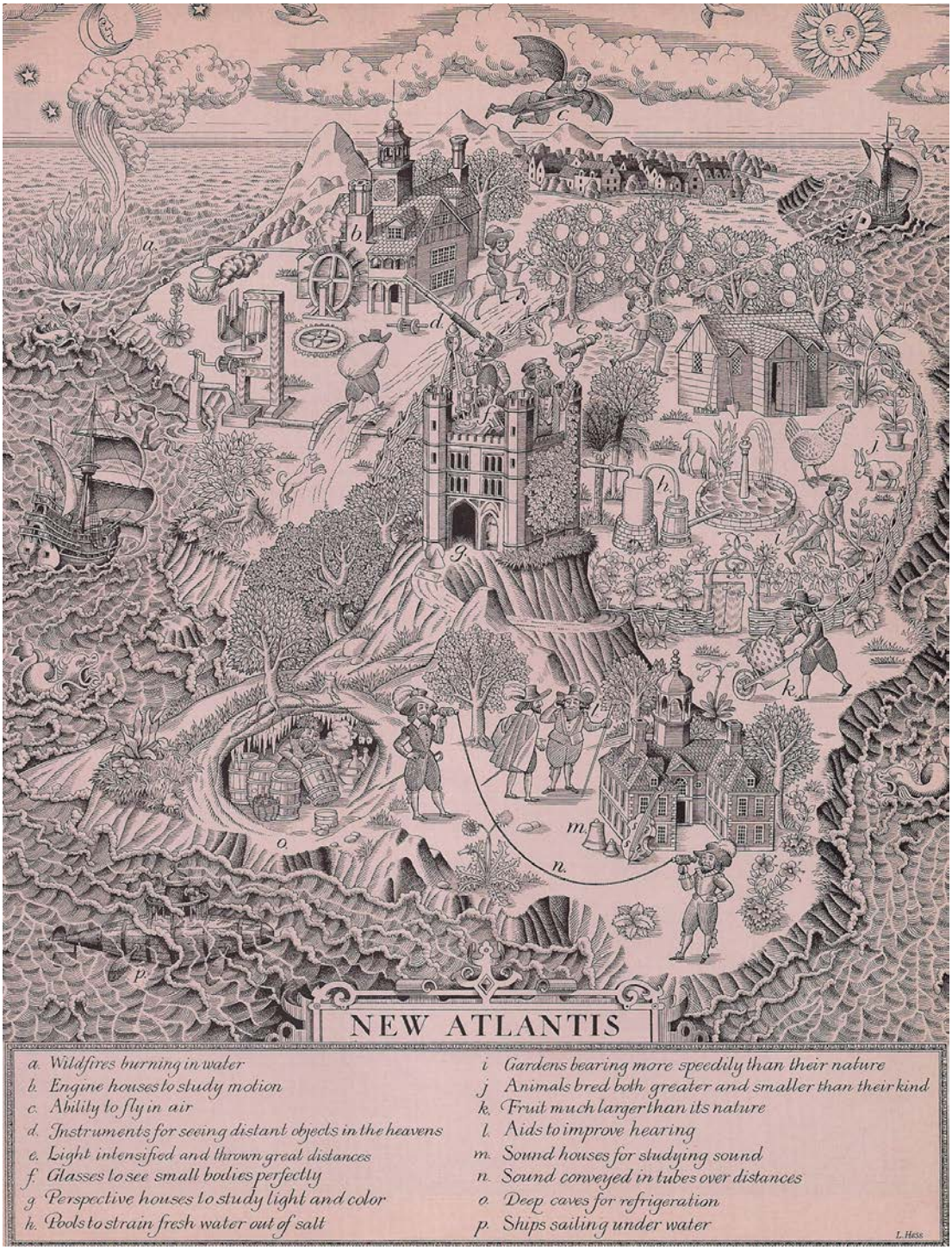
Sound between magic and science: Toward an understanding of early modern aurality

Thomas W. Patteson



In Francis Bacon's *New Atlantis*, a writing left unfinished at his death in 1626, the narrator tells the story of a ship's crew getting lost at sea in the south Pacific and alighting upon the island of Bensalem. At the end of the story, the narrator is granted a tour of the "College of the Six Days Works," an intellectual citadel whose inhabitants are dedicated to "the knowledge of causes and secret motions of things, and the enlarging of the bounds of human empire, to the effecting of all things possible."[1] The College is a menagerie of scientific marvels, comprising various chambers and spaces devoted to experimental investigation into husbandry, astronomy, agriculture, mineralogy, manufacture, and medicine. Among the last items on the tour is the following, as described by the narrator's guide:

