans. *Chuang Tzu: Mystic, Moralist, and Social Reformer* (London: Bernard Quaritch, 1889), xv.

observation was conducted via the *comparative* method of studying non-Christian religions, as well as in the study of what he referred to as the "facts" of those religions in a non-comparative context:

> But if it seem strange to you that the old Indian philosophers should have known more about the soul than Greek or Mediaeval or modern philosophers, let us remember that however much the telescopes for observing the stars of heaven have been improved, the observatories of the soul have remained much the same, for I cannot convince myself that the observations now made in the so-called physico-physiological laboratories of Germany, however interesting to physiologists, would have proved of much help to our Vedanta philosophers. The rest and peace which are required for deep thought or for accurate observation of the movements of the soul, were more easily found in the silent forests of India than in the noisy streets of our so-called centres of civilization.[383]

What was the greatest desideratum of this *science*? Nothing less, Müller declared, than the complete classification of all relevant phenomenon. In spite of his rhetoric about the forest laboratory of inner investigations, Müller felt that the *index* of *The Sacred Books of the East* series was in and of itself perhaps the most significant intellectual contribution to this fledgling "science." In particular, it separated religious *theories* from religious *facts:* "The student of religion will look in vain in this Index for such terms as Animism, Fetishism, Tabu, Totemism, and the like. May not this be a useful warning that these terms refer only to the theories and not to the facts of religion?"[384] One M. Winternitz, Professor of Indian Philology and Ethnology at the German University of Prague, undertook the massive task of preparing an index to the fifty volumes in the series *Sacred Books of the East*. With Müller, he envisioned this index as being nothing less than a comprehensive "Manual of the History of Eastern Religions."

Winternitz spent more than four years reading all the volumes and preparing

[383] F. Max Müller, *Three Lectures on the Vedanta Philosophy Delivered at the Royal Institution in March, 1894* (London and New York: Longmans, Green and Co., 1894), 7.

[384] Ibid., xiv.

70,000 "slips" which were only the "raw material from which the building had to be constructed."[385] By the time he was done, the index came to more than 684 pages. The task of creating the most "useful" of all the fifty volumes in the series[386] involved indexing and cross-referencing forty-nine volumes of translations from seven different languages, each with its own technical terminology, and with varying systems of spelling and transliteration. Winternitz remarked that "I have tried, as far as was practicable, to collect all things belonging together under one heading, but I must apologize for any inconsistencies that will be found, especially under the letter A."[387] Though the index's introduction asserted that good scholars should read texts in their entirety and not rely on time-saving devices like indexes, the sheer volume of science was changing the state of affairs: "Nowadays even German scholars have found out that life is short, and not only art, but in an even greater degree, science is getting very long. It has been impossible to get on without some time-saving machinery."[388]

The Sacred Books of the East had much to say about different kinds of breath. The index includes four columns (or two full pages) under the entry "Breath," another four under the entry "Prana," and a column on "Air," as an element and a deity. The entry on "Braman," runs about ten pages, and the entry for "Buddha," about eight. But "Prana" and "Breath" are both among the longest of the entries to appear in the massive index. James Legge, who translated all of the volumes from Chinese for the series, did leave the word "tao" untranslated, but not the word "qi" which appears either as breath or as air

[385] M. Winternitz, *A General Index to the Names and Subject-Matter of The Sacred Books of the East* (Oxford: Clarendon Press, 1910), xxi.

[386] A.A. Macdonell, preface to *A General Index*, xiv.

[387] Winternitz, *A General Index*, xiii.

[388] Ibid., xiii.

depending on the context. *Prana, breath, air, qi*: these were all facts, and not theories, of religion.

It is not insignificant that *Prana* receives its own entry, while *Qi* appears together with words that might also be translated as "breath" from other "sacred languages of the east." For the majority of its history, Western travels to and studies of China had been predominantly carried out under the auspices of Catholic and Protestant missionary activity. In spite of this long history of interactions, Max Müller could say to the Royal Asiatic Society that between China and Europe there were "no intellectual bonds." Therefore, the scholarly study of China, later known as *Sinology*, would always be, in his view, "quite unimportant…[and] confined to a very small number of scholars."[389] Only six of the fifty volumes of his *Sacred Books of the East* were translations from Chinese. All were translations by James Legge, who had been stationed in Hong Kong for more than thirty years as a member of the London Missionary Society, and who became, on his return to England, the first professor of Chinese at Oxford University.[390] From a truly vast wealth of classical Chinese literature, Legge exclusively translated Confucian texts, leaving just one slender volume for the "founding" works of Taoism: the *Tao De Jing* and the *Zhuang zi.* These choices were, of course, no accident.

According to his own self-assessment, Legge was "a moderate Calvinist with a habit of working."[391] The orientation of Legge's interests—which determined intellectual agendas and framings for scholars of China for some time to come—are suggested by the

[389] Max Müller, quoted in Norman Girardot, *The Victorian Translation of China*: *James Legge's Oriental Prilgrimage* (Berkeley: University of California Press, 2002), 3.

[390] Girardot, *The Victorian Translation of China*.

[391] Ibid., 9.

titles of some of his publications: *The Notions of the Chinese Concerning God and Spirits: with an Examination of the Defense of an Essay on the Proper Rendering of the Words Elohim and Theos, into the Chinese Language by William Boone, D.D.,*[392] "Christianity and Confucianism Compared in Their Teaching on the Whole Duty of Man,"[393] and *The Religions of China: Confucianism and Taoism Described and Compared with Christianity.*[394]

Like the Jesuits in China, Legge read the Chinese classics with a theological eye. Early debates over the proper translation of terminology, which Frederic Balfour characterized as having "filled volumes upon volumes of acrimonious controversy," had immediate practical implications in a missionary context.[395] Legge took intellectual inspiration for the particular Protestant reading of Confucianism from a Tang Dynasty scholar who was himself, in the context of the then-current influx of Buddhist influence, giving a back-to-basics Confucian reading of Taoism. Legge found in the Tang era scholar Han Yu (768-824) a vision of the trajectory of religious belief and practice that fit with his own Müllerian comparativist vision of high and low, and with his this-wordly orientation focused on the value of work. Han Yu's agenda was to restore Confucianism in the face of the foreign and corrupting influence of Buddhism. He included forms of

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[392] *The Notions of the Chinese Concerning God and Spirits: with an Examination of the Defense of an Essay on the Proper Rendering of the Words Elohim and Theos, into the Chinese Language by William Boone, D.D* (Hong Kong: Hong Kong Register Office, 1850).

[393] "Christianity and Confucianism Compared in Their Teaching on the Whole Duty of Man," Pamphlet (London: Religious Tract Society, 1883).

[394] *The Religions of China: Confucianism and Taoism Described and Compared with Christianity* (London: Hodder and Stoughton, 1880).

[395] "Upon the true meaning of Shang Ti we will not enter here; for what has been already written on the subject has already filled volumes upon volumes of acrimonious controversy." Trans. Frederic Balfour, *The Divine Classic of Nan-hua, Being the Works of Chuang Tsze, Taoist Philosopher* (Shanghai, Hong Kong: Kelley & Walsh; London: Trübner, 1881), vii.

Taoist monasticism in his critique of Buddhism as an inadequate means of serving Confucian here-and-now moral requirements of service to family and state. Supposedly "original" Taoism, as represented by *Laozi* and *Zhuangzi*, was still included (and reread) as part of "high" Chinese culture, while later Taoism, including the development and articulation of specifically Taoist ritual, liturgy, alchemy, and, most significantly for our purposes, breathing practices, were all corrupt, later degenerations from the early pure forms.[396]

This Tang Dynasty perspective on the trajectory of Chinese thought and history happened to fit nicely with the Protestant Orientalism of Müller and Legge, and of others as well. There were three translations of *Zhuangzi* between 1880 and 1900: Frederic Henry Balfour's *The Divine Classic of Nan-hua, Being the Works of Chuang Tsze, Taoist Philosopher* (1881), Herbert A. Giles' *Chuang Tzu: Mystic, Moralist, and Social Reformer* (1889) and James Legge's *Sacred Books of China: The Texts of Taoism* (1891). While each nitpicked and fussed over terminological accuracy, claiming that he had taken up the project in order to improve on the unacceptable attempts of his predecessors, they all agreed that the most ancient substrate of this corpus was the least corrupt and degenerate—and the closest to Christianity. Of particular interest to us, they all point to the particular aim of seeking the immortality of the body through breathing practices as an example of a degenerate form of Taoism, for it is not the body in this world that has eternal life.

It is worth mentioning that breathing exercises that are mentioned in the *Zhuangzi* are not necessarily specifically "Taoist." Certainly, eventually, there would be

[396] Girardot, *The Victorian Translation of China,* 12.

specifically "Taoist" texts that gave elaborate instructions for the circulation of breath, that entail visualizing its traveling to specific organs and to specific regions of the body according to the formula that "mind directs breath and breath directs mind" (about which more below). Also relevant in this context was what was called "embryonic breathing" or the suppression or radical minimization of breath. But as Isabelle Robinet details, breathing exercises were part of Chinese culture more broadly from the earliest sources on hygiene that we possess.[397]

"Taoist" or not, explicit mention of breathing and breathing practices occurs a few times in the *Zhuangzi*. In his introduction Balfour presented the idea to a naïve reader this way: "He [the Taoist] practices the mysterious 工夫 *Kung-fu*—the process of passing into ecstasy by sitting in a peculiar posture, and inhaling and exhaling the breath in a definite and unusual manner."[398] Though this explanation prepared readers for "unusual" inhaling and exhaling, it would probably not have helped them to make sense of one puzzling line of the text that reads, in modern translation: "The sage breathes through his heels."[399] Giles did not translate the word "heel," but gave an interpretive translation and a long, and for our purposes, rather interesting commentary:

> The pure men of old slept without dreams, and waked without anxiety. They ate without discrimination, breathing deep breaths. For pure men draw breath from their uttermost depths; the vulgar only from their throats.[400]

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[397] "I shall avoid lingering too long over certain aspects of Taoism that have been taken to be characteristic of the religion, but that, although they have certainly colored Taoism, actually belong to the whole corpus of things Chinese and are the property of a wide segment of the population that do not consider themselves to be Taoist in the least. Here I am referring to various matters of hygiene—techniques of breathing, gymnastics, and sexual practices." Isabelle Robinet, *Taoism: Growth of a Religion,* trans. Phyllis Brooks, (Stanford: Stanford University Press, 1997), 6.

[398] Balfour, *The Divine Classic of Nan-hua*, xxxviii.

[399] Burton Watson, *Chuang Tzu: Basic Writings*, sec. 6.

