✷ 14 ✷
Hearing

L'oreille est, pour la Musique, la porte du coeur.

PIERRE BOURDELOT[1]

Taste buds can smell.[2] Even if you hold your nose, your body can normally still detect odors by means of olfactory receptors in the taste cells located in your tongue. And the tongue is not the only part of the human body that can taste: receptors for bitter, sweet, and umami tastes are found in the digestive system, the respiratory system, the brain and, for men, the testicles.[3] While the function of these distributed receptors remains unknown, they complicate our inherited taxonomy of the five senses, which may mask as much as it reveals about processes of human perception. For a start, there is that sixth sense, proprioception, traditionally overlooked because it cannot be assigned to a specific organ. And some senses are more closely interrelated than others: taste and smell are both forms of chemosensation (assessing chemical components in the environment), whereas hearing and touch are forms of mechanosensation, transducing mechanical stimuli into neural signals. Where the classical system of five senses suggests a neutral set of distinct entities, in practice they intersect in multiple ways beyond explicit instances of synesthesia. Human bodies engage in acts of perception that we may not be fully conscious of at all times, offering striking confirmation of the early modern paradigm of the knowing, active, self-directed body.

Although most early modern writers embraced the classical system of five senses, they were often particularly interested in these instances of overlap and interrelation. While some sided with Plato and Aristotle in asserting the primacy of sight (based on its association with reason), others, like Francis Bacon, championed hearing as the sense that "striketh the Spirits more immediately, than the other senses."[4] This, Bacon con-

tinued, explained music's remarkable effects on people's bodies and emotions. The French scholar Marin Mersenne similarly ascribed to hearing a higher emotional capacity as well as a spiritual dimension that was absent from the other senses.[5] Johann Mattheson, too, posited that hearing offered "immediate access to the spirit"[6]; and although it shared that immediacy with smell, the latter sense was "more corporeal" and thus further removed from spirit's immaterial dimensions.[7] By around 1700, the macroscopic elements of the auditory mechanism were by and large mapped. The cochlea had been named by Gabriele Fallopio back in 1561, and in 1683 the French anatomist Guichard Joseph Duverney proposed an explanation of hearing close to Hermann von Helmholtz's later resonance theory. Yet older conceptions of hearing persisted, in particular the ancient notion of an "internal air" filling the ear cavity, which was more rarefied and thereby facilitated the sound's transmission via the spirits to the brain. The Prussian writer Johann Julius Hecker seems to have been unaware of contemporary critiques of this theory when affirming that in auditory perception, external vibrations "compress the inner air under the eardrum."[8] This notion of a purer air implanted in the inner ear lent further support to the conviction that the ear could offer unmediated access to the spirit(s). As many early modern religious reformers recognized, this made the ear a uniquely potent pathway for instilling theological truths.

In many ways, the mechanics of hearing could seem straightforward enough. Georg Heuermann's explanation employed a characteristic combination of vibration and flow metaphors: the air in the inner ear "makes an impression in the nerves, by which the nerve juice is shaken and brought to the brain, where the representation of the sound takes place."[9] You could even on occasion hear those spirits flowing in your ear, especially when they were subject to contamination. The German medic Johann Helffrich Jüngken suggested that "ringing and swishing in the ear" was most likely caused by "badly disposed spirits, when they are mixed with flatus or when they . . . are driven apart and moved strongly through forceful pressure."[10] Most instances of hearing loss or impairment were explained as such spiritual or humoral disturbances. A medical compendium by the Swiss physician Theodor Zwinger stated that tinnitus arose from "humors collecting and stagnating in the aural tubes."[11] Philip Barrough's *Method of Physick* identified "windie vapour" or "grosse and clammie humours" as the cause of "noise and tinkling in the eare," which could arise from cold, heat, a blow to the head, or eating "windie meates"; symptoms could worsen when the patient was hungry. Deafness resulted from "cholericke humours flying upward," or from "crude and grosse humours stopping the hearing."[12] Both aural perception and its disruptions were thus

figured as amplifications of that constant gentle flux of spirits around the ears, head, and body.

But such explanations hardly accounted for the experiential reality of a listening body-soul making sense of the complex sonic world—the "polyphony of experience"—around them.[13] Heuermann did attempt to locate music's remarkable effects in the operations of the nervous system. He posited that upon "hearing a pleasant thing, the movement of the spirits flows not only into the auditory nerve, but from there also more strongly through the intercostal nerve, into the nerves of the heart, lungs, etc.," thereby causing various psycho-physiological transformations in listeners.[14] The German poet Barthold Heinrich Brockes marveled at this distributive capacity of the auditory nerve in his extended poem on the human senses:

Hier bey dieser kleinen Sehnen
Soll man mit Verwundrung sehn,
Wie viel Aest aus ihr sich dehnen,
Ja den gantzen Leib durchgehn,
Die nicht nur in Gaum und Munde,
Zähnen, Augen, Nas' und Schlunde
Sich zertheilen; sondern auch
In der Brust und in dem Bauch.