> We have also sound-houses, where we practise and demonstrate all sounds and their generation. We have harmony which you have not, of quarter-sounds and lesser slides of sounds. Divers instruments of music likewise to you unknown, some sweeter than any you have; with bells and rings that are dainty and sweet. We represent small sounds as great and deep, likewise great sounds extenuate and sharp; we make divers tremblings and warblings of sounds, which in their original are entire. We represent and imitate all articulate sounds and letters, and the voices and notes of beasts and birds. We have certain helps which, set to the ear, do further the hearing greatly; we have also divers strange and artificial echoes, reflecting the voice many times, and, as it were, tossing it; and some that give back the voice louder than it came, some shriller and some deeper; yea, some rendering the voice, differing in the letters or articulate sound from that they receive. We have all means to convey sounds in trunks and pipes, in strange lines and distances.[2]

This remarkable passage has been read as a prophecy of the twentieth century: Peter Yates, tellingly, uses it as an epigraph to his account of the emergence of electronic music.[3] Certainly it is a testament to Bacon's imaginative powers that he could describe with such enthusiastic detail phenomena so far beyond the actual technological capabilities of his age, and it seems that such a vivid depiction must be the product of a

---

[1] Francis Bacon, *New Atlantis*, in *Francis Bacon: A Selection of His Works*, ed. Sidney Warhaft (New York: Odyssey Press, 1965), 447.
[2] Bacon, 453-54.
[3] Peter Yates, *Twentieth Century Music: Its Evolution from the End of the Harmonic Era into the Present Era of Sound* (Minerva Press, 1967), 313.

displaced contemporary of our electrified sonic sensorium. But it would be wrong to see in this passage merely the fantastic projection of an idea "whose time had not yet come": Utopia and reality often brush shoulders, and Bacon's mythical college would later serve as a model for the foundation of the Royal Society.[4] Bacon's "sound-houses" did not come from out of nowhere, like some miraculous mushrooms shooting through the barren soil of "pre-scientific" thought. Penelope Gouk has called our attention to the "hydraulic organs, mechanical musical clocks and devices for imitating birds and voices" that roiled the soundscape of Elizabethan England.[5] Conventional histories of music around 1600, as well, provide abundant evidence of a burgeoning European concern with musical sound and its production. Giovanni Gabrieli, in the first volume of his instrumental canzoni *Sacrae Symphoniae*, published in 1597, gave the first known instrumental specifications to parts, instead of the conventional Latin designations referring only to the ambitus of the voice, thus elevating timbre to an integral aspect of compositional design.[6] Michael Praetorius's *De organographia* (1618), the second volume of his *Syntagma musicum*, though it had two known fifteenth-century predecessors, was the most exhaustive treatise on musical instruments yet published.[7] The project of sonic taxonomy was carried further in the *Harmonie universelle* (1635) of Marin Mersenne, who forthrightly declared his purpose "to determine how many species or sorts of sounds and musical instruments

---

[4] See Eleanor Dickinson Blodgett, "Bacon's *New Atlantis* and Campanella's *Civitas Solis*: A Study in Relationships," *PMLA* 46, no. 3 (1931), 763-780.

[5] Penelope M. Gouk, "Music in Francis Bacon's Natural Philosophy," in *Number to Sound: The Musical Way to the Scientific Revolution*, ed. Paolo Gozza (Dordrecht: Kluwer Academic Publishers, 2000), 136.

[6] See Stephen Bonta, "The use of instruments in the ensemble canzona and sonata in Italy, 1580-1650," *Recercare: Rivista per lo studio e la prattica della musica antica* 4 (1992), 23-43. Needless to say, pieces continued to be written without instrumental designations, and performative contingencies still had the last word over compositional prescriptions.