[400] Giles, *Chuang Tzu,* 70. Note: "Uttermost depths" is literally "heels," but all the best commentators take

This "debased Taoism of modern times" was characterized by "tricks" for prolonging life. While Balfour extrapolated from a passing mention of some sort of mysterious "heel breathing," the fifteenth chapter of the *Zhuangzi*, the title of which is given in one current translation by Martin Palmer as "Rigid and Arrogant" and by Nina Corea as "Unalterable Ideas," is far more explicit.[401] Balfour translates the title of Chapter XV as "Bigoted Ideas" and again inserts his own running commentary within the text:

> Blowing and breathing, inhaling and exhaling, expelling the breath and imbibing the air, sleeping like a bear (*i.e.,* doubled up, with the mouth on the abdomen), stretching and contracting oneself as a bird does its neck—this amounts *to the acquisition of immortality*. It is favored by scholars who hold their breath; —persons who thus promote the health of their bodies and endeavour to attain the patriarchal age of P'eng Tsu. **[NOTE.—The absurd antics here alluded to, which are known as *kung-fu*, constituted a system of mystic and recondite calisthenics, once extensively practiced by the Taoists. The object held in view was the cure of diseases, the purification of the body, and the eventual attainment of immortality….].**[402]

History has not been kind to Balfour's Chinese language skills or his scholarship more generally. While Legge's translations are still reprinted (a testament, perhaps to the relatively slow pace of scholarly translations from Chinese, or more likely to the vastness of the work there to be done), Balfour's are considered to be not simply old but unreliable. Yet he was not the only Protestant Orientalist to hold the kind of views he did about the "absurd antics" of Taoist breathing exercises. Legge gives a simpler but similar translation of the passage:

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the sentence to mean that pure men breathe with their whole being, and not as it were superficially, from the throat only. This passage is probably responsible for the trick of taking deep inhalations of morning air, practiced (not without scientific foundation) by the followers of the debased Taoism of modern times. Other tricks for prolonging life, such as swallowing the saliva three times in every two hours, etc., are more open to adverse criticism. See the *T'ai-His-Ching.*

[401] Martin Palmer, trans. *The Book of Chuang Tzu* (New York: Penguin, 1996).

[402] Balfour, *The Divine Classic of Nan-hua*, 187.

> Blowing and breathing with open mouth; inhaling and exhaling the breath; expelling the old breath and taking in new; passing their time like the (dormant) bear, and stretching and twisting (the neck) like a bird;—all this simply shows the desire for longevity. This is what the scholars who manipulate their breath, and the men who nourish the body and wish to live as long as [Pang Zu], are fond of.[403]

Western translators saw the comparison of breathing exercises to the movements and behaviors of animals as making fun of the antics of the scholars manipulating breath and body for what they saw as foolish, perhaps selfish, visions of bodily life without end. Legge is quite explicit about this and claims it on no less authority than that of Zhuangzi, representative of Original Taoism, himself:

> The fifth member of this first paragraph is interesting as showing how there was a class of Taoists who cultivated the system with a view to obtain longevity by their practices in the management of the breath; yet our author does not accord to them his full approbation, while at the same time the higher Taoism appears in the last paragraph, as promoting longevity without the management of the breath.[404]

Both translators are dismissive of the breathing "antics" or *kung-fu*; both believe that they follow Zhuangzi in this dismissal. A Taoism focused on the merely corporeal could not, to their minds, be the highest, most sublime form. Balfour seems to dismiss the breathing exercises as part of a degenerate Taoism in which pursuit of the wrong kind of immortality became the preoccupation:

> The lofty ascetism inculcated by Lao Kün was vulgarised into a means by which to achieve the sublimation of the corporeal frame. Speculative research into the mysteries of nature and science became degraded into an attempt to transmute the baser metals into gold; aspirations after a never-ending life beyond the grave sank into the meaner pursuit of prolonged temporal existence, and the companionship of angelic intelligences resolved itself into a base belief in witchcraft, by proficiency in which the Taoist priest arrogated to himself the power of exorcism over evil spirits. Thenceforth the history of Taoism is a history of imposture and credulity. The philosopher's stone, or elixir of gold—the source of personal

[403] James Legge, trans. "The Writings of Kwang-Tze," in *The Sacred Books of China, The Texts of Taoism* (1891). Vol. 39 of Max Müller, ed. *The Sacred Books of the East.*

[404] Ibid., 146.

> sublimation and immortality,—then first came into imaginary existence, and to this, a purely Chinese superstition, may be traced the strange enthusiasm which has since enchained so many victims in Arabia and Europe.[405]

While Legge, in his own translation of *Zhuang zi*, felt he was correcting many of Balfour's mistakes, he did not alter or amend his assessment of the reference to breathing exercises that appears there.

Making sense of the arrival and pervasive impact of foreign cultural and religious influences, scholars tried to separate the pure from the turbid by applying their own frames of reference as sorting device. This was as true of Han Yu making sense of Buddhism as it was of Balfour, Giles, and Legge attempting to make sense of China. It was how Giles understood the presence of breathing exercises polluting the otherwise sagely Zhuangzi.

Perhaps not by change, in the end breathlessness appears again. In a second volume that followed his *Classic of Nan-Hua* by several years, Balfour translated a selection of texts from the Taoist Canon (a compendium first compiled in the Ming Dynasty that included more than fifteen hundred texts, and which continued to be supplemented). Amongst these he included one he called "Respiration of the Embryo" (胎息經).[406]

The term "embryonic breathing" itself can be found as early as the *Houhan* Shu (398-445), as well as in the work of Ge Hong in the fourth century.[407] While there were

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[405] Balfour, *The Divine Classic of Nan-hua*, xxvi.

[406] See Stephen Eskildsen, *Daoism, Meditation, and the Wonders of Serenity: From the Latter Han Dynasty (25-220) to the Tang Dynasty (618-907)* (Albany: State University of New York Press, 2015), 241-54. I can't find a date or author for the specific text that Balfour translated (nor does his own introduction provide such information).

[407] Ibid., 241.

many variants, the essential aim of embryonic breathing was to bring immortality to the practitioner by the intentional cultivation of a breathing like that of an embryo—most practically speaking, a non-breathing state, metaphorically taking one back to a state of total dependence on the inexhaustible spirit of the creator rather than on any time-bound air.

In his preface, Balfour claims he has undertaken the translations, and in particular a new translation of what he calls *The Tao Te Ching*, because all previous translations, including Legge's, were overly influenced by the Confucian commentaries and their views of the profound immorality of Taoism. Balfour relies instead on a Taoist commentator, Lü Ch'uu-yang of the eighth century, rather than any Confucian apologists who charged the Taoists unfairly with heresy.[408]

In spite of this new and supposedly generous hermeneutic, Balfour includes "Respiration of the Embryo" somewhat apologetically. He offers the same view of body practice as a degenerate version of the pure form. He translated the text on embryonic breathing "belonging though it does to a corrupted development of Taoism proper" in order to illuminate the sixth chapter of a text from the early, pure works of Taoism, the *Tao Te Ching*. "The Respiration of the Embryo" was corrupt for the reasons we have seen above; it was a practical text, an instruction guide to the practice of embryonic breathing. Balfour reads this chapter in an obviously Trinitarian mode, perhaps concerned with metaphysical questions of how One can become Three and how that can, in turn, result in an apparently multitudinous universe: "In the whole Universe there is but one Breath, or Being, a participation in which results in Life or Birth." This One Being is, somehow, at

[408] Frederic Henry Balfour, *Taoist Texts Ethical, Political and Speculative* (London: Trubner & Co., Ludgate Hall, 1900), 1.

once double: "embodying the Yin of feminine Principle of Nature with the Yang, and from these producing all things."[409] "Participation" is, of course, a theological word, one attempt to solve the ontological and doctrinal problems of the trinity and the divinity of Christ.[410]

Balfour translated the text, he claimed, to "amplify" the pervasive, unitary, and "imperishable" nature of breath. He certainly did not aim to teach a person to *do* anything with his or her own breath, such as cause it to cease entirely, as though one had become an embryo again, living, but not dependent on coarse air for continued physical survival. It was not a very Protestant idea, nor indeed one suggestive of the kinds of nineteenth-century bodies deemed capable of breathing their way to different states of being that we have considered in this chapter.

[409] Ibid., 63.

[410] See, for example, J. Todd Billings, who takes the idea to Aquinas. *Calvin, Participation, and the Gift: The Activity of Believers in Union with Christ* (Oxford: Oxford University Press, 2007.)

Chapter Four: Breathing Out of Body

"The modes of inducing artificial respiration are of two kinds: the first may be compared, in its operation, to the action of the forcing-pump; the second, to that of the suction-pump; and both have been used with a disregard to the all-essential consideration of posture." —Marshall Hall, 1957[411]

Consider two films that teach the art of life saving.[412] The first, *Artificial Respiration*, a silent film that appeared in 1927, is characterized by its steady but entirely unhurried pace. Two men lounging on a dock spot a third, flailing, as he sinks beneath the water. One resolutely dives into the water and ferries the unconscious swimmer back to the dock. The other rescuer unceremoniously hangs the victim's bent body over his arms and shakes water from his mouth. The still unconscious man is then stretched out on the dock, face-down, and while one rescuer stands at the ready, the other kneels over the victim's back and applies sharp downward thrusts to his lower back and thoracic ribs. It looks like what is currently practiced as CPR, but not applied to the chest in order to manually pump the heart, but, for some reason, to the other side of the body, opposite the heart. The thrusts are delivered at the pace of ponderously slow breathing. A text box tells us: "It is very important that artificial respiration should approximate the action of normal breathing. The operation may be timed by saying: 'Out goes the bad air…In

[411] Marshall Hall, *Prone and Postural Respiration in Drowning,* London, 1857, 23. Consider *posture* in the sense it is used by George Vigarello, "The Upward Training of the Body from the Age of Chivalry to Courtly Civility," in *Fragments for a History of the Human Body*, pt. 2, ed. Michel Feher with Ramona Naddaff and Nadia Tazi (New York: Zone, 1989), 148-199.

[412] *Artifical Respiration* (Loucks & Norling, INC. New York: 1927), online video, 10.43 min., from Prelinger Archive, https://archive.org/details/Pa2104Artifi and *The ABC of CPR* (The Royal Navy, 1983), online video, 12.38 min., from Wellcome Moving Image and Sound Collection,http://catalogue.wellcomelibrary.org/record=b1678213~S3.

comes the good.'"

The technique, apparently, was intended to manually form the body into the positions taken during ordinary breathing, to compress and release the thoracic cavity, allowing air to rush in and elastically recoil out. So-called "artificial respiration" was, above all, meant to recreate the body's own breathing.

The rescuers take turns applying pressure to the thorax, allowing one another to rest. It goes on, unchangingly, long enough that the average modern viewer might start to fidget: How long has the drowned man been without breath? And how long can this go on? Finally, another text screen: "Continue compressions until rigor mortis sets in-- until then there is hope! Sometimes life can return after three or four hours!" Thankfully, the scene closes well before that time is up, with the two men continuing to help the body breathe, if "artificially." What is not artificial is that air enters into the vacuum of the lungs and exits on recoil of the chest as it would if two men were not making it so.

An instructional film of the 1980s, on the other hand, has lost all sense of calm. In one scene, the screams of an hysterical mother are heard as we see the image of a child, lying motionless on a carpeted floor, covered head to toe in a giant plastic sheet with which he has apparently—somehow—been able to suffocate himself. An authoritative narrator instructs: "Give the panicker something to do, even if it is your mother, and *get on with it*….breathe *for* him." The boy's sister, having shooed the frantic mother out of the room to call an ambulance, expertly tilts her brother's head back, pinches his nose, covers his mouth with her own and provides what the film terms "the kiss of life," breathing into his lungs and visibly inflating his chest. She breathes for him.