Ja so gar bis in die Füsse
Sollen kleine Zweige gehn,
Wannenher ich leichtlich schliesse,
Wie die Wirckungen geschehn,
Welche die Music erreget,
Da der Ton das Ohr uns schläget,
Und im Nervchen, das er rührt,
Durch den gantzen Leib sich führt.[15]

[We should marvel at this little (nerve) strand, how many branches extend from it and go through the whole body, parting not only in the mouth and palate, teeth, eyes, nose, and throat, but also in the chest and stomach. Little branches are even said to extend into the feet. From this I easily deduce how the effects arise that music incites, when a sound hits our ear and passes through the whole body via the nerve strand that it touches.]

Among other things, Brockes here seems to offer a poeticized explanation for the phenomenon of feeling compelled to tap your foot when hearing

certain rhythms. Nonetheless, as Christian Wolff attested, it remained surprising that the eardrum "can transmit so many different sorts of sound clearly." Even more surprising was the fact that the ear thereby could become "the entrance of another's soul into our own," in the sense that human language, containing another person's thoughts, could enter another body-soul through the ear and be comprehended by the receiver.[16] How the bodily sense organs allowed for this contact between souls, via words or music, remained, as Hecker put it, "miraculous."[17]

What these accounts reveal collectively is that, in the early modern imagination, the process of hearing was not confined to the ear, but could materially affect the whole body. This was due not just to the multi-modal nature of sound perception, which could also take place through visual or tactile modes (for instance by observing a vibrating string). More than that, a human body's innards could hear. In a dedicatory poem to one of Mattheson's treatises, his Hamburg colleague Georg Jacob Hoefft located hearing in the chest: "Nothing can prepare us better for devotion, and no delight provides greater joy, than when our breast perceives the sound of sweet strings."[18] Before we dismiss his formulation as one more instance of Baroque metaphorical excess, let us recall that the early modern heart did in fact have ears, both anatomically and theologically. The "aures cordis" were two "small membranous ventricles" at "the widest and uppermost part of the heart" through which blood was channeled into and out of the heart.[19] While scientifically these ears were understood as non-hearing, in devotional practice the (Augustinian) "ears of the heart" constituted a crucial pathway for absorbing God's Word and grace. As the Lutheran theologian Gottfried Arnold warned in 1700, "those who do not open the ears of the heart to hear the voice of the Lord are hardened and deaf in the heart, they are a corrupt instrument on earth and stand under the judgment of damnation."[20] The Catholic cleric Simplicianus Watzel commented that the Holy Spirit "blows through the ears of the heart" as a gentle air.[21] Corrupting matter, meanwhile, could enter the heart through the actual sensory organs of the human body: as Heinrich Müller put it, "the doors of your heart are your eyes, ears, and mouth, they are wide open during the day, and through them frequently those things enter that destroy the inner devotion."[22] And music had a unique power to operate these doors. In the evocative language of the English lutenist Mary Burwell, "if the heart be closed, [music] openeth it and if it be too much opened, it gently shutteth it to embrace and keep in the sweetness that the lute inspires into its sensible concavities."[23]

The foundation of these processes of external and internal hearing was touch, the haptic transmission of material impact. The German anato-

mist Lorenz Heister confirmed the widely held opinion that "the sense of touch is the most general, and the other senses are different species of it, so to speak," in that all sensory perception involved the stimulation of nerve papillae on the surface of the sense organ.[24] Isaac Newton also figured sense perception as haptic transmission in his corpuscular theory of light, which imagined "a great number of little Globules striking briskly on the bottom of the eye."[25] With regard to hearing, the German poet Barthold Feind stated: "When the compressed air touches the eardrum, or the sun rays the nerves of the eye, or rough, heavy, cold, and warm particles the skin, and press themselves into it and reach the nerve juice, then the latter through this external touch necessarily has to be indented, pushed forward, and raised . . . to the innermost part of the brain."[26] It was for this reason that hearing could happen through vibrational impact on bones and internal organs, as when the French scientist Claude Perrault asserted that "the agitation caused by sound is capable of moving the diaphragm," or the Swiss scholar Johann Jakob Scheuchzer wrote that "often our bodies and hearts tremble from the sound and tone of the trumpet or a large organ."[27] Other writers outlined more specific modes of non-cochlear hearing that complicate any straightforward process of music entering the ear and traveling to the brain to be represented and decoded there. If this still tends to be the guiding assumption in neuroscientific approaches to musical hearing today, as outlined in Stefan Koelsch's recent comprehensive volume on music and the brain, such an approach risks tuning out more holistic modes of sound perception.[28] A 1734 treatise by the Erfurt medic Johann Wilhelm Albrecht laid out three ways in which music could penetrate the body and cause emotional transformations within: via the nerve fibers of the ear, leading to the brain; by means of adjacent nerve strands vibrating sympathetically with the auditory nerves; and through sound waves agitating the fibers of the whole body, "without the intervention of the auditory organs." These sonic "tremors," Albrecht asserted, "produce various and determined mutations of the solid and fluid parts, and out of this the effects of music on the living body can be explained."[29]