[7] Michael Praetorius, *Syntagma Musicum II: De organographia Parts I and II*, ed. David Z. Crookes (Oxford: Clarendon Press, 1986), xvii.

there are."[8] Thus, the experimental fervor at work in Bacon's imagined sonic laboratories—the almost Faustian drive to "extend the sensory capacities themselves"[9]—was no historical anomaly, but rather emblematic of broad tendencies in contemporary thought and practice. A new aural imagination was taking shape in the early seventeenth century, fired at once by the first stirrings of experimental acoustics and by old but still vital conceptions linking music and sound with immaterial, magical forces.

What is new in this welter of activity is not its object—speculation about the nature of sound seems to be as old as philosophical thought itself—but its approach. This may be described as an epistemological reorientation from abstract mathematics toward observation and experiment. The speculative approach to music had been enduringly valorized in the sixth century by Boethius, who exalted the purely intellectual contemplation of music theory above the mere "handicraft" of performance and composition.[10] This attitude surely helped justify an anti-empirical attitude and inhibited any impulse to get one's hands dirty with acoustic experiments. Turning away from this hallowed tradition, Bacon discarded the Pythagorean decad (the belief that the numbers 1 to 4 and their ratios underlie the structure of the universe, including musical scales) and instead treated music as "a sonorous phenomenon of nature, perceived by the senses, rather than as a branch of mathematical speculation."[11] For the new scientific mindset,

---

[8] Marin Mersenne, *Harmonie Universelle: The Book on Instruments*, trans. Roger E. Chapman (The Hague: Martinus Nijhoff, 1957), 15.

[9] Judah Bierman, "Science and Society in the *New Atlantis* and Other Renaissance Utopias" (*PMLA* 78, no. 5 (1963), 492-500.

[10] Boethius, *Fundamental of Music*, in *Source Readings in Music History*, ed. Oliver Strunk (New York: Norton, 1998), 142.

[11] Gouk, 136. Gioseffo Zarlino in 1558 had already expanded Pythagoras' four numbers to six to allow for the thirds and sixths of modern contrapuntal practice, but his *senario* was likewise based on number mysticism and ungrounded in observation, and thus widely viewed as unsatisfactory by the early 17th century. See H.F. Cohen, *Quantifying Music: The Science of Music at the First Stage of the Scientific Revolution, 1580-1650* (Dordrecht: D. Reidel Publishing Company, 1984), 3 ff.

mathematical calculations take a back seat to the active manipulation of sound celebrated in Bacon's *New Atlantis*. Instead of providing a direct, unmediated connection to the sounding reality, numbers were now employed to make sense of phenomena observed in experimentation. Alongside this tendency, there came about an altered sense of the place of number in the universe: once revered as "the constituent principles and elements of the whole," numbers were reconceived as simple markers of mundane realities.[12] Paolo Gozza elaborates on the changing role of numbers in early acoustic thought with regard to a methodological quarrel between Kepler and Robert Fludd:

> For Kepler numbers have no demonstrative force; they derive from measurement (*numeri numerate*), hence presuppose homogenous objects, having the same unit of measure. Fludd's harmonies are based on the numerical similarities of incommensurable objects, such as musical intervals and the regions of the cosmos…. Fludd defends the idea of numerical symbols: without the mystery of occult abstract numbers it is not possible to grasp the intimate nature of things, or the relationship between natural and supernatural things.[13]

There was no general agreement among the early practitioners of experimental acoustics on the role of mathematics in relation to observation. Galileo Galilei logged the results of his experiments with such rigor and precision that his name has become synonymous with the project of modern science, but at the other extreme, the German Jesuit polymath Athanasius Kircher concerned himself almost not at all with mathematical corroboration.[14] The experiments proposed in Kircher's musical writings, the *Musurgia universalis* (1650) and the *Phonurgia nova* (1673), are not meant to generate scientific data, but rather resemble a collection of do-it-yourself recipes for private wonderment. In Kircher's work the emphasis is on *experience*, instead of *experiment* in the strict sense;

---

[12] Paolo Gozza, "Introduction," in *Number to Sound: The Musical Way to the Scientific Revolution*, ed. Paolo Gozza (Dordrecht: Kluwer Academic Publishers, 2000), 2.
[13] Gozza, 49.
[14] Cohen, 85: "More than any other scientist's, Galileo's work marks the transformation from Aristotelian to modern science."

but what is important is the equal distance of both from the primarily speculative approach that characterized thinking about sound in the Pythagorean tradition.