In another scene of the same film, we see a swimmer not swimming but floating,

ominously, face-down, in a seemingly infinitely vast expanse of water: “Paul has stopped breathing. So from now on, every second counts. The sooner air can be got into his lungs, the better his chances of living rather than drowning.” There is certainly no time to allow rigor mortis to set in: every second counts, and it is getting air in the lungs, by hook or by crook, that determines just what the chances of surviving are: “Just get air in! And quickly! I repeat: Get air in. And don't stop until a physician orders you to!" The physician’s order, rather than the signs of death that slowly emerge or the exhaustion of a well-intentioned rescuer, determines at what point the breathing is not likely ever to return.

Even in the relatively short span of time that separates the two films, significant changes occurred in the understanding of the limits of both life and death, and correspondingly, in the understanding of the “use” of the breath. To be more specific, over just a few years leading up to an influential 1958 *New England Journal of Medicine* article that argued that the old manual resuscitation was ineffective and mouth-to-mouth alone was, there was a dramatic reorientation from what we have been calling the “motion” view of breathing to a view that was more “substance” oriented. This language points in the right direction but does not perfectly characterize the change because it was well known that the *substance* of air needed to enter the body; the difference in the two views by the twentieth century turned on whether or not it mattered *how* that happened. As was suggested in chapter three, there was in the late nineteenth century a new sense that the “how” of breathing was significant, in part because of the need for self-care measures to combat tuberculosis and the effects of other unsalubrious airs of civilization, and in part because of the arrival of the idea of “practicing” breathing via Chinese and

Indian texts and travelers.

But the change that happened in 1958, a sudden acceptance of the formerly banished mouth-to-mouth resuscitation, was definitively a move away from the "how" of breathing, and away from what we have described so far as characteristic of a "movement" view of breath and the corresponding experience of soul or self. It was not that the "how" of, for example, designing a ventilator to safely and effectively keep a patient alive was not a matter of interest—it was a matter of intense interest—but rather that the acceptance of *positive pressure methods* into resuscitation and surgery was in fact a radically new view of breathing with significant implications. What was positive pressure and why was it so significant?

Positive pressure ventilation, whether via mechanical ventilation or some form of mouth-to-mouth resuscitation, forces air into the lungs. As it is currently described by physiologists, in ordinary breathing air under atmospheric pressure rushes spontaneously into the *vacuum* created by contraction of the muscles that change the shape of the rib cage, primarily the diaphragm, intercostals, and scalenes. What this means is that inspiration occurs in the presence of an absence. It occurs when there is an empty space that can be occupied. In fact, air rushes in precisely to the degree of vacuum that is present but no more; the delicate tissues of the lungs maintain their integrity and the circulation of blood, which itself to some degree depends on the pressure changes of respiration, is protected by virtue of this relationship between ambient air pressure and the varying pressures created inside the body.[413]

When air leaves the body, again in so-called "natural breathing," in the best

[413] Jerome A. Dempsey and Allan I. Pack, *Regulation of Breathing,* 2nd. ed. (New York: M. Dekker, 1994).

instance where no significant pathology is present, it does so because the thoracic "cage," composed not only of bone but also of flexible cartilage, is effectively spring-loaded. (If it it is indeed a "cage," it is not a very effective one!) If we do not intentionally modulate exhalation, as in speech, breath spontaneously tumbles out of the body without any particular effort on our part: the natural recoil of the chest takes care of the motivation for us. There is, in this view, an effortless quality to breathing. Though one of the broad aims of this dissertation is to question the assumption that there is such a thing as "natural" or "normal" breathing, it is nonetheless the case, at least according to current models of the anatomy and physiology of breathing, that introducing air into the lungs under its own pressure does not resemble normal breathing.

Seen in this light, positive pressure appears strange. But its absence is perhaps stranger still. The films make clear that it was not long ago that resuscitation did not rely on what might seem to anyone, even someone not trained in the most cutting-edge methods of first aid, to be the most obvious intervention: quick introduction of oxygen into the lungs. It turns out that the absence of positive pressure methods was actually both quite entrenched and long-standing. The history of the absence of positive pressure ventilation—the introduction of forced air into the lungs—is surprising from a post-1958 perspective. Why wouldn't people simply put air in? Many good answers have been put forward, including fears of contagion, fears of touching the dead, and the belief that exhaled air was toxic. The chapter adds a slightly different perspective to those certainly correct reasons.

In particular, this chapter interprets the history of resuscitation practices in terms of the skin-centered (or "motion") and the lung-centered (or "substance") framings of

breathing that we've been developing to this point. The first is represented by the *iron lung,* a so-called "negative pressure" method of mechanically maintaining respiration for a person who cannot breathe independently. (The iron "lung" is a misleading name in our terminology since the iron lung turns out not to emphasize the lungs at all!) The second is represented by several methods of positive pressure ventilation, such as the Pulmotor, a resuscitation machine that was somewhat popular but then vehemently rejected in the first decades of the twentieth century, as well as mouth-to-mouth resuscitation. What might it be like to breathe, to live, and to die if breathing *is* the filling of balloon-like lungs with air? What might those things be like if the whole body breathes (or at the very least, if breathing is imagined to include the expansion of the torso in all directions)? These questions stand behind the examples of this chapter.

Let's begin by considering the very idea of resuscitation. As a phenomenon like the *rising of the lights* would suggest, there was once a sensibility that breathing was a process that involved the fluid motions of the entire body including the blood, skin, pores, stomach, and brain, to name a few. Not only were the fluids of the body in motion, but the whole breathing body moved. That this motion-orientation was not merely a scholarly frame is clear when we look at how various forms of suffocation were treated. The complete approach to difficulty breathing or the total absence of breath was to unblock any fluid flows, bring motion to the body and the organs, and kindle the life-like heat of the body.[414] All of this was in evidence in the case of Anne Green, mentioned in

[414] Bonet on this point: "For them that are strangled or choaked, the suffocating humor having recourse to the throat, either because the blood is forcibly carried to the heart or brain, whether it come from the womb or from some other place, bleeding is never amiss in this symtome, that is, if you find the pulse strong and the veins full." Théophile Bonet, *A guide to the practical physician shewing, from the most approved authors, both ancient and modern, the truest and safest way of curing all diseases, internal and external, whether by medicine, surgery, or diet. Published in Latin by the learn'd Theoph. Bonet, physician at Geneva. And now rendred into English, with an addition of many considerable cases, and excellent*

passing in chapter one. Following her mid-December 1650 hanging in the Cattle yard at Oxford, she was counted among the "apparently dead," which was why it was so surprising that when her coffin was later opened by none other than Thomas Willis, who had arrived to dissect her, she was found to be intermittently breathing.[415] Willis then turned his attention from anatomy to resuscitation.

They opened her "fast set" teeth to give her "hot and cordial spirits"; they opened her stiff hands and vigorously rubbed her body all over, tickled her with a feather, let five ounces of blood from her arm (as soon as some heat had returned) and then another twenty ounces, "that the heart might, when eased of the abundance of blood, more easily and readily distribute the rest into the whole body." They anointed her all over with "oyls and spirits," applied a plaster to her breasts, and then gave a "heating odiferous" clyster (enema) "to be cast up in her body, to give heat and warmth to her."[416] Finally, she was sent to bed with a woman who was "persuaded" to lie close to her and rub her such that she would sweat. As Théophile Bonet concludes in his account of the case, "afterwards being further helped by the dexterity of the physicians, she could understand the bystanders talk, observe, and laugh. …In a few days time she was able to go about her

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medicines for every disease (London: printed for Thomas Flesher, 1686), Book XVI, Section VII, 570. http://eebo.chadwyck.com/

[415] Anne Green suffered multiple misfortunes: impregnated by the grandson of the family she served as a maid, she delivered a stillborn baby she was then accused of having murdered. He execution was reported thus by one "Scholler in Oxford": "she was turn'd off the ladder, hanging by the neck for the space of almost halfe and hourse, some of her friends in the mean time thumping her on the breast, others hanging with all their weight upon her leggs, sometimes lifting her up, and then pulling her downe againse with a suddaine jerke, thereby the sooner to dispatch her out of her paine insomuch that the under-sheriffe fearing lest thereby they should breake the rope, forbad them to doe so any longer." *Newes from the Dead or a True and Exact narration of the miraculous deliverance of Anne Green*. Written by a Scholler in Oxford (Oxford: Printed by Leonard Lichfield for Tho Robinson, 1651). http://eebo.chadwyck.com/

[416] Bonet, *A guide to the practical physician,* 577.

affairs."[417]

Anne Green's absence of breath, and close brush with death, was a matter of surplus blood. The first thing was to kindle and nurture the warmth and life of the body, and then to drain the excess blood as soon as there was sufficient resiliency in the body to do so. This represents a typical order of operations in what we might call resuscitation before 1700. And this is why there there was indeed something different when in 1744 John Fothergill reported to the Royal Society that a man "dead in appearance" had been saved by "distending his lungs with air." As though Fothergill felt the whole situation was implausible enough to require reputable witnesses, he mentions that "there were many hundred people, some of them of distinction, present at the time" to see a man, cold with no pulse and no respiration, brought up from a mine thirty fathoms deep. They then saw the Scottish surgeon William Tossach blow his own breath into the mouth of the seemingly dead man, causing his chest to rise fully. Soon, Fothergill continues, there was a pulse: Tossach's breath had "set the lungs in motion." The victim was also bled, pulled, pushed, and rubbed to help the blood to move and to bring him "pretty well to his senses." Fothergill provided further justification for the novelty of the occurrence:

> Anatomists, it is true, have long known, that an artificial inflation of the lungs of a dead or dying animal will put the heart in motion, and continue it so for some time; yet this is the first instance I remember to have met with, wherein the experiment was applied to the happy purpose of rescuing life from such imminent danger. Bleeding has hitherto been the only refuge upon these occasions: if this

[417] Ibid., 576 (original pagination). Bonet includes a case of a woman who, unlike Anne Green, was treated when she still appeared dead. The first vomit did not help, but eventually he manages to resuscitate her with cold water: "A certain healthy, and corpulent Woman, after she had taken a Medicine to make her Conceive, was taken with a pain in her Belly and with griping in the Guts, and she swelled: There was shortness of Breath, and perplexity of pain, and she swooned five times, so that she seemed dead: nor did her present pain or difficulty of breathing abate by giving her a Vomit with cold water. But about 30 *Amphorae* of cold water were poured on her Body, and truly this only seemed to do her good, and afterward Bile came plentifully downwards. But while the pain lasted, she could not go to stool, and she lived." Ibid., 579.

did not succeed, the patient was given up.[418]

