Strange Science

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CHAPTER 6

Performing Phonographic Physiology

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In January and February 1854, the German scholar Chevalier Bunsen convened a group of leading philologists and phoneticians for a series of "Alphabetic Conferences" at his ambassadorial residence in London. The group focused on a difficult linguistic problem that had exercised individuals for centuries: how to identify and arrange human speech sounds in a new symbolic system that would be universally usable across all the languages of the world. The potential of such a system had become increasingly clear for a rapidly globalizing nineteenth century. It would meet a scientific need by offering insight into the sound relations of diverse languages and the mechanism of speech; it would meet a practical need with its promise that a new dawn of intercultural conversation was at hand, galvanized by a parallel explosion in communications technologies that seemed tantalizingly ready to offer intermediary assistance. To achieve this goal, it would first be necessary to move beyond conventional alphabets. It had long been recognized that the relations of spelling to speech were both arbitrary and maddeningly inconsistent—the same sound could be expressed by multiple combinations of letters, and multiple sounds could share identical orthographic formulations. The learned experts gathered for the conferences in London directed their efforts toward the exhaustive collation of the ways in which speech sounds were rendered in existing alphabets, in the hope that these might

be refined and reconfigured in novel, complex combinations. Yet for those who were most sensitive to the range of vocal variations within and between languages, it was evident that conventional systems of spelling would not be capable of adequately representing them.

At this historical moment, decades before the appearance of the invention that decisively took the name in 1877, the word "phonography" (literally "sound-writing") designated a variety of practices and techniques that sought to fix and transcribe intangible vocal sounds into recorded forms. The previous quarter-century had seen the gradual development of elocutionism, or vocal training, into what was now becoming called vocal science. The two major influences on the field in this period had issued from the late eighteenth-century writings of Thomas Sheridan and John Walker. Each had promoted different techniques: Sheridan thought that the ideally trained voice was one that advanced toward the purity of natural laws, whereas Walker was committed to identifying the mechanical processes involved in the physiology of vocal production and devising annotations to describe them. The latter method was to inform the so-called mechanical school, which went on to become largely ascendant at midcentury. Among the most prominent of its adherents was the Scottish elocutionist Alexander Melville Bell, the son of Alexander Bell (a well-known vocal teacher in London and the author of a series of popular guides earlier in the century). Melville Bell's own phonetic system, Visible Speech, published in book form in 1867, was one of the major debts of the International Phonetic Alphabet (IPA) in the late 1880s, which, based on physiological principles, marks the consolidation of the mechanical approach that defined modern vocal science.[1]

In this chapter, I argue that Bell's idiosyncratic but highly influential version of physiological phonetics can help us see more clearly how—in the years just before the appearance of Edison's invention—the human body was already being figured in phonographic terms: as an apparatus, increasingly understood mechanically, that records received stimuli and replays them as performed behaviors. In doing so, I show how the fields of physiology, phonetics, and phonography are mutually determined in the 1860s and 1870s, and how each draws on a shared understanding of articulatory performance in accounting for the ways that multiple, sustained impressions and movements record their accumulated traces in the fabric of bodies also furnished with the capacity to replay them. In making the case for connecting vocal physiology with the new meanings of phonography, I examine the development and implementation of Bell's Visible Speech, and then move on to recover two aspects of its

broader contextual constellation: first, a sequence of discourses on physiological memory that attended the emergence of the phonograph, and second, the retrospective foil offered by Bernard Shaw's 1912 play *Pygmalion*, whose wry satire on the phonetic culture of the late nineteenth century not only contains a profusion of phonographic metaphors, but also registers some discomfort with the disquietingly implicit agenda of such vocal pedagogy to "humanize" its subjects.

Visible Speech

In *The Principles of Elocution* (1878), appearing in its fourth revised and expanded edition as the phonograph emerged into the consciousness of the world, Alexander Melville Bell maintained that "speech is wholly conventional in its expressiveness, and mechanical in its processes."[2] Elocution, he held, "must embrace the Physiology of Speech—the mechanics of vocalization and articulation," its mastery relying upon learning what Bell called the "principles of Instrumentation." A student "should be made acquainted with the instrument of Speech *as an instrument*, that all its parts may be under his control, as the stops, the keys, the pedals, and the bellows, are subject to the organist."[3] It had taken him some time to reach this position. Following the 1854 conferences, Bell had looked on as a series of attempts toward a "universal alphabetics" had fallen short of ideal completeness. He was an articulate enthusiast of the cause, explaining in a lecture to the Society of Arts in March 1866 that "a system of letters which, when learned in connection with any one language, would be vocalised with uniformity in every other language, has long been felt to be one of the great wants of the world."[4] His approach to the problem was distinctive. He reported that he had alighted on an alternative method, one that avoided the "insuperable obstacles" that had hitherto stalled others' progress. Unlike them, he explained,

> I worked from different data, and by a totally different process. . . . Instead of going to languages to discover the elements of utterance, I went to the apparatus of speech, and, after many partial failures, but with gradual approximations to success, during a long series of years, I had the satisfaction ultimately of discovering, with demonstrable certainty, the complete physiological basis of speech, and of establishing an organic scale of sounds which could not but include all varieties, known and unknown.[5]