If the efforts of early experimental acoustics are characterized above all by their rejection of Pythagorean number mysticism, they nonetheless retain its conceptual substrate—the idea that music forms a link between the various dimensions of the existence. Bacon, Kircher, and Mersenne investigated sound not as an isolated phenomenon, but as a unique means of ingress into the secrets of the physical world. Bacon called sound "one of the subtlest pieces of nature" and lamented that, while music has been deeply studied, "the nature of sounds in general hath been superficially observed."[15] His avowed purpose is to provide practical music-making with a scientific foundation in the form of acoustic theory.[16] Mersenne, who unlike Bacon and Kircher not only proposed but also executed numerous acoustic experiments, took a more radically Pythagorean stance on the value of musical science, asserting that "sounds can shed more light on Philosophy than any other quality, which is why the science of Music should not be neglected, even if all singing and playing were completely abolished and forbidden."[17] Among Mersenne's more logistically ambitious experiments was his attempt to correlate string vibrations per second with particular musical notes. Because the only means of counting vibrations was with the naked eye, Mersenne procured strings 100 feet in length, whose slow vibrations could counted by an observer while another counted off seconds.[18] Although the monochord was no doubt the inspiration for such exercises, there

---

[15] Francis Bacon, *Sylva Sylvarum or a Naturall History in ten Centuries*, ed. William Rawley (London, 1669), 32. Accessed at http://eebo.chadwyck.com/home.
[16] Bacon, *Sylva Sylvarum*, 29.
[17] Cohen, epigraph.
[18] Frederick Vinton Hunt, *Origins in Acoustics: The Science of Sound from Antiquity to the Age of Newton* (New Haven: Yale University Press, 1978), 90-92.

is something new and dramatic in Mersenne's acoustic curiosity. The distinction between speculation and practice upheld by Boethius is here overridden in the name of knowledge: as H. F. Cohen writes, "Though it is both customary and practicable to divide Mersenne's work into an acoustical and a musical part, to him they were but different aspects of the one science of harmony. […] In Mersenne's hands…the musical instrument was turned into a scientific instrument, capable of revealing nature's hidden properties."[19]

For Kircher, too, to study sound meant to study nature itself. He proposed various "phonocritical sound-experiments" addressing the question of "how the nature of diverse types of wood, bone, and mineral can be probed by means of sound."[20] In his explanations of acoustic phenomena, Kircher mapped the workings of sound onto other natural forces with syncretistic abandon: he describes an *Experimentum musicum* in which six glasses are filled each with a different liquid: aquavit, wine, oil, and water of three different degrees of purity. The rims of the glasses are to be rubbed with a dampened finger, and the quivering of the liquid will vary according its viscosity—or, as Kircher explains it, according to the complexion of its humors. He proceeds to draw an analogy between the effects of sound on various liquids and the effects of music on the human temperament.[21]

An important index of the position of musical thought in the context of nascent scientific materialism is the continued use of the Scholastic category of the *species* to conceptualize the nature of sound. H.F. Cohen, noting Kepler's use of the term, states

---

[19] Cohen, 100-102.
[20] Athanasius Kircher, *Musurgia Universalis* (1650), reprint of the 1662 German edition (Kassel: Bärenreiter, 1988), 62 ff.
[21] Kircher, 169-70.

that according to this theory, "an object…emits an immaterial species that is received by the sense organ in question (the eye, the ear, etc.). This species is no longer the material object itself, but it preserves its other properties, and thus accounts for the likeness between the object itself and its mental representation."[22] Kepler was not the only early modern thinker to retain this idea: Bacon combined in his natural philosophy aspects of modern, mechanistic thinking, which explained phenomena in terms of matter and motion, with a "pneumatic" sense for the role played by immaterial spirit, of which the species theory of sound was an example. (As Gouk notes, this lead to some ambivalence in Bacon's understanding of sound, as he was compelled to acknowledge that the creation of sound—if not its propagation—was the result of colliding physical bodies.)[23] For Kircher, the world teemed with these spiritous projectiles of sight and sound: "Just as the air is filled with innumerable images, which shimmer forth from their objects through the *medium*, so is it full of innumerable *speciebus sonorum*, of which however only those present themselves to our hearing, which are borne in a proportionate measure to the auditory faculty in the ear by means of a physical motion."[24]

The notion of species as employed in the early seventeenth century dates back at least to Robert Grosseteste (c. 1175-1253), for whom the species was a kind of likeness (*similitudines*) projected outward from objects into the surrounding medium, and,