As important as Fothergill himself seemed to think it was, his report had nothing like the impact an announcement of the same "discovery," mouth-to-mouth resuscitation, would have two hundred years later. Nonetheless, by the last quarter of the eighteenth century, many so-called "humane societies" devoted to spreading information that laymen could use to save lives were established throughout Europe and New England (Amsterdam in 1767, at the Chapter Coffee House in London 1774, as the Society for the Recovery of Persons Apparently Drowned, and throughout the 1770s across New England and Atlantic Canada).[419] Writing themselves into a key position in the history of the changing space between life and death, the editors of a 1793 issue of the *Transactions of the Royal Humane Society* (London) claimed the ancients thought that death happened in a moment: "we cannot find the faintest glimmerings of their having any kind of knowledge that the vital powers could remain in a state of suspension."[420] The doctrine of resuscitation and the resuscitation movement depended on exactly this possibility—

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[418] John Fothergill, "Observations on a case published in the last Volume of the Medical Essays, of recovering a man dead in appearance by distending the lungs with air, Printed at Edinburgh, 1744," *Philosophical Transactions of the Royal Society (1683-1775)*, 43, no. 472 (1774-75): 275-281. It is perhaps worth mentioning that the reason that blowing into the lungs works is not, it seems, so much that "air" enters them, as that a certain *motion* is imparted to the body. The key was the *distention* of the lungs: "Perhaps those, who, to appearance, are struck dead by lightening, or any violent agitation of the passions, as joy, fear, surprize, and etc. Might frequently be revover'd by this simple process of strongly blowing into the lungs, and by that means once more communicating motion to the vital organs" (Fothergill, 278). It was all part of the same kind of approach which was to support life, the warmth and motion of the body, to continue of its own accord: "It does not seem absurd, to compare the animal machine to a clock; let the wheels whereof be in never so good order, the mechanism complete in every part, and wound up to the full pitch, yet, without some impulse communicated to the *pendulum*, the whole continues motionless." (Fothergill, 279). Most significantly, introducing motion to the lungs was important because it conveyed motion to the heart. Fothergill did not recommend the use of bellows, both because the force was possibly too much and because the "warmth and moisture" of the breath would promote the movement of blood.

[419] Amanda Bowie Moniz, "Saving the Lives of Strangers: Humane Societies and the Cosmopolitan Provision of Charitable Aid," *Journal of the Early Republic* 29, no.4 (Winter 2009): 607-640.

[420] William Hawes and the Royal Humane Society, *Transactions of the Royal Humane Society,* vol. I (London: Printed by Jno. Nichols and sold for the Society by Rivingtons, Dilly, Johnson & Hookham, 1793), xiv.

claimed rightly or wrongly by Humane Society to be "modern"— of the existence of what came to be called suspended animation: "It is among the moderns that we are to seek the origin of the doctrine of resuscitation."[421]

In particular, according to the anonymous author of the issue's introductory material, it was John Fothergill's report to the Royal Society that had opened the modern era of resuscitation, which made it odd that "the subject, closely as it is pressed to the bosom of every individual," had resulted in little if any response. Resuscitation societies had only begun to appear forty years after the appearance of his report; it hardly caused a ripple, let alone functioned as a call to arms. When the societies were eventually established, "artificial respiration," by which they meant the rescuer blowing either his own air or air from bellows into the nose or mouth of the victim, was indeed included amongst the instructions, citing Fothergill's authority. But there was still hesitation when it came to mouth-to-mouth. In the earliest protocols, the steps in order of importance were first to warm the body, second to give breaths, then to fumigate or give an enema, to rub the body, to give stimulants to nose or skin, and finally to bleed the patient and cause vomiting.[422] Introducing air into the lungs remained a matter of debate and would be removed from all Society protocols by the third decade of the nineteenth century.[423]

Some have argued that the crucial piece in the rejection of forced respiration was the discovery of oxygen by Priestley in 1774 and the new exploration of the use of gases in medicine, including but not limited to oxygen.[424] If it was known, the argument goes,

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[421] Ibid., 635.

[422] Arthur Keith, "Three Hunterian Lectures on the Mechanism Underlying the Various Methods of Artificial Respiration," *Lancet* (March 13, 1909): 746.

[423] Ibid.

[424] R. Barrington Baker, "Artificial Respiration, the History of an Idea," *Medical History* 15, no. 4 (October

that the quantity of oxygen in exhaled air was so small—and the quantity of what was considered a poisonous material so high—this knowledge alone would have sealed the fate of forced ventilation. If anything, the situation is quite the opposite: it is strange that a new interest in the relationship of gases and respiration would not have made forced respiration a *fait accompli.* Though the matter at hand was rescue in circumstances far from the laboratories where gases could be made, several researchers looked into the use of oxygen in resuscitation and even promoted it. Among these were John Hunter, who promoted forced ventilation and suggested that oxygen might be the most efficacious gas to use, and Fothergill himself, who experimented with oxygen for resuscitating animals and tried to convince the Royal Humane Society to formally promote the method.[425] Resuscitation might have then become a matter of forcing oxygen into the lungs and sucking carbon dioxide out. But that wasn't the way matters unfolded at all.

The anonymous author who claimed resuscitation was "modern" was wrong when he said that "the ancients" had not questioned the limit between life and death and the ways of distinguishing when death had indeed happened. It was true, however, that the new category of "suspended animation" was a very problematic one indeed.[426] Suspended animation was a matter of intense interest in the eighteenth and nineteenth centuries. Lloyd Stevenson counted no less than 418 references to it in an 1890 textbook on the subject.[427] The difficulties of the new category of suspended animation were similar to

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1971): 336-51.

[425] Keith, "Three Hunterian Lectures," 748.

[426] On suspended animation, see also Kristen Keerma Freedman, "Soul Sleepers: A History of Somnambulism in the United States, 1770-1840" (Ph.D. thesis, Harvard University, 2014).

[427] Felix Gannal, *Mort apparente et mort reele: moyens de les distinguer* (Paris, 1868; 2nd. ed. 1890) in Lloyd Stevenson, "Suspended Animation and the History of Anesthesia," *Bulletin of the History of Medicine* 49, no. 4 (Winter 1975): 482.

those that faced mouth-to-mouth and bellows resuscitation. In both cases lurked a certain hard-to-articulate unease.

The discomfort was articulated in one form by Jean-Jacques-Joseph Leroy d'Etoiles, who in 1829 wrote an influential statement against bellows, claiming that in the hands of unskillful users they could not only cause acute damage to the lungs, tension pneumothorax, and death, but also, in survivors, long-term respiratory impairment.[428] Leroy's single study, as translated to the Royal Humane Society by one Mr. John Dalrymple, was enough to permanently remove artificial respiration from the recommendations of the Society. As the *London Medical Gazette* quotes Dalrymple: "I firmly believe that there are cases in which it has been of the highest service; but…those cases are comparatively rare, and that with the difficulty of its application by non-medical men, the dangers attendant on its use are not only augmented, but much valuable times is lost which might be better employed."[429]

The prominent surgeon Sir Benjamin Brodie is quite positive about artificial respiration and the use of bellows—he uses it consistently in his studies of "vegetable poisons" with animals, including some clearly intended to show the dangers of tobacco per anum—but he draws a stark line where the absence of respiration together with the absence of the pulse is concerned. It is fine to gently prod the motions of respiration to begin again, but these efforts will be useless in the event that the heart itself has stopped beating. For someone whose heart has stopped beating is dead, and no human intervention can give life; after the heart stops, artificial respiration is powerless to restart

[428] Qtd. in Keith, "Three Hunterian Lectures," 748.

[429] *London Medical Gazette: or Journal of Practical Medicine* 17 (1836): 663.

it.[430]

One of the most passionate statements of the vitalist perspective on the whole matter of forced respiration was that of one co-founder of the Harvard Medical School, Benjamin Waterhouse, who had studied with Fothergill and called him "the inspirer of my studies."[431] His perspective on the forced respiration promulgated by Fothergill could not, however, have been less inspired by Fothergill. Waterhouse wrote that air contained a "certain *vivifying principle*" and referred to the organs of respiration as the "*systema spirituale pneumonicum"* and to the movement of these organs as the "*primum mobile"* of human life. The motions of the body were driven by the first cause of respiration, and as long as the body was capable of breathing, it still partook of the *anima mundi*. This didn't entirely clarify matters, but Waterhouse gave a practical example. If a person remained too long underwater but somehow—by communication of warmth or agitation of the lungs—breathed again, he was capable of "imbibing again the needful portion of that spirit in which we 'live, move, and have our being.' I say imbibing *again;* for in the beginning '*He breathes into man the breath of life,* and the consequence was, 'he became a living soul.'"[432]

The implication was, of course, that it was only He who could breathe life into man and that the best that could or ought to be done by human hands in moments of difficulty was to coax or jostle that life to express itself more fully. Though Waterhouse

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[430] Benjamin Brodie, *Pathological and Surgical Observations on Diseases of the Joints* (Philadelphia: Benjamin Warner, 1821).

[431] R.W. Innes Smith, *English-Speaking Students of Medicine at the University of Leyden* (Edinburgh/London: Oliver and Boyd, 1932), 242.

[432] Benjamin Waterhouse, *The Botanist being the botanical part of a course of lectures on natural history, delivered in the University at Cambridge. Together with a Discourse on the principle of vitality* (Boston: Joseph T. Buckingham, Winter-Street, 1811), 253, note.

praised the Humane Societies in the same rhapsodic language he used to talk about the great principles of Vitality, Animation and Life, he did not mince words when it came to artificial respiration: "To blow one's own breath into the lungs of another is an absurd and pernicious practice. In animal bodies there are only two conditions; life and death…and no human art can communicate life to dead matter."[433]

This impasse was the origin of the life-saving techniques that would persist, with variations in detail but not significantly in principle, into the late 1950s (techniques of the kind seen in the first film clip). These techniques assiduously avoided introducing air into the lungs, and tried to recreate the movements of the naturally breathing body instead. Though they did not use exactly this language, and while it was acknowledged that the goal at hand was for air to enter and exit the body, these techniques were implicitly taking the side of *motion* in the old debate between motion and substance. This alignment with "motion" made sense insofar as the techniques were, at least to some degree, a response to concerns about the various meanings of taking charge of breath, not the least of which was that breathing *for* someone else might be taking too much responsibility for life. It meant not only taking undelegated responsibility for one's *own* life, but additionally claiming the capacity to share, manage, or inspire life in someone else.

These concerns were evidently still in full effect at the time of the publication of Marshall Hall's 1857 *Prone and Postural Respiration in Drowning*, which summarized the most recent statement of the protocol of the Royal Humane Society in which blowing air into the lungs is nowhere to be seen: "These rules may be summed up in one word—

[433] Ibid., 251. Also qtd. in John Tercier, "The Lips of the Dead and the 'Kiss of Life': The Contemporary Deathbed and the Aesthetic of CPR," *Journal of Historical Sociology* 15, no. 3 (September 2002): 283-326.

warmth! The idea is repeated no less than eight times."[434] In reintroducing both the idea of artificial respiration and his own method, Hall quickly did away with the idea of blowing into the lungs with either bellows or one's own mouth on the grounds that the pressures required to do so effectively had been shown by Legallois and Leroy to damage the lungs: "the air so impelled sometimes passing into the capillary vessels, and sometimes even into the cavity of the thorax."[435]

Hall's method was intended to "imitate" and "excite" respiration, but significantly was not a form of breathing *for* the victim. Following the respiration chemistry of his day, Hall emphasized *exhalation* and the expulsion of "carbonic-acid blood-poison," the excessive presence of which would interfere with inhalation. The technique therefore began with laying the victim "prone" on the stomach and applying downward thrusts to cause stale air to leave the body. The "posture" portion of the cycle involved grasping the victim's shoulder in an anatomically savvy way such that turning them on their side would expand the thorax. Though it would be repeatedly redesigned, the essence of Marshall Hall's method of resuscitation—various maneuverings and compressions of the body to mimic the natural movements of respiration—would not be definitively replaced for more than one hundred years.