In contrast to the effort to collate existing orthographic symbols into a new universal system, Bell's goal was "to discover, *from the organs of speech*, all the modifications of which they were susceptible." From this systematization of the elements of vocal physiology, Bell suggested that "all possible shades of sound might be gathered, and every alphabetic variety in languages might certainly be found and recognized."[6]

Since its symbols were devised as visual analogues of the vocal organs that formed this variety of sounds, Bell named his new alphabet Visible Speech. "All writing may be said to be, in a sense, visible speech; that is, it is a visible record of conventional language," he explained in a lecture on the subject, "but the system of Visible Speech is physiological, and records the actions of the mouth, irrespective of any particular employment of them."[7] Bell's system would record not the arbitrary shapes of traditional letters, whose transformation into spoken utterance depended on often illogical conventions, but rather the "actions of the mouth," in symbols that reflected the physiological arrangement required for a given speech sound—the lips open or closed, the soft palate depressed just so, the passage of air through the nose, and so on. The idea was that any suitably trained person who followed the directions to reproduce those actions would find that the vocal sounds associated with them would follow automatically. "Whatever the mouth can do, you can write," Bell declared, "and whatever you write, any student of the system can read—to whatever language the written matter may belong."[8]

Visible Speech could be described as a universal alphabet because it claimed to enumerate and symbolize every sound, linguistic and nonlinguistic, that the vocal organs themselves were theoretically capable of producing. Where a sound required the simultaneous operation of more than one elementary action, the symbols were gathered into compounds, allowing even the most complicated sounds to be represented. The special distinction of Visible Speech, retained in modern-day phonetics, was therefore that every part of a symbol expresses a physiologically and phonetically meaningful feature, in contrast (for instance) to Roman script, which is littered with redundant, meaningless details (such as the extension of stalks above and below the general line, in *b* and *g*). Visible Speech claimed to hold the universal key to the representation of all vocal sounds. This remarkable aspect of its typology permitted its further description as a "self-interpreting" system, which connected the whole taxonomy of phonetic representations directly to the physiology of the human voice—a symbolically complete metalanguage. It was a system of spelling sound that even in the middle decades

of the nineteenth century would have been readily understood as phonographic. The extensive promise of Visible Speech as a technique of sound-writing is reflected in the testimony of a contemporary:

> A full sneeze, for example, is a complex operation: it comes among what are called inarticulate sounds; but Mr Bell writes it down, and, for aught we know, could undertake to furnish every member of the House of Commons with a symbol representative of his own particular sneeze, as distinguished from those of all his colleagues.[9]

In Bell's system, these transcriptions had a dual purpose or possibility, for they enabled not only the capture of vocal phenomena, but also the reproduction (through phonetic rearticulation) of what had been transcribed. Indeed, it was in this sense that Visible Speech moved beyond the symbolic to the properly indexical: its characters did not just represent, they also self-interpreted; they did not merely record the general, but replayed the particular.

The identification of the physiological components of vocal sounds with the mode of their mechanical reproduction had previously only been approximated, with the use of speaking machines—a special variety of a wider tradition of automata dating back several centuries that were contrived to replicate a range of physiological processes, from eating and drinking to the workings of the circulatory system. As Thomas L. Hankins and Robert J. Silverman have shown, speaking machines emerged from the work of phoneticians, elocutionists, and stenographers who were concerned with rendering their investigations more objective. For them, such a machine might "serve as a standard for pronunciation; it could help to analyze speech sounds into their phonetic components; and it could aid in forming a truly phonetic shorthand, because a phonetic sound could correspond to a unique arrangement of [its] elements."[10] The English phonetician Alexander John Ellis was an influential advocate of this approach, observing in his 1845 book *Alphabet of Nature* that "it is impossible that any person in analysing sounds can do more than analyse his own sensations"; since these "may never occur in any other individual," it cannot be done "without the aid of a machine."[11] By contrast, Bell believed that he had indeed distinguished objectively a complete and universal set of dispositions. In describing the human vocal apparatus figuratively as a "speaking machine" in his first published version of *Visible Speech* in 1867, Bell was saying more than he may have realized—for in rendering an actual

machine unnecessary for the task, he had figured the body itself as one.[12] The ideal student of Visible Speech commanded the physiological knowledge to replay in bodily actions the sounds that the system had recorded in its phonetic transcript.

Bell used a series of "public experiments in the Writing of Languages" to stage the performance and display of the phonographic capacities he had identified. The demonstrations involved Bell's training of his sons to acquire mastery of the system—accomplished, he claimed, in just a few days—such that they were "enabled to pronounce, at sight, the most difficult and peculiar words that could be selected from the Eastern and other Languages; often involving combinations of sound which the readers had never heard before their own organs gave them utterance."[13] In a published letter to the journal *Reader*, Ellis himself gave an account of one such occasion conducted in London in the spring of 1864. Bell's sons, with no advance knowledge of the details of the challenge about to be posed to them, were sent out of the room, while Ellis "dictated slowly and distinctly the sounds which I wished to be written." As an expert in phonetics, Ellis clearly reveled in devising ingenious ways to test the system's limits. The sounds he dictated to Bell

> consisted of a few words in Latin, pronounced first as at Eton, then as in Italy, and then according to some theoretical notions of how the Latins might have uttered them. Then came some English provincialisms and affected pronunciations, the words "how odd" being given in several distinct ways. Suddenly German provincialisms were introduced. Then discriminations of sounds often confused, as *ees, is'* (Polish), *eesh*, *ich* (German), *ich* (Dutch), *ich* (Swiss), *ouï*, *oui* (French), *we* (English), *wie* (German), *vie* (French). Some Arabic, some Cockney-English with an introduced Arabic guttural, some mispronounced Spanish, and a variety of shades of vowels and diphthongs.[14]