[22] Cohen, 24.
[23] Gouk, 140.
[24] Kircher, 12-13: "Der Luft, gleich wie er von unendlichen Bildern, so [die] von ihren *objectis*, durch das *medium* hervor schimmern, erfüllt ist, also auch ebenermassen mit unendlichen *speciebus sonorum*, unter denen doch nur diese sich allein dem Gehör präsentieren, welche mit einer sinnlichen Bewegung zu der hörenden Kraft im Ohr, *proportionato modo deferiert* und gebracht werden..." Thanks to Elizabeth Mellon for help with Kircher's Latin terms.

according to Grosseteste, subject to the laws governing the propagation of light.[25] Although the idea of species thus has a medieval (if not indeed Aristotelian) pedigree, it exemplifies in its ontology of resemblance the Renaissance episteme described by Michel Foucault, "in which signs and similitudes were wrapped around one another in an endless spiral."[26] With the advent of scientific materialism, sound would increasingly be explained in strictly mechanical terms as the impact of vibrating air upon the eardrum, and the concept of species would appear as an untenable residue of medieval thought. In Foucault's terms, instead of bearing the presence of their objects of origin within themselves in the form of a likeness, sounds would gradually be figured into a matrix of representation in which "the relation of the sign to its content is [no longer] guaranteed by the order of things in themselves."[27]

The early seventeenth century was witness to the seemingly untroubled coexistence of the new experimental mindset and older beliefs which scientists would later dismiss as superstitions. One of the most remarkable testaments to this conjunction of the apparently incompatible is the attempt to bring the new technologies and modes of knowledge to bear on the ancient mysteries of musical speculation. The notion of a prosthetic ear for the enhancement of hearing had been proposed as early as 1584 in Giambattista della Porta's *Magiae naturalis*; Bacon, likely inspired by della Porta, imagined in his *New Atlantis* "certain helps which, set to the ear, do further the hearing greatly," and the idea of an "ear spectacle" or otacousticon would eventually be taken up by the Royal Society

---

[25] Steven Marrone, "Metaphysics and science in the thirteenth century: William of Auvergne, Robert Grosseteste and Roger Bacon," in *Routledge History of Philosophy, Volume III: Medieval Philosophy*, ed. John Marenbon (London and New York: Routledge, 1998), 217.
[26] Michel Foucault, *The Order of Things: An Archaeology of the Human Sciences* (New York: Vintage Books, 1994), 32. This point touches upon the important question, which I am in no position to answer, of whether Foucault's Renaissance episteme can be extended backward in history to the medieval period.
[27] Foucault, 63.

in the second half of the century.[28] But whereas Bacon and even the "natural magician" della Porta had rather mundane purposes in mind, such as use in warfare and reconnaissance, others imagined that such devices might enable the audition of hitherto inaudable sounding phenomena. Tomasso Campanella envisaged an aural equivalent to the telescope which "would one day make possible the perception of the music of the spheres."[29] Kircher imagined something more akin to a sonic microscope, a "special instrument for the ear" which might render audible the otherwise silent sounds emitted by the "incessant motion" and collision of physical bodies.[30]

Mersenne, in the course of his investigation of the speed of sound, expended considerable effort calculating the time required for a sound to circle the earth, but ultimately conceded that "a sound would not last so long nor be strong enough to be heard so far away, unless God wished to produce such a sound; that will perhaps be when the Angels sound the Trumpet on the great day of Judgment to summon those who are about to die." And yet he does not let this inconvenience impede his speculation, finally determining that the sound of the trumpet "will be perceived everywhere on the earth in about ten hours from the point at which it sounds."[31]

Kircher, too, concerns himself with the numerous extraordinary sonic phenomena depicted in the Bible. His description of the *Sonus prodigiosus* bears a remarkable resemblance to what in the eighteenth century would be called the musical sublime: "The

---

[28] Gozza, 144-45.
[29] See Lorenzo Bianconi, *Music in the Seventeenth Century*, trans. David Bryant (Cambridge: Cambridge University Press, 1987), 54.
[30] Kircher, 12-13: "Aus dieser immerwärenden Bewegung entsteht die Zusammenstossung der Leiber: aus dieser collision, nach dem die corpora sonora beschaffen sind, entstehen die unendliche Varietäten sonorum, welche zwar nich allezeit, aber wohl könnten vernommen werden, wenn das Gehör entweder durch höhere Göttliche Kraft, oder vermittelst eines sonderbaren Ohr-Instruments, corroboriert und gestärkt würde."
[31] Hunt, 86-87; cf. Biblical depiction of the trumpet blast, Revelation 8:1 ff.