A vast amount of intellectual energy went into refining manual artificial respiration methods of the kind introduced by Hall in the 1850s. Bizarre and benighted as they now seem, these were scrupulously studied and provided subject matter for a mountain of publications that undoubtedly advanced many a career. Anyone could make a name by coming up with an eponymous version of manual artificial resuscitation. A list

[434] Hall, *Prone and Postural Respiration in Drowning,* 21.

[435] Ibid., 24.

compiled by one historian includes the Leroy method, Dalrymple method, Marshall Hall method, Sylverster (Silverster?) method, Pacini method, Bain method, Howard method, Schultze method, Schroeder Method, Schucking method, Schuller method, Bowles method, Laborde method, Shaefer method, and Holger-Nielson method.[436] And so was the Holger-Neilson superior to the Schaefer Prone Pressure method? How many cubic centimeters of air could enter the lungs using the Brosch-Silvester method?[437] Innovations of a small sort were regularly being made. Manual artificial respiration was soundly established and, it seemed, continually improving.[438]

In 1912, for example, a whole family of what were called "prone pressure" manual artificial respiration methods was systematically studied and approved by a commission jointly appointed by the U.S. Bureau of Mines, the American Medical Association, the American Red Cross and the National Electric Light Association (Walter B. Cannon was one distinguished member).[439] The same committee simultaneously rejected a breathing machine that had recently appeared on the market on the grounds that the lungs, unlike the empty bag used in a demonstration they saw, presented resistance to incoming air and the machine failed to adequately ventilate against this resistance.[440]

Nothing much had changed by the time that Phillip Drinker and Louis A. Shaw reported their invention of the Iron Lung in 1928. They state explicitly at the outset of the

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[436] Tercier, "The Lips of the Dead and the 'Kiss of Life,'" 288.

[437] Qtd. in Keith, "Three Hunterian Lectures," 896.

[438] Heinz Specht, "Back-Pressure Arm-lift Artificial Respiration," *Public Health Reports* 67, no. 4 (April 1952): 380-3; Archer Gordon, Max Sadove, Frank Raymon, and A.C. Ivy, "Critical Survey of Manual Artificial Respiration," *Journal of the American Medical Association* 147, no. 15 (December 8, 1951): 1444-53.

[439] Yandell Henderson, "The Return of the Pulmotor as A 'Resuscitator': A Back Step Toward the Death of Thousands," *Science* 98, no. 2556 (Friday, December 24, 1943): 549.

[440] Ibid., 550.

report that none of the various positive pressure methods of ventilation, including devices like the bellows, lungmotor, and pulmotor which "force air in and out of the lungs," were in use by rescuers in Canada or the United States and that these methods had been thoroughly discredited. Instead it was the method of Sir E.A. Sharpey Schaefer that was in common use. The document they cite in order to demonstrate the ubiquity and effectiveness of the Schaeffer method gives a nice sense of where things stood in 1928: "Follow the instructions even if the patient appears dead. Continue artificial respiration until natural breathing is restored or until a physician declares rigor mortis (stiffening of the body) has set in. Success has come after *eight hours* of effort."[441] It wouldn't be long before people were expected to die in a much greater hurry.

Well into the 1950s, while detailed studies comparing the endlessly appearing if only minorly-varying methods of manual artificial respiration were still being published in reputable journals, suddenly mouth-to-mouth resuscitation was proven to be highly effective and manual methods ineffective. In particular, the first studies that appeared promoting mouth-to-mouth ventilation claimed not that the standard manual techniques did not work *per se*, but rather that they did not work in the case of a collapsed airway.[442] In the presence of airway support, such as a tracheal tube, the methods were able to exchange adequate air. But without the tube, if the victim's palate, throat, or tongue were

[441] Engineering Committee of the Conference on Electric Shock, "Recent Experience of the Public Utilities of the United States and Canada in the Use of the Schaefer Prone Pressure Method of Resuscitation in Cases of Electric Shock," *Journal of Industrial Hygiene* 10 (1928), 127.

[442] J.O. Elam, E.S. Brown, and J.D. Elder, "Artificial Respiration by Mouth-to-Mask Method: A Study of the Respiratory Gas Exchange of Paralyzed Patients Ventilated by Operator's Expired Air," *The New England Journal of Medicine* 250, n. 18 (May 6, 1954): 749-54; P. Safar, L.A. Escarraga, and J.O. Elam, "A Comparison of the Mouth-to-Mouth and Mouth-to-Airway Methods of Artificial Respiration with the Chest-Pressure Arm-Lift Methods," *The New England Journal of Medicine* 258, n. 14 (April 3, 1958): 671-7; P. Safar, L. Aguto-Escarrage, L. Drawdy, M.C. McMahon, A.H. Norris and J. Redding, "The Resuscitation Dilemma," *Anesthesia and Analgesia* 38, no. 5 (September/October 1959): 394-405; Peter Safar, "Failure of Manual Respiration," *The Journal of Applied Physiology* 14, no. 1 (January 1959): 84-8.

collapsed, and (quite independent of airway issues) if the chest had lost its natural recoil, they were entirely ineffective. This matter of "collapse" was nothing but a parenthetical comment, but it was the difference between success and failure for techniques that had seemed effective for more than a hundred years. Manual artificial respiration disappeared, together with the view of breathing and body that it entailed, because of what the Yale respiration physiologist Yandell Henderson might have called the absence of *tonus*.

Henderson and *Tonus*

What is it that determines the "point of no return" beyond which someone lingering between life and death cannot be "brought back"? As we saw above, Brodie, for one, thought that artificial respiration and other techniques could be effective as long as the *heart* had not stopped beating. It was the absence of motions of the heart that marked the point beyond which there was no use providing breath or warmth. In quite a different spirit, Yandell Henderson found the difference between life and death to the property of something he called *tonus*.[443]

While carrying out his own evaluations of the varying efficacy of different methods of artificial respiration with dead bodies, Henderson noticed that after the breathing had stopped but before rigor mortis appeared, after about five or ten minutes, the muscles of the body would lose their tone. This loss of tone was the most significant

[443] A closely and compellingly related idea of "tension" is developed in Shigehisa Kuriyama's "A Silent Revolution: Colds, Catarrhs, and the Experience of Air" in *Medicine and the History of the Body, Proceedings of the 20th, 21st and 22nd International Symposium on the Comparative History of Medicine East and West*, ed. Yasuo Otsuka, Shizu Sakai, and Shigehisa Kuriyama (Ishiyaku EuroAmerica, Inc, 1999), 169.

determinant of the value of manual artificial respiration. If there was *tonus*, there was life. Like others who had tried to understand resuscitation before, he bravely named the point beyond which any techniques would not be of use: "So long as tonus is present, manual methods are effective. When tonus disappears, the victim is dead beyond recall."[444]

In everyday terms, *tonus* was what gave the soldier standing long at attention more vitality and more capacity to remain still but ready, than an elderly man who could stand hardly at all, and needed to regularly sit or lie down. But *tonus* was not a name for ignorance like "vitality," for in death, it was, even mechanically speaking, "the failure of *tonus* that permits the major functions of respiration, circulation, and metabolism to fail."[445]

Tonus was the source of an independently existing being's autonomy. A baby, floating in the warmth of the mother's womb, did not yet require *tonus*, for it did not have its own breath, heat, or life. But as a baby emerged into the world, the relatively cooler air on its skin would quickly awaken the motor neurons and awaken *tonus*. This subtle tension would remain throughout the course of the organism's life, and the departure of *tonus* would mark the end of its independent existence: "But, if the baby is to establish and maintain its independent life, *tonus* is essential."[446] The constant imperceptible tension of muscles held the body upright and maintained the elasticity of the lungs: "from birth to death the lungs are never completely deflated because the diaphragm is never completely relaxed." Some baseline degree of *tonus* in the body, the absence of *complete* relaxation, was a characteristic of a living body as opposed to a dead one. As long as a

[444] Yandell Henderson, "How Breathing Begins at Birth," *Science* 85, no. 2195 (January 22, 1937): 89, n.5.

[445] Ibid., 91.

[446] Ibid., 90.

body lived, it lived with a degree of tension.

Tonus was also a significant source of the heat of life. Respiratory metabolism was intimately connected to the overall *tonus* of the body, and these two were in turn connected to heat production. This tension was related to the body's metabolism, the muscular consumption of oxygen, and production of carbon dioxide and heat, interacted with the nervous system's control of all body processes, including setting its temperature. It could work the other way around, too. Tonus had to do with the exposure of skin to air. In warmth it disappeared, but it reappeared with the right degree of coolness on the skin: "take the fetus out of the [warm] saline and expose its skin to the air; tone at once appears in its muscles, only again to be abolished by replacing the embryo in the bath."[447]

While the slaves who took their lives by holding their breath displayed a very radical kind of autonomy—control over breath beyond life and death—they still exerted that volition at the level, shall we say, of thinking about it. This was the way, too, that Houdini and Bernard held their breath: with intention. But the real autonomy, Henderson might have said, was before all that. The baby exerted this autonomy when it responded to the new, cool air with *tonus.* There was a quality in the body that was associated with individual, autonomous life, even if that life was open to the various winds that might blow. It was characterized by a quality of elasticity that allowed robust responsiveness to the environment. It was not conceptually, consciously willful, but it was aware.

As Henderson saw it, all methods of resuscitation were secondary to the question of whether or not the subtle but fundamental tension was present in the body. If you were to inflate lungs lacking it with air, they would simply deflate again. If you applied manual

[447] Ibid., 91.

artificial respiration to a body without tension, there would be no spring to welcome the air and send it out again. But though all methods were the same in that sense, it was a particular inattention to *tonus* that made mechancial ventilation problematic for Henderson. The device that he developed and promoted for resuscitation delivered carbon dioxide to stimulate oxygen uptake during manual artificial respiration. As for "suck and blow" respirators, he thought them not only ineffective but dangerous, and provided evidence of the harm to lungs that had been discovered on autopsy (much as Leroy had in the 1820s). The body was not a slack balloon to be filled with air.

He made this point with great urgency just a few months before his death in 1944. In an article in *Science,* Henderson somewhat dramatically reported that the rebranding and new marketing of an old device, a portable positive-pressure respirator that had originally been called the Pulmotor, was a "back-step toward the death of thousands."[448] Henderson found the affair "particularly evil" insofar as the identical device which alternately sucked and blew air, claiming to deliver healthful gases and remove poisonous ones, had been definitely rejected thirty years prior as ineffective and unsafe. (The "evil" part of it was, as he explained in great detail, the machinations of the machine's manufacturer and marketers to variously repress, buy off, and intimidate the scientists and committees who had originally spoken against the device, Henderson himself included.)