Ellis explained his choices by noting that "the sudden changes and the confusion would utterly prevent anyone from guessing by the context," and that the particular distinctions between vowel sounds that he had deployed "would be very difficult either to seize or to imitate except by persons thoroughly used to appreciate [*sic*] such sounds, or led by a strictly physiological system of symbolization to conceive and utter them."[15] Visible Speech was claimed to be just such a system, and according to Ellis's account, it worked. Having transcribed the sounds into the symbols of Visible Speech, Bell recalled his sons to the room, and they

articulated them according to the instructions. "The result was perfectly satisfactory," Ellis enthused, noting how "Mr. Bell wrote down my queer and purposely-exaggerated pronunciations and mispronunciations and delicate distinctions in such a manner that his sons, not having heard them, so uttered them as to surprise me by the extremely correct echo of my own voice." He went on: "I was not satisfied with approximations, and I obtained correct imitations. Accent, tone, drawl, brevity, indistinctiveness, were all reproduced with surprising accuracy." This was a range of features that had hitherto eluded conventional methods of soundwriting, and no such methods had been adequately sophisticated as to be able to register and reproduce a vocal phenomenon so phonographically indexical that it could be deemed an "echo." Having studied alphabetic systems for over twenty years, Ellis did not "know of one which could have produced the same results," concluding that "so far, then, as I am able to judge, Mr. Bell has solved the problem." He held that the success of Bell's technique, appropriate to its name, was secured by a physiological fidelity that was practically visible: "I could, as it were, trace the alphabet in the lips of the readers."[16]

There were many other staged demonstrations in which the Bells virtuosically performed the physiological transformation of transcribed input into perfectly articulated output. In a memoir, Alexander Graham Bell (the middle in age of the sons) recalled a public lecture at which members of the audience were "invited to make any sorts of sounds they desired." The volunteers called to his father's platform duly "uttered the most weird and uncanny noises," and the young man rendered them all with exactitude, including an obscure and difficult Sanskrit vowel that he gave correctly without having heard the sound before, and a "curious rasping noise that was utterly unintelligible" to him, but recognized at once by the audience as the sound of sawing wood, "which had been given by an amateur ventriloquist as a test."[17] The method proved so successful that Melville Bell identified it almost immediately as being applicable to the teaching of deaf mutes, which was after all the condition into which his sons had effectively placed themselves in the Visible Speech performances. Since the deaf could not memorize sounds as heard, the physiological basis of Visible Speech was its peculiar advantage: by learning the ways in which the vocal apparatus was configured and utilized in producing articulations, the practical means for rendering the full range of vocal sound could be internalized without necessary auditory reference to the phenomenal sounds themselves. Ellis had actually anticipated this pedagogical development: in a follow-up letter to the

Reader in 1865, he had speculated that the successful promulgation of Bell's scheme would be secured "by transfusing it into living organisms which will give his written symbols motion and meaning."[18]

Graham Bell began to enact this process of transfusion in the teaching that he undertook at Susanna Hull's school for deaf children in London in 1868. In a class with two of these young pupils, his biographer Robert V. Bruce tells us, Bell

> sketched the profile of a face, including the "insides of the mouth" (as he explained to the girls by finger spelling). Then he rubbed out all but the lower lip, the point, front, and back of the tongue, and the glottis. Those curved lines in their respective facings constituted the Visible Speech symbols for "back," "front," "point," "lip," and "voice."[19]

By the end of the first lesson, the girls had learned a dozen sounds. The culmination of the practice, forged in London, followed shortly after the family's move overseas. In 1871 Graham Bell undertook a demonstration of the method before an audience of "influential Educationalists" in Boston, Massachusetts, which he relayed in a letter to his parents. One of his congenitally deaf pupils, Theresa Dudley, who had also been mute for most of her life, "read from the symbols words in German, French and Zulu—introducing clicks." Bell then "invited the audience to dictate words in *any language*. Theresa Dudley did not fail in a solitary instance," he reported. "The best of it," he went on, "is that she does not know yet that she uttered words at all." In a further twist, Bell illustrated how Theresa could "vary the 'timbre' of her voice at will"—as he put it, how she "could inflect it mechanically" under his direction. Following the motions of Bell's hand, another pupil, apparently without quite knowing it, sang first a scale, then a rendition of "God Save the Queen," and then a short extract by the eighteenth-century poet Robert Lloyd.[20]

What is spectacularly revealed in these performances is the Bells' extraordinary conception of the body as a machine for reproducing sound. The theory and practice of their phonetic system augmented transcription with translation, and transformed the static recording of symbols into active rearticulation by "transfusing" into their subjects the capacity for the performance of what I have here called "phonographic physiology." The twin processes of translation and articulation, based on the understanding of the human voice and ear, and made automatic by a self-interpreting symbolic vocabulary, figures this system as phonographic (*avant la lettre*) in the Edisonian—rather than the merely

stenographic—sense. In Visible Speech, sounds were not transcribed in order to preserve them for their own sake, or simply to communicate textually. Instead, the system aimed at what amounted to physiological recording and replay. Moreover, as Graham Bell himself keenly observes, his pupils were practically unaware of their vocal achievements. Like his own earlier automatic articulations of previously unheard sounds via the transcribed symbols of Visible Speech, Bell's pupils performed mechanically. Theresa "does not know . . . that she uttered words at all." The device that emerged from Edison's laboratory just a few years later and which appropriated the term "phonography" was to be a machine whose operation was similarly mechanical and unconscious.