wonder-sound is nothing other than an unfamiliar and unexpected sound, which signals a special occurrence. This sound violently assails and penetrates the ears, and yet the cause of it remains hidden; thus those who hear it are thus horrified and astonished. It is of three sorts: natural, unnatural, and miraculous."[32] It is characteristic of the mercurial course of his thought that Kircher does not elaborate on the intriguing typology put forth in this last sentence, but instead goes on to discuss the Pied Piper of Hamelin and tales of self-ringing bells in Japan and Spain. Elsewhere Kircher explains the phenomenon of sympathetic vibration in terms of magnetism, which had been introduced into modern scientific discourse by William Gilbert's *De magnete* in 1600:

> Thus it is no wonder that a string gives forth a tone in response to another string which has just been sounded, and not in response to a gunshot. The cause is the hidden power of certain sounds, which is proportionate to certain bodies, such that it causes to move only this but not that, has an effect upon one body, but none upon another, in the same way that the magnet draws to itself not wood, not lead, but only a body similar to itself. Thus there are a number of sounds which are fit and proportionate to excite various bodies, and if one were to know these proportions, he would bring about wondrous things in nature.[33]

Remarkably, Kircher also draws on the theory of magnetism to explain one of the foundational myths of Western music: "On account of this musical magnetism, this

---

[32] Kircher, 197: "*Sonus prodigiosus* ist nichts anders, als ein ungewohnter und unverhoffter Schall, dahin gerichtet, dass er etwas andeuten soll, welcher, weil er die Ohren gar gewaltig angreift und durchdringt, die Ursache aber verborgen ist, so bringt es bei den Zuhörern grosse Verwunderung; derselbe ist dreifach: Natürlich, Ohnnatürlich und Übernatürlich oder Wunderbar." In my translation I have interpolated this passage from the *Musurgia universalis* with this parallel passage from Kircher's *Phonurgia nova* of 1673, which consists largely of material reproduced from *Musurgia*: "Wunder-Hall oder Wunder-Ton ist nichts anders, als ein ungewohnlicher Ton oder Hall, so da, etwas sonderliches zu bedeuten, geschieht, welcher indem er gewaltig und stark in das Gehör fällt, die Hörende aber, die eigentliche Ursache dessen nicht wissen noch verstehen, sie dadurch in grossen Schrecken und Verwunderung gesetzt werden. Dieser Ton ist dreierlei Art, natürlich, unnatürlich, übernatürlich oder wunder-wirklich." Athanasius Kircher, *Neue Hall- und Thon-Kunst*, reprint of 1684 German edition (Hannover: Th. Schäfer Druckerei, 1983), 152.

[33] Kircher, 191: "Dann ist es nicht Wunder, dass eine Saite zu der andern gleich gezogen, toniert, und nicht zu einem Büchsenschuss. Die Ursache ist die verborgene Kraft etlicher Sonen, so zu etlichen gewissen Leibern also proportioniert ist, dass sie nur diese und nicht jene moviert, in diesen, und nicht in jenen seine Wirkung hat, zu gleicher Weise, wie der Magnet nicht das Holz, nicht das Blei, sondern nur ein gleichmässiges *Corpus* an sich zeucht: also sind etliche gewisse *soni*, welche tüchtig und proportioniert sind, etliche gewisse Leiber zu erregen, welche Proportionen wenn ein Mensch wissen sollte, würde er Wunder-Sachen in der Natur ausrichten."

magnetic pull of music, the ancients not without reason said of Orpheus, that he drew animals, forests, and stones toward him with the magical sound of his lyre…"[34]

The miraculous powers of music charted by Kircher were not relegated to myth, but also infused into the modern, materialist sensibility. Music was wedded to medicine, not only in the rather more diffuse sense of effects upon the bodily humors, but also as a brute physical force: Kircher reports, among the various medical wonders attributed to music, that "some are said to have restored hearing to the deaf by means of musical science [Musik-Wissenschaft]."[35] Elsewhere, Kircher avers that the reason that those who are born deaf are also unable to speak is explained by a "commonality of the nerves in the tongue and the ear."[36] This remarkable statement, asserting a physiological connection between the faculties of hearing and speech, helps to make sense of the following "experiment" designed to let a deaf man hear music:

> A lute with a long neck can initiate this experiment: take a strung lute, let the deaf man rest his teeth upon the end of the neck, and then strike the lute, and he will perceive the harmony: for the *sonus* of the lute, thus conducted through the neck of the lute into the mouth, stimulates with wondrous force the faculty of hearing through the *nervos* in the organ of hearing [durch die *nervos* in dem Hör-*organo*].[37]

In closing, I'd like to consider the work of Bacon, Kircher, and Mersenne in light of what H.F. Cohen presents as the three foremost characteristics of the Scientific Revolution:

1) Mathematization (explaining in terms of quantities instead of qualities)
2) Experiment (from simple observation to constructed scenarios or "artificial nature")

---

[34] Kircher, 160: "Wegen dieses musikalischen *magnetismi*, und magnetischen Zugs der Musik, haben die Alten nicht ohne Ursache von *Orpheo* ausgeben, dass er Tier, Wälder, Stein mit dem magischen *sono* seiner Leier zu sich gezogen habe."
[35] Kircher, 170.
[36] Kircher, 61.
[37] Kircher, 247.

3) Mechanization (reducing all phenomena to the motion of various particles)[38]

Both Bacon and Kircher were inclined to speculation or "simple observation," rather than experimentation in the strict sense. When Kircher did conduct experiments—for instance, his investigation of sound waves causing vibration in liquids, mentioned above—the outcome was most often a noteworthy phenomenon than could be observed and described without the aid of mathematics. Even Mersenne, who was responsible for "the first full-fledged application of the experimental method to the science of music," was not overly concerned with precision in his calculations.[39] With regard to mechanization, the picture is extremely ambiguous: Bacon, as we have seen, thought of sound in terms of scholastic notion of an immaterial *species*, yet admitted that physical motion was required to create sound. Kircher emphasized the materiality of sound, but ascribed to music a vast, magical efficacy that the nascent scientific spirit would increasingly seek to banish. Only Mersenne could be said to have adopted a broadly mechanistic model as the basis for his work. Thus the three primary traits of the nascent Scientific Revolution jibe at best very loosely with the work conducted by three main figures of this study. The old ways die hard. In England, arguably the center of the experimental movement, as late as 1653 one William Brouncker (1620-1684)—who would later become President of the Royal Society—described the qualities of the "Complete Musician" in his preface to an English translation of Descarte's *Compendium musicae*. In keeping with the universalist spirit of the times, Brouncker declares that the ideal musician "be such, as hath not only Nibbled at, but swallowed the whole Theory of Musick," being at once "Physiologist, Philologer,

[38] Cohen, 7-9.
[39] Cohen, 114; Hunt, 82 ff.

Arithmetician, Geometrician, Poet, Mechanique, Metallist, Anatomist, Melothetick [melodist]." But Brouckner dilates most extensively upon the final persona of his list:

> And, lastly, he must be so far a *Magician*, as to excite Wonder, with reducing into Practice the Thaumaturgical, or admirable Secrets of Musick: I meane, the Sympathies and Antipathies betwixt Consounds and Dissounds; the Medico-magical Virtues of Harmonious Notes […], the Creation of Echoes […], the Artifice of Otocoustick Tubes, or Auriculary Meanders, for the strengthening, continuation, and remote transvection of weake sounds, and the mitigation of strong; the Model of Autophonous, or speaking Statues; and finally, the Cryptological Musick, whereby the secret conceptions of the mind may be, by the Language of inarticulate Sounds, communicated to a Friend, at a good distance.[40]

Most of these ideas are parallel with, if not indeed directly inspired by, the para-musical speculations of Bacon, Kircher, and Mersenne. Clearly, such notions cannot be dismissed as anomalous or isolated outside the intellectual mainstream. The once-dominant notion of a sudden and all-encompassing "paradigm shift" around 1600 is gradually being supplanted by a more nuanced sense of the coexistence and mutual influence of newer "scientific" mentalities and older "magical" ways of thinking in the early seventeenth century. This paper is intended as a modest contribution to that project.

[40] Gozza, 20-21.