The article was flamboyant and scathing. It claimed that the only evidence for the effectiveness of what he called "suck and blow" devices was that when they were

[448] Henderson, "The Return of the Pulmotor as a 'Resuscitator,'" 547-551.

attached to the mouth of a rubber doll, the doll could be made to breath "realistically."[449] (Scare quotes Henderson's). Again echoing a criticism of Leroy's, he claimed that though the principle of the device was to provide air to the lungs and then remove it, the pressures the device would have to supply for adequate ventilation (and indeed did supply, if inconsistently) would damage the lung tissue and cause hyperventilation. But the worst problem presented by the Pulmotor was that it considered the breathing of a human being to be that of a doll, without its own responsiveness or rhythm (however dormant that rhythm might have become):

> It is true that a healthy conscious man can voluntarily adjust his breathing to the rhythm of such apparatus, so that he appears to behave like the rubber doll. But if the patient is unconscious and the pressures applied, both positive and negative, are low enough to be harmless, there is generally either complete discordance between the patient's breathing and the rhythm of the apparatus…[450]

The Pulmotor had very little to do with the mechanism of human breathing or the nature of the human body and therefore failed to ventilate a real human being. Henderson died within six weeks of the publication of his article, an article that was, as one commentator in *Science* the following summer put it, "the old warrior's last use of his mighty battle-axe."[451] It would be interesting to know what Henderson might have made of what was to come.

Occurring simultaneously with all this was a significant pharmacological development. Starting in 1942 with a paper by two Canadian anesthesiologists, the arrow poison curare began to be widely used in anesthesia. Cyclopropane and ether anesthesia could make a patient unconscious for the duration of a surgery, but something was

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[449] Ibid., 548.

[450] Ibid., 548.

[451] Paluel J. Flagg, "Resuscitation Apparatus," *Science* 99, no. 2580 (June 9, 1944): 470.

wanted which could address common irritations like that of coming to close the peritoneum at the end of an appendectomy and finding that the abdominal muscles had become problematically tense: "Every surgeon has wished at times that he might be able to produce rapid and complete muscular relaxation in resistant patients under general anesthesia."[452] The administration of 5 cc. of Intocostrin (Squibb's curare extract) made the belly "soft as dough,"[453] Harold Griffith and Enid Johnson wrote. The "crude" curare of the South American Indians, which contained many toxic substances, had been purified and could give "this kind of relaxation temporarily and apparently quite harmlessly."[454]

Though Griffith and Johnson claimed that at small doses neither the heart nor respiration was impaired, the quality of "soft" tissue and completely yielding relaxation that they desired was hard to produce without also turning off the muscles of breathing, the diaphragm in particular. In 1947 there were angry responses to an article that had glowingly reported on curare under the title "A Revolution in Anaesthesia." These responses were critical of the whitewash and wary in particular of the suppression of respiration that could easily be caused by curare. Those promoting its use understated the difficulty of safely managing the respiration of a surgical patient lacking, shall we say, *tonus*.[455]

In the event, it was curare and $150 that was given to the forty-nine doctors,

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[452] Harold R. Griffith and Enid Johnson, "The Use of Curare in General Anesthesia," *Anesthesiology* 3, no. 7 (1942): 418.

[453] Ibid., 419.

[454] Ibid., 418.

[455] Dawkins and H.W. Loftus Dale, "The Revolution in Anaesthesia," *British Medical Journal* 1, no. 4505 (May 10, 1947): 654.

medical students, and one nurse who agreed to volunteer for Peter Safar's study comparing manual artificial respiration to mouth-to-mouth. Their oxygen levels were closely monitored as they were alternately assisted to breathe by the Schaeffer, Silvester and Neilson methods without a tracheal tube and by mouth-to-mouth.[456] Though an airway under the influence of curare was not exactly a "natural" airway, this was the model of total respiratory failure that Safar and his team used: "To simulate field conditions, they were studied both with their *natural airways* only and with an artificial oropharyngeal airway."[457] The study was, they claimed, the first "objective" study of mouth-to-mouth insufflation to be reported, and it showed that the then-dominant methods of resuscitation were useless.[458]

Resusci-Anne

Ten years prior, Henderson had mocked the Pulmotor marketers' use of the rubber doll in a precise way. And given the centrality he ascribed to *tonus,* the analogy was apt: the human body was not a rubber doll, and breathing was not like filling and emptying balloon-like lungs. But while the plastic doll was originally just a marketing strategy for the Draeger company to promote their Pulmotor, later, when mouth-to-mouth resuscitation suddenly and forcefully returned to the scene, the doll reappeared as a serious pedagogical tool. There was no irony in the introduction and vigorous promotion

[456] Mickey S. Eisenberg, *Life in the Balance: Emergency Medicine and the Quest to Reverse Sudden Death* (Oxford: Oxford University Press, 1997), 96.

[457] Safar, Escarraga, and Elam, "A Comparison of the Mouth-to-Mouth and Mouth-to-Airway Methods of Artificial Respiration," 671.

[458] Elam, Brown, and Elder, "Artificial Respiration by Mouth-to-Mask Method," 753. (Safar's collaborator, James Elam, was also an amateur filmmaker and the results of some of their filmic collaborations can be viewed at: https://www.youtube.com/watch?v=FG2qy4CQy0Q).

of "Resusci-Anne".

She was in fact the result of an enthusiastic collaboration between Peter Safar, who had been traveling the world spreading the word about the superiority of mouth-to-mouth resuscitation, and a Norwegian doll-maker, Asmund Laerdal, whose child had nearly (but not entirely) drowned a few summers prior. Ideally, the mannequin had to be someone that students would at least be willing (if not actively want) to kiss, and Laerdal chose to model Anne's face on the "enigmatic yet peaceful gaze" of the death mask of a woman who had drowned herself in the Seine.[459] The disgust of "laying ones lips on the lips of a corpse" (as the Candian Red Cross would put it, holding out against mouth-to-mouth until 1960) was somehow recast in a kind of erotically charged opportunity to revive Millas' *Ophelia*.[460] Or perhaps, less poetically, as an opportunity to lay one's lips on a perfectly yielding, silent, simulacra.[461]

Porous Skin and Iron Lung at the Department of Ventilation and Illumination

The iron lung, which saved many lives during several international polio epidemics, came about as a result of an attempt to study skin breathing in mammals.[462] Accounts of the development of the Iron Lung often say something along the lines that Phillip Drinker's brother Cecil and the physiologist Louis A. Shaw had been studying

[459] Eisenberg, *Life in the Balance,* 102.

[460] Tercier, "The Lips of the Dead and the 'Kiss of Life,'" 286.

[461] Anthony Ferguson, *The Sex Doll: A History* (Jefferson, NC: McFarland and Co., 2010).

[462] Drinker and Shaw never made the analogy explicit, but one developer of an early version of a negative pressure respirator similar to the iron lung, Wilhelm Schwake, did: "negative pressure upon the skin…draws out…the gaseous byproducts." Qtd. in E. Trier Moerch, "History of Mechanical Ventilation," in *Mechanical Ventilation,* ed. Robert R. Kirby, Robert A. Smith, and David A. Desautels (New York: Churchill Livingstone, 1985), 8.

"various aspects of respiration physiology in cats."[463] What they were studying, to be more precise, was skin breathing in mammals. Cecil and Phillip both had laboratories at the Harvard Department of Ventilation and Illumination (on the top floor and in the basement, respectively).[464] That year, though, Cecil, who was a close associate of the Danish physiologist August Krogh who had carried out work on comparative respiration physiology, was in Denmark working with Krogh on aspects of the surface of the body: the lymph and capillaries.

Phillip, meanwhile, back in Boston had the "harrowing" experience of seeing children in the terminal stages of respiratory paralysis from polio: "I didn't have any idea, neither did Cecil nor anybody else about what would help these children." The younger Drinker had been associated with Boston Children's Hospital by virtue of his work on the development of incubators—tiny respiratory environments—for premature infants. Phillip called up "Willie Shaw" (Louis A. Shaw), whose studies of skin respiration with Cecil had required using a technique in which an entire animal was contained in a box with its head protruding through a rubber collar, a plethysmograph he had designed together with Cecil.[465] (See Figure 12.)

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[463] Anon., "The Iron Lung: First Practical Means of Respiratory Support," *Journal of the American Medical Association* 255, no. 11 (March 21, 1986): 1476-80.

[464] Phillip Drinker, "Transcripts from Drinker Interview," Oral History interview with Dr. Lynne Dunphy, August 5, 2001. Countway Library. "Ventilation" used to mean the quality and quantity of the air passing through a room or environment, but now it has a new meaning: whether or not sufficient air is transferred to a particular set of lungs via "ventilator." "We had reasonable funds for the building alterations that were necessary and funds for the building up of new labs like my brother's. Physiology on the top floor and mine on the bottom, industrial hygiene. The department was originally called ventilation and illumination, and not industrial hygiene."

[465] Louis A. Shaw, "Cutaneous Respiration of the Cat," *American Journal of Physiology* 85, no. 1 (May 1, 1928): 158-167

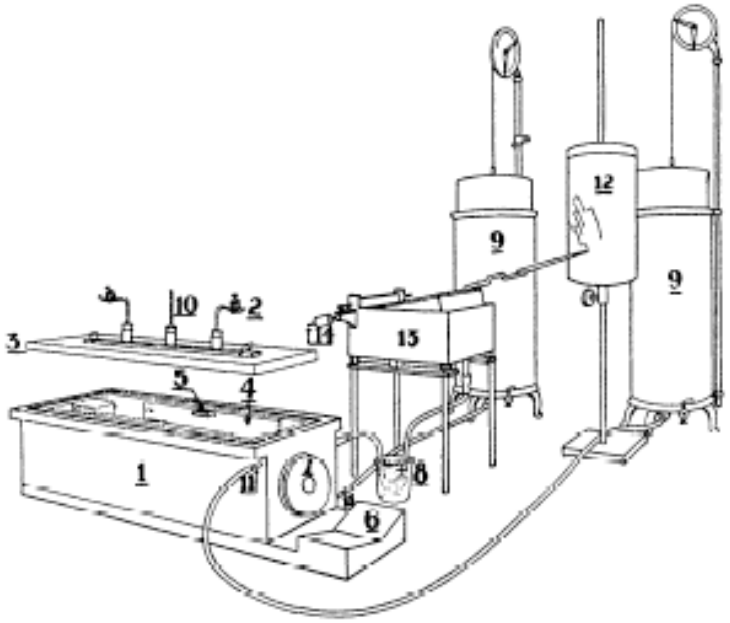

Fig. 1. Apparatus for determining cutaneous respiration. *1*, plethysmograph; *2*, gas sampling tube; *3*, cover; *4*, blocks to reduce space; *5*, cleats; *6*, head rest; *7*, head aperture; *8*, condensation chamber; *9*, mixing spirometer; *10*, thermometer; *11*, tubes entering gas seal; *12*, kymograph; *13*, Krogh spirometer; *14*, counterbalancing pin.

Figure 12. The cutaneous respiration measurement device that became Drinker's Iron Lung. Source: Louis A. Shaw, "Cutaneous Respiration of the Cat," *American Journal of Physiology*, May 1928.