Mechanical Memory

The phonograph cylinder worked by revolving while a stylus inscribed whatever acoustic vibrations put it in motion. When the instrument is arranged to replay what it has recorded, its stylus indifferently retraces its path along the grooves it made. Shortly after Edison's invention had emerged from his Menlo Park laboratory, the philosopher Jean-Marie Guyau struck upon the device (as many have similarly struck upon the latest technology) as an apt metaphor for the working of human memory. In citing approvingly the Belgian physiologist Joseph Delboeuf's claim that "the mind is an album of phonographic recordings," Guyau suggested in 1880 that just as the "resonances of the voice are transferred to a needle" in the case of the phonograph,

> it may well be that in a similar way invisible lines are incessantly engraved into the cells of the brain, lines that constitute the beddings for the nervous currents. When, after some time, the current happens to encounter one of these previously formed beds, through which it has already passed before, it engages itself in them once again. Consequently the nervous cells resonate as they did the first time, and this comparable resonance corresponds psychologically to a sensation or thought that is similar to the forgotten sensation or thought.[21]

Guyau's invocation of vibration in the term "resonance" is not accidental. Delboeuf's claim emerged from a broader argument proposing, as Laura Otis puts it, that "memories were changes in patterns of molecular vibration, just as a stone thrown into a pond affects the wave pattern cre-

ated on the surface by stones that have been thrown in shortly before it."[22] Memories, then, are composite phenomena—"accumulated capital" in Delboeuf's phrase—originating in the vibratory properties widely thought at that time to be fundamental to the nature of physiological matter. This notion of accumulation is foreshadowed in Herbert Spencer's 1863 *Principles of Biology*, in which Spencer claims that all physiological development is a process of combination and compounding, in his molecular focus on how the "mutual play of forces . . . produces a difference in the form which the aggregate of them assumes."[23] Spencer's notion of aggregation is itself drawn implicitly from the composite form of multiple vibrations suggested by the metaphor of competing wave patterns in water, and the same basic principle is found in the phonograph groove, which materially sums the vibratory multiplicity of acoustic phenomena in a single resultant form.

In Delboeuf's and Guyau's post-Edisonian reflections, the phonograph provides for them a new physical analogue for a way of thinking about the connections between physiology, articulation, and memory that already had been in development for some years before Edison. In 1869, for instance, the British physician H. Charlton Bastian had published a provocative series of articles addressing the question of what he called the "physiology of thinking." Bastian's premise is that thoughts are formed and exchanged in language, and that language is fundamentally an act of articulation. "We may ask then," he writes, "whether, in using language as a vehicle for thoughts, words recur or are revived primarily as ideas of sound, or as revived remembrances of articulatory efforts. Are they ever, in fact, primarily revived as 'suppressed articulations'?"[24] For Bastian, an instance of language-as-thought is both an acoustic event and a physiological configuration of the human vocal apparatus. He suggests that what we ultimately bring to mind in this process of mental recurrence or revival is the latter: a memory resides not merely as an abstract datum, but as written into the very fabric of the body. In terms later echoed by Guyau, Bastian describes his account of how sensory impressions "pass along definite routes to certain parts of the cerebral hemispheres."[25] The recollection of these impressions, he held, revives "precisely the same parts of the hemispheres" that had been activated by the original event, and the "same nerve-fibres, and same nerve-cells" are "called into activity as were previously concerned in the perception of the original impression."[26]

This automatic theory of muscular memory was explicitly revived later in the century by one Theodate L. Smith, whose article-length treatise

on the subject returns us to the work of Alexander Graham Bell. Writing for the *American Journal of Psychology* in 1896, Smith reports the case of Edith Thomas, a young pupil of Bell's (and sometime classmate of Helen Keller and Laura Bridgman) who had been deaf and blind from the age of four, and who had become increasingly mute since then. When Edith was nine years old, Bell tested her abilities to reproduce movements by means of motor imitation, just as he had done with many other pupils. Smith reports:

> She succeeded fairly well, pronouncing the letter K, which offers peculiar difficulty to deaf mutes, with unusual distinctness. When asked to repeat the letter some hours later, she called with an almost perfect enunciation, "Kitty, Kitty, Kitty." Investigation revealed the fact that when at the age of four years the gradual loss of speech had followed that of sight and hearing, the last intelligible word spoken by the child was "Kitty." The reproduction was unconscious, the child having absolutely no idea of what she had done. It was not, then, a reproduction of the word *as heard or associated with something*, but of a *muscular movement*, which, latent for five years, was recalled by the suggestion of a similar movement. This incident suggested that possibly, under normal conditions, the muscles play a greater part in our memories than we are accustomed to assign to them.[27]

More than thirty years after the original Visible Speech performances and the associated teaching methodology had been devised, Smith here endorses the connections that the Bells had intuited between voice, physiological movement, habit, and memory formation. As he puts it, "Every teacher has observed children busily moving their tongue and lips during the memorizing of a lesson," but they do so, he claims, "without thinking that the movement was not a mere habit, but a real aid in the process of memorizing."[28] In Smith's theoretical model, the physiologically latent store of articulated memories is reactivated by the stimulus of a vocal action that prompts the muscles and neural fibers, stylus-like, to retrace their grooves.