If present-day approaches in sound studies have highlighted the (potentially harmful) physical force of sonic vibration, many early modern accounts of music were already closely attuned to this power.[30] Giovanni Battista Guarini encapsulated it in a poem on the sixteenth-century bass singer Giulio Cesare Brancaccio:

> Quando i più gravi accenti
> Da le vitali sue canore tombe
> Con dilettoso horror Cesare scioglie,

Par che intorno rimbombe
L'aria, e la terra. E chi n'udisse il suono,
Senza veder chi'l move, e chi l'accoglie,
Diria, forse il gran mondo
E che mogge con arte? E dal profondo
Spira musico suono?

[When with delightful horror, Cesare unleashes the lowest notes from the living depths of his sounding sepulcher it seems as if the earth and the air are reverberating around him. And whoever should hear and enjoy the sound without seeing who is producing it and who is receiving it would say, "Perhaps the whole world is rumbling artfully? And breathing musical sound from the deep?"][31]

Such musical reverberation seems to have little to do with any kind of "res cogitans." As Veit Erlmann has elaborated, resonance indeed posed an awkward challenge to the hegemonic claims of early modern reason.[32] Music's haptic impact short-circuited the representational process via the brain by letting sounds infiltrate porous human bodies to immediately affect the airy spirits contained therein. Scheuchzer stated that "the sensory spirits are awoken, so to speak, by a loud or particularly ordered sound, so that they drive out the poison stuck in the blood, or cause other motions in the body in concordance with the sounds."[33] His Lutheran contemporary Christoph Raupach described this process of music inducing bodily-spiritual transformations in a listener in more detail:

> The sound of music, which is much more spiritual than material, spreads together with the air it moves and is transported to the ear. It penetrates even solid bodies, but all the more so our human bodies, which are very porous and full of holes. It does not simply go in the ear, but also to the heart itself, which is the workshop of the vital spirits, which are dispersed throughout the brain, in and around the heart and through the remaining parts of the body. These vital spirits consist in a very subtle and mobile blood vapor and are very easily moved by air that is moved harmonically or musically; this motion, because it is felt by the soul, produces different affective motions according to the different motions of the spirits.[34]

In the body imagined by Raupach, the material transmission of external stimuli did not stop with the skin. The pervious human body, "full of holes," responded to music not solely as an aural stimulus that communicated a representational notion to the brain, but through a full-body

immersion in sound.[35] We might be tempted to dismiss this model as grounded in a "nativist fallacy" of music directly eliciting emotions, which modern research into the psychology of musical emotion has shown to be misguided.[36] But Raupach's commentary drew on a commonly shared framework within which at least some of these historical listening experiences unfolded. As the English writer Richard Braithwait put it, human hearing has "a distinct power to sound into the centre of the heart."[37] In Athanasius Kircher's vision of the resonant human body, "when we hear a pleasant and agreeable music, song or sound, we feel a tickle or pleasant itch, so to speak, in our hearts and souls."[38] In these accounts, music is envisaged as a kinesthetic entity that exerted tangible pressure on all parts of the listening body, affecting auditors down to the innermost fibers of their beings. As Steffen Schneider has summarized, the early modern spiritus-based model of sense perception functioned not as a "coding, transmission, and decoding of signs, but as the transmission of particles, as pressure, heat, even as immediate guiding intrusion in the innermost parts of soul and brain."[39] Raupach asserted, moreover, that this took place without those affected necessarily being conscious of it or understanding its causes. A composer who knew the right musical strategies to evoke different affects would achieve any effects they wanted in their listeners, "even though they did not prepare themselves to receive the impression."[40] Without any need to understand the words or decode the affect represented in the notes, these listeners were being permeated by the material-spiritual force of music, from head to toe, from skin to heart.