In a 2001 oral history interview, Phillip Drinker doesn't mention what kind of studies Shaw and Cecil were doing, but from Shaw's publications, we know that at least part of this work was an attempt to precisely measure gas exchange across the skin of the cat. The direct inspiration for these studies was Krogh, who had carried out detailed measurements of cutaneous respiration, using a similar technology, in many different animals: tortoise, frog, eel, and pigeon.[466] Shaw's work on cutaneous respiration in the cat was an extension of this work to mammals. To be specific, he wanted to know if the

[466] Krogh, A. 1904. Skand. Arch. Physiol., xvi, 348.

phenomenon was true of mammals, and if so, what the balance between skin and lung breathing was.

Phillip Drinker had been made chairman of the Rockefeller Institute's committee to study prolonged artificial respiration. In the oral history interview, Drinker recounts how, at one of the meetings, he reported on an experiment he had carried out with Shaw in which they hadd rigged up a syringe to the plethysmograph. Using the respiration tracings that had been made on an unsedated cat in the cutaneous respiration studies, they simply attempted to recreate the same tracing with a curarized cat in the box using pressure provided through the syringe: "After fooling around and making some bad estimates on the air volumes needed it was obvious that we could keep such an animal alive indefinitely."[467] (See Figure 13.)

[467] Drinker, Oral History Interview, 4.

Figure 13. Phillip Drinker applies negative and positive pressure to ventilate a curarized cat while assistant Louis Freni looks on. Source: Catherine Drinker Bowen, *Family Portrait* (Boston: Little, Brown, 1970), 239.

In the interview, Drinker shared a conversation he had had with J.B. Haldane, probably the most significant respiration physiologist of the period. For Drinker, the step from the plethysmograph to the iron lung was just a matter of "fooling around"; it wasn't that he thought skin respiration a matter of significance. (Shaw found, by the way, that there was indeed a small amount of gas transfer across the skin, but amounting to only about 1% of total gas exchange.) He recounted:

> I showed this machine to Jerry Haldane in London in '31 and told him that he had shown in his textbook on respiration from the Sullivan Lectures which he gave at Yale that you could [put] a man in a box such as we had and record respirations in which the machine was used as a plethysmograph and I said [if you had] just fooled around with this and put a pump on it you would have had a respirator!

And he said we didn't need it. He laughed.[468]

Still, Drinker came up with the Iron Lung rather than the Pulmotor. In chapter one, we saw that the Galenic doctrine of skin breathing which persisted in some form into the seventeenth century allowed for the possibility of long breath holding without death. It was the explanation given for how apoplectic men and hysterical women survived their fits and ecstasies. Then, as we saw with von Garbe, even into the early twentieth century the doctrine was even still occasionally invoked to explain the survival of burial alive and trance-like periods without breath—indeed the nature and extent of gas transfer across the skin was an open question. It was almost as though the breathing of the skin, or the breathing of the entire body, rather than just the lungs, was the principle of so-called "prolonged artificial respiration." It was almost as though someone who would otherwise not be breathing was being assisted to breathe "through their skin." The simple inclusion of the surface of the body in its respiration somehow had broader implications. These were implicitly understood by Hall when he invented a mode of resuscitation that was meant to closely mimic the "natural" movements of the body's breathing, and to give wide berth to the body's "posture."

A still-missing thread of this story is that of how methods of mechanical positive pressure ventilation were developed. The evolution of the mechanical ventilators of today belongs to its own chapter (or book), and a brief mention here will have to do. It's a story that begins, oddly enough considering what's been said here so far about resistance to positive pressure, in the last decades of the nineteenth century. In spite of this, there is a clear parallel between the lack of interest in mouth-to-mouth and in mechanical positive

[468] Drinker, Oral History Interview, 7.

pressure ventilation more generally. Suffice it to say: the Pulmotor was certainly not the state of the art for the first decades of the twentieth century.

Though open heart and other kinds of thoracic surgery were not commonly performed in the United States until the 1950s, this was not because it would have been technically impossible to do so earlier. A separate strand of research, already highly developed in the physiological laboratories of the late nineteenth and early twentieth centuries, had already developed the techniques we now use in cardio-thoracic and other complex surgeries: oral intubation, tracheotomy, compressed tank oxygen, mechanical ventilation machines that adequately and safely did their job, and even machines for the delivery of anesthesia.[469] The work of Paul Bert, Hering and Breuer (the same Josef Breuer of Freud and Breuer's *Studies on Hysteria* and Anna O.), for example, and, though in more primitive form early in the nineteenth century, Brodie, all depended on versions of these technologies.[470]

The piston ventilator seen in Figure 14 below is an example. It was developed for use in humans in Leipzig in 1910 and was able to deliver oxygen via alternating positive and negative pressure through an endotracheal tube.[471] The analogy between experimental animal breathing and human breathing was not exact, which led to certain glitches in extending the known techniques to people (the thoracic envelopes in dogs and people are different, for example). Another significant problem was infection, not a concern for animals who would be "sacrificed." But, as suggested here, there were deeper

[469] Moerch, "History of Mechanical Ventilation," 1-58.

[470] Gene L. Colice, "Historical Perspectives on the Development of Mechanical Ventilation," in *Principles of Mechanical Ventilation*, ed. Martin J. Tobin (New York: McGraw-Hill, 1994), 1-35.

[471] Laewen and Sievers, "Zur Paktischen Anwendung ger instumentellen künstlichen Respiration am Menschen," *Munch. Med. Wochenschr* 57, no. 2221 (1910). In Moerch, "History of Mechanical Ventilation," 16.

concerns associated with positive pressure ventilation; the lack of antibiotics was only part of the story.

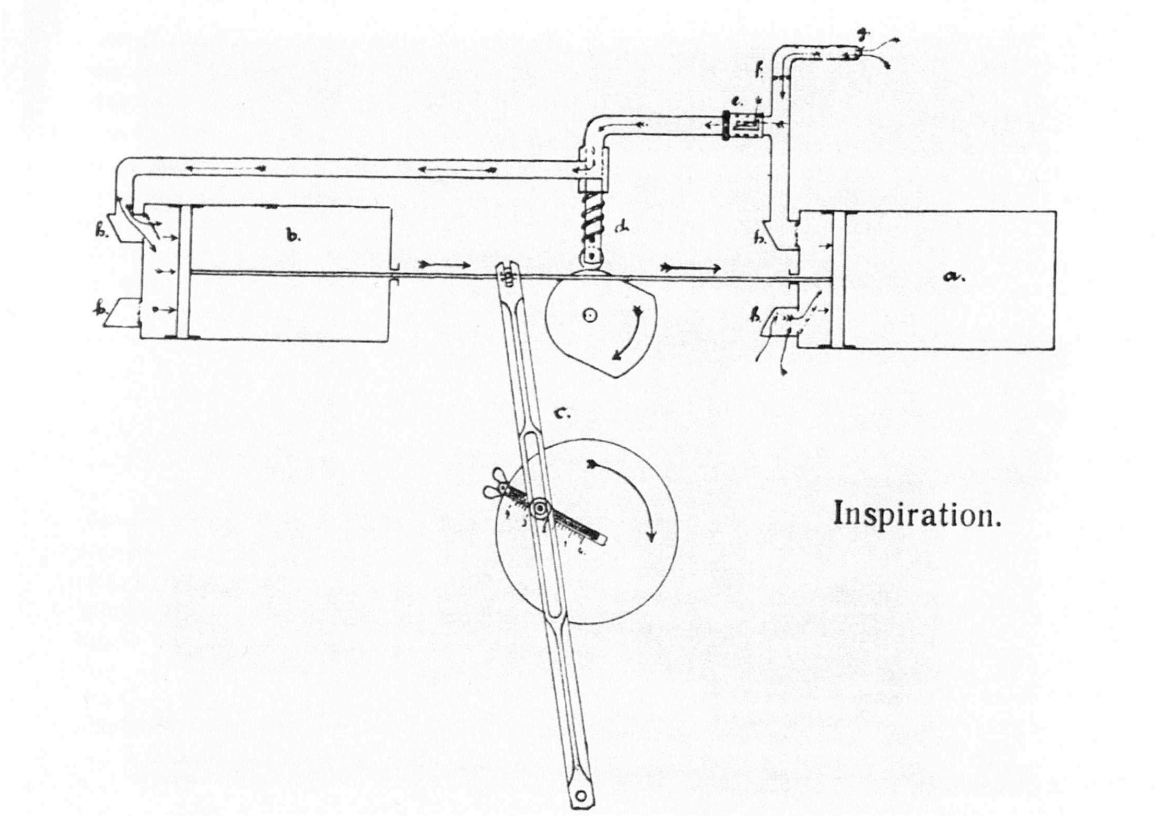

Figure 14. Forced Inspiration according to Laewen and Sievers piston ventilator. Source: "Zur Paktischen Anwendung ger instumentellen künstlichen Respiration am Menschen." *Munch. Med. Wochenschr* 57, no. 2221 (1910).

The closed thorax is its own, sealed environment within the larger context of atmospheric pressure. Opening the chest in thoracic surgery evens the pressure between the thoracic space and the surrounding environment and causes the lungs to collapse. Breathing depends on the pressure differential that must be supplied, somehow, when the sealed environment of the thoracic cavity is opened. In this sense, positive pressure ventilation was a necessity for surgeries that depended on opening the thoracic cavity. Additionally, surgeons desired what they evocatively called the "quiet field." The

performance of complex surgery inside the chest was not aided by a body with its own ideas. As we saw above, curare was introduced for this reason.

Mechanical ventilation for use in surgery had been especially developed in Scandinavian countries and was used there earlier than in the rest of Europe and the United States. During World War Two, when a young Danish doctor studying anesthesia in the U.K. was unable to import the ventilators he used at home, he built his own and reported it to the Royal Society of Medicine in London in 1947. In summarizing his ventilator's many advantages, this physician, E. Trier Moerch, wrote about the advantages of the "quiet field" provided by controlled respiration: "during a thoracotomy when an automatic machine is used, the respiratory movements are very small and take place in an exactly regular rhythm. This is a great help to the surgeon and makes his job easier."[472]

Morch's report describes how the machine takes over breathing after a patient has received anesthesia. Either the machine can be set to first pace the naturally occurring pattern before taking respiration over entirely, or the respirator can be simply started with its eventual rate and depth: "If during this time the speed of the respirator does not exactly coincide with the speed of the patient's respirations, the difference is eliminated by the clutch. As a matter of fact it is astonishing how little it matters if there is a difference between these two frequencies. After a short fight the patient gives up and the

[472] Moerch (1947), p. 607. In another place, Moerch described some "ancillary uses of mechanical ventilator": "The main beverage streamed merrily from 2 large kegs of beer until at midnight the party was in grave danger when the pump failed, and beer would no longer leave the keg. Unseen by the rest of the party, Trier Moerch sneaked out and and returned to the hospital, found the very ventilator which had been breathing for Winnie only a few months earlier and dragged it across the street…after a few on-the-spot modifications, Moerch adjusted the machine to run at low volume, high speed and high pressure to pump air into the kegs, and—mirabile dictu—the beer was again streaming down the throats of an appreciative crowd. Never did one mechanical ventilator save so many 'patients' at one time!" Moerch, "History of Mechanical Ventilation," 23.

respirator wins."[473] Safe and effective surgery depended on the respirator "winning."