"You Can Turn Her On as Often as You Like"

In her recent book *Heart Beats*, Catherine Robson has identified the seventy or so years from 1875 as the "heyday" of memorization in the peda-

gogy of poetry in Britain and the United States.[29] That this period closely corresponds to the moment of greatest prominence of the mechanical school of elocutionary teaching, practiced by Bell and others, is surely no coincidence. Neither, as Ashley M. Miller and others have shown, was nineteenth-century prosody in general ever far from understandings of the physiology of memory.[30] These contextual affiliations suggest the importance of a further perspective, unaddressed since the start of this chapter, on what I have so far discussed. For one of the most significant mirrorings between memorized recitation and the quest for a universal alphabetics concerns their shared objective of carefully inculcating (trans)national cultural knowledge by means of physiological transfusion, and the implicitly operative trope of "civilization" in the practice of vocal education. In his 1864 *Reader* article, Alexander John Ellis had expressed his optimism that the emergence of a truly universal alphabet would collapse cultural borders and divisions and "rapidly become a great social and political engine."[31] This was a radical goal enthusiastically shared by the dramatist Bernard Shaw, himself a keen phonetic writing aficionado. His 1912 play *Pygmalion*, to which I will now turn, points toward some of the conflicted consequences of this proposed engine of transformation.

Pygmalion, which Shaw had devised as early as 1897, returns us to the culture of late nineteenth-century phonetic science.[32] The background to the play is well known, but certain aspects of its provenance are worthy of remark in establishing a relation with Melville Bell's Visible Speech. To begin with, Shaw had connections to Bell through the latter's nephew Chichester, who seems to have been responsible for passing to Shaw a copy of his grandfather's 1847 play *The Bride*, in which the valet Allplace is introduced as having been taken into the family of the unremarkable aristocrat Sir Cicero Pandect for the purpose of instructing him in proper manners.[33] The central theme of transformation bears a close resemblance to *Pygmalion*, and is just one signal of the considerable affinities, formal and informal, between Shaw and the Bell family. Bell is named as a "hero" in the preface, and the playwright was surely aware that Melville Bell's wife (who was deaf) was named Eliza. Shaw himself learned Visible Speech in the 1870s, and *Pygmalion*, titled "The Phonetic Play" in the original manuscript, was drafted in Pitman shorthand—the curious concern with phonetics and phonography manifesting itself in both form and content. The male protagonist Higgins (capable, he absurdly claims, of pronouncing 130 distinct vowel sounds) reflects some composite of phoneticians stretching from Bell to Henry Sweet to Daniel

Jones, among others (Sweet's own system, Broad Romic, was another of the crucial developmental steps on the path toward the codification of the IPA).[34] Most significant of all, in *Pygmalion*—a text suffused with the imagery of recording and refashioning—Shaw realizes the process of voice training as a series of performances of writing and reading sound.

In the play, even before the introduction of Eliza, Shaw presents Higgins as someone deeply invested in the performative power of phonetics, but whose interest is marked by extreme emotional detachment. As the play opens, Higgins sits under the shelter of a church portico in Covent Garden, surreptitiously recording the varied diction of the people around him, arousing the suspicions of a crowd. To defend himself, Higgins enthusiastically casts himself in the role of scientific performer. Turning his observations into a form of variety entertainment, he responds to each bystander's spoken objections in turn, gleefully identifying their place of birth: Selsey, Lisson Grove, Hoxton. He is quizzed on his method by an onlooker:

> THE GENTLEMAN [PICKERING]. How do you do it, if I may ask?
> THE NOTE TAKER [HIGGINS]. Simply phonetics. The science of speech. Thats my profession: also my hobby. Happy is the man who can make a living by his hobby! You can spot an Irishman or a Yorkshireman by his brogue. I can place any man within six miles. I can place him within two miles in London. Sometimes within two streets.[35]

Shaw figures Higgins as an exemplar of a certain variety of scientist whose obsession with intellectual work precludes authentic engagement with his fellow humans. Shaw describes him as "heartily, even violently interested in everything that can be studied as a scientific subject"; consequently, he is "careless about himself and other people, including their feelings."[36] Higgins is of this attitude when he encounters Eliza in the street, regarding her merely as a scientific object to be examined as he transcribes and exactly rearticulates her utterances in his own "Universal Alphabet."[37] He remarks to her that "a woman who utters such depressing and disgusting sounds has no right to be anywhere—no right to live." His sense of superiority over her is evident in his assertion that she must "remember that you are a human being with a soul and the divine gift of articulate speech: that your native language is the language of Shakespear [*sic*] and Milton and The Bible; and dont sit there crooning like a bilious pigeon." She responds with an almost indescribable noise

(rendered by Shaw as "Ah-ah-ah-ow-ow-ow-oo!"), which is immediately transcribed phonographically by Higgins and read aloud again by him, "reproducing her vowels exactly."[38]

Presently Eliza appears in Higgins's Wimpole Street laboratory, a room arrayed with a variety of phonetic instruments, including a phonograph, singing flames, tuning forks, and a "life-size image of half a human head, shewing in section the vocal organs."[39] Upon her arrival, Higgins remarks to his collaborator Pickering:

> This is rather a bit of luck. I'll shew you how I make records. We'll set her talking: and I'll take it down first in Bell's Visible Speech; then in broad Romic; and then we'll get her on the phonograph so that you can turn her on as often as you like with the written transcript before you.[40]

Higgins's playful words somewhat conceal the multiple purposes of their endeavor. The objective is not simply to transfer Eliza's voice to the phonograph so the men can hear her voice at will—either for Higgins to demonstrate the apparatus to Pickering, or to diagnose what needs "fixing" in Eliza's dialect. Rather, the passage sets up the idea that Eliza must herself become a phonograph, in its wry anthropomorphic figuration of her as a recording to be repeatedly examined.