Conclusion: Varieties of Controlled Respiration

It is sometimes argued that life support technologies are twentieth-century innovations that have blithely meddled with The Order of Nature, thereby spawning ethical dilemmas of a new order. A patient dependent on a mechanical ventilator is able to breathe when she could not do so on her own, and without such a machine, it's argued, we would not have the insoluble problem of when, and if, to "pull the plug."[474] But is there another way of imagining the situation?

What if instead we admitted breathing technologies into the family of *techniques of the body* and considered how they are constitutive of the self? All of the interventions for troubled or absent breathing we've examined here change the boundary between the breathing body and its environment. They are natural examples of the way tools were described by Merleau-Ponty or Marshall McLuhan, who suggested, in different ways, that tools are extensions of the human sensorium. Merleau-Ponty's famous blind man incorporated the stick through which he oriented spatially in the world into his own body. The electronic surround (when he was writing just a glimmer of what it has now become) was, for McLuhan, an extension of the human nervous system.[475] What kind of sensory extensions were the iron lung and the mechanical ventilator?

It is telling that the appropriate pressure levels of the iron lung were set by finding

[473] E. Trier Moerch, "Controlled Respiration by Means of Special Automatic Machines as Used in Sweden and Denmark," *Proceedings of the Royal Society of Medicine* 40, no. 30 (May 2, 1947): 606.

[474] Stanley Joel Reiser, "Therapeutic Change and Moral Doubt in a Technological Age," *Daedalus* 106, no. 1 (Winter 1977): 47-56.

[475] Maurice Merleau-Ponty, *Phenomenology of Perception* (London and New York: Routledge, 2006); Marshall McLuhan, *Understanding Media* (London: Routledge, 2001).

the moment when the patient enclosed in the case could no longer speak: the appropriate degree of influence of the machine on the patient's breathing was determined by the patient's capacity for expression.[476] Comparatively speaking, it's clear that an intubated patient or one having air forced into the lungs by mechanical ventilation does not speak. In either case, iron lung or mechanical ventilator, interference with something so basic and intimate as breathing is bound to be problematic, but people did survive in iron lungs for extended periods of time, even decades. One example is Martha Mason, a woman who nearly died of polio at the age of eleven but lived out the next sixty-one years of her life in an iron lung. In the introduction to her memoir, a friend described her quality of life breathing with the support of the lung:

> To begin with, Martha *enjoys* other people. She has the ability to put visitors at ease so quickly and engage them in such interesting conversations that even the insistent iron lung fades into the background. Depending on the time of day and the dispositions of the visitors, her home in the village of Lattimore (population 419) in North Carolina's western piedmont can become a beauty parlor (or a beauty shop) where gossip is exchanged or a caucus where local political decisions are made or a sort of confessional where foibles are admitted and approbation is freely given. And for special friends, it becomes a cozy table for two in a familiar restaurant.[477]

What is the subjective quality of breathing under mechanical ventilation? What is it like to fundamentally lose control of one's own breathing? There are a few accounts, including one passing mention by a psychiatrist writing in the late 1960s, about not the mechanical ventilator but hand-controlled positive pressure ventilation:

> For example, persons may lose all control of their respiratory movements through the use of curare-like substances in medical school demonstrations (on student subjects), during surgery, or as pre-medication in electro-convulsive treatments.

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[476] P. Drinker and L.A. Shaw, "An Apparatus for the Prolonged Administration of Artificial Respiration," *Journal of Clinical Investigation* 7, no. 2 (June 1929): 238.

[477] Charles Cornwell, "Introduction," in *Breath: A Lifetime in the Rhythm of an Iron Lung* by Martha Mason (New York, Berlin, London: Bloomsbury, 2003), 3.

> Almost everyone who is awake during such periods of respiratory paralysis, even though they are expertly "breathed" by an anesthetist, report intense feelings of terror or horror: the inability to breathe for themselves is subjectively worse than pain or other dangers.[478]

Currently, while patients whose breathing is dependent on mechanical ventilation are generally sufficiently sedated to be unaware of their situation, recovery times have been shown to be quicker when patients are minimally sedated or even spend their days on mechanical ventilation entirely without sedation.[479] Veronika Karlsson studied the experience of Swedish patients who were conscious while on mechanical ventilation and found that their two most common reports (given by notes scratched on paper or through interpretation of facial expressions she recorded on video) were of breathlessness and dependent voicelessness. Patients were irritated by being unable to control their own breathing. With the endotracheal tube, one patient said that they "felt cut off…couldn't see and be seen in the same way." The patients' faces, Karlsson reported, were lifeless, expressionless, and withdrawn, and if there was a dominant emotion it was sorrow.[480] In another study, Karlsson's subjects also reported panic, anxiety and fear in addition to the pain and discomfort of the physical situation of the respirator. They experienced drifting in time, a sense of being half awake and half asleep, and a feeling of helplessness to take control over their situation.[481]

The iron lung gave the body its own, enclosed environment and a unique

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[478] Mardi Horowitz, "Some Psychodynamic Aspects of Respiration," in *Hyperventilation and Hysteria*, ed. Thomas Lowry (Springfield, IL: Charles C.Thomas, 1967).

[479] Veronika Karlsson, "The lived experiences of adult intensive care patients who were conscious during mechanical ventilation: A phenomenological-hermeneutic study," *Intensive and Critical Care Nursing* 28, no. 1 (February 2010): 6-15.

[480] Veronika Karlsson, Berit Lindhal and Ingegerd Bergbom, "Patients' statements and experiences concerning receiving mechanical ventilation: a prospective video-recorded study," *Nursing Inquiry* 19, no. 3 (2012): 247-258.

[481] Karlsson, "The lived experiences of adult intensive care patients," 6-15.

relationship to the atmospheric pressure with that space, in a sense extending the body's boundary outward. The forms of positive pressure did the opposite, collapsing the body's boundary inward, almost entirely, such that the body had little or no need to negotiate a boundary with "incoming" pressure. This chapter has argued that is the second of these "techniques of the body" that is most often used now and has traced how it has come to be so.

Conclusion

Aristotle inaugurated a tradition that taught that the last act of life is an exhalation. The story of a life was held on either end by and inhalation and an exhalation. A life, in miniature, was encapsulated in the cycle of a breath: inhalation was the very first thing a new being would do, and the very last was to exhale: "…for though these two functions go on in alternation, yet the last act when life comes to a close is the letting out of the breath, and hence its admission must have been the beginning of the process."[482] Throughout, this dissertation has considered breathing and the boundary between life and death. A boundary that, as we have seen, proves more flexible than we might have imagined, a boundary that is always changing in history, but always mediated by the apparent fact of time.

When observing one's own breath or that of another as object, we come face to face with this dictatorship of time. A dim awareness becomes plain: experience is to be measured and doled out in portions determined not by us, as we might like, but by time. A relentlessly ordered ticking clock that prevents sleep can be banished from the room. But the metronome of our own breath is an audible, palpable, indwelling conductor that we cannot live without. There's nothing inherently relaxing about observing breath; rather it intensifies the vague knowing that we do not control time, but time controls us. Is this anxiety about time yet another reason we tend to forget breathing?

For Freud, repression and repetition—time—were intimately linked. In *Beyond*

[482] Aristotle, "On Youth, Old Age, Life and Death, and Respiration," in *The Complete Works of Aristotle: The Revised Oxford Translation,* Vol. I, ed. Jonathan Barnes (Princeton, NJ: Princeton University Press, 1984), 752.

the Pleasure Principle, he recounted the story of a well-behaved (if not particularly intellectually gifted) child.[483] A "good boy," he obediently did not enter forbidden rooms or touch off-limits objects. And, though he was certainly very attached to his mother, he did not cry when she would leave for long stretches of time. This was not, Freud wrote, because the infant was not bothered by her departure. Instead, there was a certain performance enacted by the child that allowed him to manage the distress of her disappearance and absence.

In the child's collection of toys was a wooden car on a string. But rather than dragging the car along the floor as any other child might be inclined to do, he would instead stand at the edge of his curtained crib and throw the car out of sight while calling out "oooo," which Freud heard as a childish pronunciation of the word *fort*—gone. He would then pull the car on its string back into sight while exclaiming joyfully: "Da!"—here. This was a reenactment, a repetition, of the painful departure of the mother, and a way of gaining control over a "powerful impression" that had been made. The trauma could be experienced again, and again, and again, but now with a different outcome, one that the child desired and that he could bring about himself. An intricate cycle of pleasure and pain, but with the child in control, bringing about a desired outcome: Here.

There is a built in fort/da in human embodied experience, and that coming and going, appearing and disappearing, is the breath. It is the sequence of this appearance and disappearance that constitutes the fabric of experience, and in particular that constitutes its unfolding in time. For Freud, the fact that we all dream, that we have repression and an unconscious, was, as Norman O. Brown put it in Christian language, a kind of original

[483] Sigmund Freud, *Beyond the Pleasure Principle and Other Writings*, trans. Mark Edmundson (London: Penguin Books, 2003), 53.

sin—our original neurosis.[484] Extending the idea to the body, there's a kind of neurotic repetition built right into its most basic processes, especially breathing. The repression that drives repetition is not unlike the breathing of the body as it changes an inhalation for an exhalation. One drive toward inspiration, one toward expiration. An erotic life drive, and the death drive, *thanatos*, in every cycle of breath. The cycle of breath, unnoticed, driving recurring patterns of time, experience, and history.

Writing at the end of the 1950s (just as the new view of positive pressure ventilation was becoming prominent), Norman O. Brown described the new and very real possibility of the total obliteration of mankind as the victory of the death drive, and called for the abolition of repression, which he renamed "the resurrection of the body."[485] This "resurrection" consisted not of the repression or exclusion of the death drive, but of its "satisfaction," of the body and psyche's total acceptance of death, which was the same as the end of all repression: "The death instinct is reconciled with the life instinct only in a life which is not repressed, which leaves no 'unlived lines' in the human body, the death instinct then being affirmed in a body which is willing to die."[486] There would be no more pathological drive to "make history"; the end of repression would be the end of the generation of time, the end of the unconsciously repeated cycle of breath.[487] To leave no "unlived lines," would be to give perfect and equal attention to each moment of breathing, to inhalation and exhalation, to life and to death.

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[484] Norman O. Brown, *Life Against Death: The Psychoanalytical Meaning of History*, 2nd ed. (1959; repr. Middletown, CT: Wesleyan University Press, 1985), 6.

[485] Ibid., 307.

[486] Ibid., 308.

[487] Ibid., 307.

The history of breathing, the remembering and forgetting of breath, is the history of a community's negotiation and renegotiation of the imagination of life and of death. As we have seen, some of these stories include the possibility of the body's resurrection—the ending of the tyranny of time— and some do not. But each necessarily contains an implicit gesture toward the real mystery of the self that is a breathing—or unbreathing—body. Looking squarely into this mystery is the potential of an attentive examination of the contingent but ever-present breath.