At one point Mrs Higgins rebukes the two men, and Higgins's response is instructive as to his purpose:

> MRS HIGGINS. You certainly are a pretty pair of babies, playing with your live doll.
>
> HIGGINS. Playing! The hardest job I ever tackled: make no mistake about that, mother. But you have no idea how frightfully interesting it is to take a human being and change her into a quite different human being by creating a new speech for her.[41]

For Eliza does not adopt the tones of another voice as a temporary trick. Her whole person is reshaped, reprogrammed, by the multiple articulatory impressions that her months-long reeducation involves, until she is able to repeat "just like a parrot . . . every possible sort of sound that a human being can make."[42] The process is so closely associated with phonographic recording and replay that Eliza herself seems to merge with the apparatus. The creation of a new speech depends on her physiological re-creation, a transformation that is tracked and exhaustively

documented, as Higgins notes: "Every week—every day almost—there is some new change. . . . We keep records of every stage—dozens of gramophone disks and photographs."[43] Her new way of speaking becomes "unconscious," because it has been seared permanently into her body—recalling, perhaps, the etymological origin of the very word "recording" in the notion of learning *by heart*. The process of Eliza's vocal education, in other words, is not simply social or psychological in an abstract sense, but material and physiological. In exceeding Higgins's expectations by completely mastering the art of articulatory transformation, Eliza functions for him as an idealized phonetic machine.

In this sense, *Pygmalion* is very much in keeping with the sculptural theme of the original myth against which the play is quite deliberately placed. Yet, for the reasons that I have already suggested in this essay, the imbrications of phonetic and phonographic culture in the later nineteenth century offer a further important context for the play that helps it exceed its Ovidian frame.[44] John M. Picker has recently shrewdly situated *Pygmalion* in the "trajectory of imaginative representation of the 'female talking machine,'" reading through it a web of connections from Edison's 1880s phonographic talking dolls to E. E. Kellett's 1900 short story "The New Frankenstein," which was abridged and republished the following year in *Pearson's Magazine* as "The Lady Automaton"—a text that Philip Klass has similarly suggested may have been a source for Shaw, with many shared features.[45] In closing, I will build on Picker's argument that Eliza ultimately eludes Higgins's controlling grasp in becoming (as he puts it) "no mere talking machine but an independent speaker who reveals herself to be the upwardly mobile, self-governed voice of Edisonian modernity," by connecting the emergence of universal alphabetics as a practice of vocal education with the claims that Laura Otis has made in suggesting that the play "parodies [fin de siècle] conversion narratives, in which miserable creatures are rehumanized and achieve enlightenment."

For Otis, even as Shaw "challenge[s] the notion that speech distinguishes people from animals," he nevertheless depicts the discomforting process of "transformations [that] cause excruciating pain," perpetrated by a scientific protagonist who gives "little thought to how the [creatures] will live once they have been transformed."[46] In *Pygmalion*, Higgins oscillates between regarding Eliza as a "creature" and as a fellow member of his own species, reminding her that access to the human soul is found only through the physiological and moral enlightenment of language. Eliza does not become creditably human for Higgins until

she is physiologically upgraded to an appropriately refined state by her vocal education.

Later in his career, Graham Bell had become irrevocably associated with the oralist movement, whose goal was to assimilate deaf people into society by abolishing the use of signed languages and emphasizing speaking and lipreading in their place.[47] Bell's interventions in the field had an obnoxious (and not, alas, uncommon) eugenic dimension. Jennifer Esmail has shown how deaf people were seen in the nineteenth century "as less than fully human," their linguistic repertoire of visual gestures compared to the rudimentary vocalizations and gesticulations of monkeys and apes. The construction of the deaf as biologically inferior led eugenicist agitators to cast them as a "threat to the 'fitness' of the human race through deaf intermarriage and its potential reproduction of deafness through generations."[48] In such a poisonous culture, it was not clear how oralist demands could possibly be a help to the process of the mutual adaptation and negotiation of hearing people with deaf people. The work that had been notably inaugurated in the theory and practice of Visible Speech led, however circuitously, to a distinctly unpleasant destination. The figuring of speechless subjects as "less than fully human" is implicitly coded in the utopian, normalizing rhetoric that claimed advancement in civilization and global communication would be secured by a universal alphabetics, visibly spoken.

One contemporary reviewer of *Pygmalion*, the radical journalist Henry William Massingham, complained that in place of Ovid's sympathetic protagonist, Shaw's "Pygmalion," Higgins, is "merely a diligent watcher of a test tube."[49] Yet in figuring Eliza as a scientific object that escapes her phonetic laboratory, Shaw's achievement is to sharply ventriloquize Higgins's almost inexpressible discomfort at the rapid social transformation that attended the phonetic in his education of Eliza. The satire becomes most acerbic in Higgins's scientifically obsessed, "careless" self-regard, and painfully mocked in the emotional departure of his charge. The arrogant declaration of his own independence turning to "sudden humility," Higgins confesses, with uncharacteristic sentimentality: "I shall miss you, Eliza. . . . I have learnt something from your idiotic notions . . . I have grown accustomed to your voice and appearance. I like them, rather." Eliza: "Well, you have both of them on your gramophone and in your book of photographs. When you feel lonely without me, you can turn the machine on. It's got no feelings to hurt." In the wake of this wounding riposte, Higgins is left to pathetically implore, "I cant turn your soul on. Leave me those feelings; and you can take away the voice

and the face. They are not you."[50] In the end, Eliza is the automaton turned autonomous, the emancipated fugitive of Higgins's overbearing power. One suspects the many students of Visible Speech under the Bells came to enjoy no such enfranchisement from their ordeals.

Conclusion: Physiological Resonance

Long ago, in *Technics and Civilization*, Lewis Mumford diagnosed a profound shift in technological development witnessed by the nineteenth century—a movement away from the enormous machinic scale that distinguished the industrial age, and toward the scale of the human. Since around 1870, he argued, "The organic has become visible again even within the mechanical complex," from which "some of our most characteristic mechanical instruments—the telephone, the phonograph, the motion picture—have grown out of our interest in the human voice and the human eye and our knowledge of their physiology and anatomy."[51] Mumford's assertion that underlying such development is "the effort . . . either to extend the powers of the otherwise unarmed organism, or to manufacture outside the body a set of conditions more favorable toward maintaining its equilibrium and ensuring its survival," has motivated a whole line of inquiry in the study of media, best encapsulated in Marshall McLuhan's axiomatic notion of the "extensions of man."[52] Recently, literary critics and cultural historians alike have begun to attend ever more closely to the ways in which the mechanical and the organic—so often held apart, even defined as outright opposites—might be seen more accurately to have long operated in a system of exchange and feedback.[53] For the technological evolution of mechanical contrivances modeled on organic structures gave rise, in turn, to new and finer understandings of the mechanics of the body.

In this chapter, I have attempted to demonstrate one set of ways in which such understandings were arrived at. As I have shown, the proliferation of inquiry into physiological resonance and auditory vibration in the period immediately before the appearance of the phonograph—a mechanical device that depended for its operation on precisely these principles—converges with a longer lineage of investigation into the physiological basis of vocal movement and memory. Reading these contexts alongside the Bell performances and *Pygmalion*—a stinging satire written in the age of the phonograph but illuminating the sometimes condescending pedagogical culture that preceded it—indicates that the

affiliation of the physiological body with a capacity so uniquely cultural as language was often ethically fraught.

Together, these texts and contexts provide some germs of insight into a mode of thinking in which the mind-body was figured as a read-write device years prior to the emergence of the first technical instrument to perform such operations. Alexander Melville Bell's insight and tenacity in pursuing the development of a phonetic alphabet based not on arbitrary symbols but on the movements of the human vocal apparatus prefigures an explosion of physiological inquiry attentive to the performative aspects of the process of memorization. *Pygmalion* offers a collapsing of phonetics into the suggestive notions of resculpting and reshaping. What I have called in this chapter "phonographic physiology" points to one influential nexus of relations from which the recorded and recordable body emerges as a central and enduringly problematic theme of modernity.

Notes

1. See Ira Jean Hirsh, "A Brief History of the Systems Used to Represent English Sounds," *Quarterly Journal of Speech* 29, no. 3 (1943): 334–42; Alexander Melville Bell, *Visible Speech: The Science of Universal Alphabetics, or Self-Interpreting Physiological Letters, for the Writing of All Languages in One Alphabet* (London: Simpkin, Marshall, 1867).

2. Alexander Melville Bell, *The Principles of Elocution; with Exercises and Notations for Pronunciation, Intonation, Emphasis, Gesture and Emotional Expression*, 4th ed. (Salem: Burbank, 1878), xviii.

3. Bell, *Principles of Elocution*, xviii.

4. Alexander Melville Bell, "On Visible Speech: or, a Universal and Self-Interpreting Physiological Alphabet" [1866], Alexander Graham Bell Family Papers, Library of Congress, Washington, DC (hereafter AGB), Box 15, 1.

5. Ibid.

6. A. M. Bell, "Visible Speech," *Werner's Magazine: A Magazine of Expression* 25 (1900): 213.

7. A. M. Bell, lecture notes [n.d.], AGB, Box 12, 12; emphasis added.

8. A. M. Bell, "Visible Speech," 216.

9. "Visible Speech," *Athenæum* 1968 (July 15, 1865): 84.

10. Thomas L. Hankins and Robert J. Silverman, *Instruments and the Imagination* (Princeton, NJ: Princeton University Press, 1995), 178.

11. Alexander John Ellis, *The Alphabet of Nature; or, Contributions towards a More Accurate Analysis and Symbolization of Spoken Sounds; with Some Account of the Principal Phonetical Alphabets Hitherto Proposed* (London: Bagster and Sons, 1845), 25.

12. A. M. Bell, *Visible Speech*, 11.

13. Ibid., 19.

14. Ibid., 22.

15. Alexander John Ellis, "Mr. Melville's 'Visible Speech,'" *Reader* 4, no. 88 (September 3, 1864): 304.

16. Ibid.

17. A. G. Bell, "Prehistoric Telephone Days," *National Geographic Magazine* 41, no. 3 (March 1922): 228.

18. A. M. Bell, "Mr. Melville Bell's 'Visible Speech' No. II," *Reader* 6, no. 136 (August 5, 1865): 155.

19. Robert V. Bruce, *Alexander Graham Bell and the Conquest of Solitud*e (Ithaca, NY: Cornell University Press, 1973), 56.

20. A. G. Bell, letter to A. M. Bell, Eliza Symonds Bell, and Carrie Bell, December 1, 1871, AGB, Box 4, 1.

21. Jean-Marie Guyau, "The Origin of the Idea of Time by Jean-Marie Guyau," in *Guyau and the Idea of Time*, ed. John A. Michon, Viviane Pouthas, and Janet L. Jackson (Amsterdam: North-Holland, 1988), 118.

22. Laura Otis, *Organic Memory: History and the Body in the Late Nineteenth and Early Twentieth Centuries* (Lincoln: University of Nebraska Press, 1994), 17.

23. Herbert Spencer, *The Principles of Biology*, vol. 1 (London: Williams and Norgate), 183; see also E. Ray Lankester, "Perigenesis v. Pangenesis: Haeckel's New Theory of Heredity," *Nature* 14, no. 350 (July 13, 1876): 235–38.

24. H. Charlton Bastian, "On the 'Muscular Sense,' and on the Physiology of Thinking," *British Medical Journal*, 1, no. 435 (May 1, 1869): 394.

25. Ibid.

26. Ibid.

27. Theodate L. Smith, "On Muscular Memory," *American Journal of Psychology* 7, no. 4 (July 1896): 454–55; emphasis added.

28. Ibid., 455.

29. Catherine Robson, *Heart Beats: Everyday Life and the Memorized Poem* (Princeton, NJ: Princeton University Press, 2012).

30. See Ashley M. Miller, "Involuntary Metrics and the Physiology of Memory," *Literature Compass* 6, no. 2 (2009): 549–56.

31. Ellis, "Mr. Melville's 'Visible Speech,'" 304.

32. Bernard Shaw, *Pygmalion*, ed. Dan H. Laurence (London: Penguin, 2003).

33. Alexander Bell, *The Bride, a Play, in Five Acts* (London: Cleaver, 1847).

34. See, for instance, Bertrand M. Wainger, "Henry Sweet: Shaw's '*Pygmalion*'," *Studies in Philology* 27, no. 4 (1930): 558–72; Beverley Collins and Inger M. Mees, *The Real Professor Higgins: The Life and Career of Daniel Jones* (Berlin: Mouton de Gruyter, 1999).

35. Shaw, *Pygmalion*, act 1, 17. Shaw tended not to use apostrophes, and the edition used in this essay reflects his nonstandard punctuation.

36. Ibid., act 2, 24.

37. Ibid., act 1, 18.

38. Ibid.

39. Ibid., act 2, 23.

40. Ibid., act 2, 25.

41. Ibid., act 3, 65.

42. Ibid., act 3, 66.

43. Ibid., act 3, 65.

44. Essaka Joshua has demonstrated that Shaw was indeed far more concerned to satirically engage with the "nineteenth-century context" than to construct a direct

theatrical adaptation of the Greek tale. See *Pygmalion and Galatea: The History of a Narrative in English Literature* (Aldershot: Ashgate, 2001), 97–133.

45. John M. Picker, "My Fair Lady Automaton," "Victorian Oral Cultures," special issue of *Zeitschrift für Anglistik und Amerikanistik* 63, no. 1 (2015): 97; Philip Klass, "'The Lady Automaton' by E. E. Kellett: A *Pygmalion* Source?," *Shaw* 2 (1982): 75–100.

46. Laura Otis, "Monkey in the Mirror: The Science of Professor Higgins and Doctor Moreau," "Darwin and Literary Studies," special issue of *Twentieth Century Literature* 55, no. 4 (2009): 485–86.

47. For a longer version of this history, see Jennifer Esmail, *Reading Victorian Deafness: Signs and Sounds in Victorian Literature and Culture* (Athens: Ohio University Press, 2013).

48. Ibid., 104, 134. See also Danielle Coriale's contribution to this volume, which traces the influence of fears about the hereditariness of deafness on the arch-eugenicist Francis Galton, who drew directly on Graham Bell's work in his alarmist review essay "Hereditary Deafness," *Nature* 31 (January 1885): 269–70.

49. Quoted in Essaka Joshua, *Pygmalion and Galatea: The History of a Narrative in English Literature* (Aldershot: Ashgate, 2001), 97.

50. Shaw, *Pygmalion*, act 5, 100.

51. Lewis Mumford, *Technics and Civilization* (1934; Chicago: University of Chicago Press, 2010), 6.

52. Marshall McLuhan, *Understanding Media: The Extensions of Man* (1964; London: Routledge, 2001).

53. For instance, see Tamara Ketabgian, *The Lives of Machines: The Industrial Imaginary in Victorian Literature and Culture* (Ann Arbor: University of Michigan Press, 2011); Jonathan Sterne, *MP3: The Meaning of a Format* (Durham, NC: Duke University Press, 2012).