

The Origins of the Orchestra Machine

Emily Iuliano Dolan

During that summer, the music of the changing of the guard delighted him more than before. When they passed by his house, he would open the middle door of the room in the back in which he lived, where he listened attentively and with pleasure. One might have thought that the profound metaphysician would have derived pleasure only from music characterized by pure harmony, bold transitions, elegantly resolved dissonances, or from the works of a serious composer such as Haydn. But this was not at all the case, as the following circumstance demonstrates. In 1795, accompanied by the late G. R. von Hippel, he paid me a visit to hear my *bogenflügel*. An adagio with the flageolet stop, which is similar to the tone of the glass harmonica, seemed rather disagreeable to him, but the instrument gave him uncommon pleasure when the lid was opened and its full force unleashed, especially when it imitated a symphony with full orchestra. (quoted in Drescher 1974:268)

The eager listener described above is none other than Immanuel Kant, affectionately chronicled by philosopher and theologian Ehregott Wasianski. This colorful description of Kant's fascination with loud military music is suggestive on many levels. Most obviously, it tells us something of his listening habits, inviting us to smile at the great metaphysician's somewhat unsophisticated musical taste. We could use Wasianski's sketch to begin deconstructing Kant's own musical upbringing and shed light on the infamously negative valuation of music in his third *Critique*. This passage, however, also encourages us to consider the surrounding context and examine what Wasianski implies about contemporary musical aesthetics. First, he distinguishes between an intellectual mode of listening—the kind that appreciates daring modulations and the nuances of Haydn's compositional style—and a more immediate mode that takes pleasure in the sheer noise generated by military music. Second, Wasianski makes casual reference to a “*bogenflügel*,” one with various stops. Given the variety of musical instruments invented during the eighteenth century, and the fact that so many of them are lost to us, we might ask exactly what he used to entertain Kant and von Hippel in 1795. Last, we can examine what it means for Wasianski simply to be able describe an instrument as imitating an orchestra, confident that his readership would know what he means. When interrogated in this way, this passage can be the starting point of investigations that help us

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understand the complex and rapidly changing musical aesthetics of the late eighteenth and early nineteenth centuries.

Bogenflügels, Orchestrions, and Other Instruments with Funny Names

Since it may seem surprising to turn to the *bogenflügel* for information about the surrounding aesthetic climate, a few words are in order here. The eighteenth century witnessed the invention of numerous ingenious instruments and musical machines, from Vaucanson's automaton flute player to ornate musical clocks, from the *bogenflügel* to the anemochord. This rich tradition of instrument building expanded throughout the century: numerous reports of new instruments in late eighteenth and early nineteenth century music journals testify to the general fascination with musical inventions. In current scholarship, however, these instruments occupy a modest position. Scholars occasionally discuss Mozart's and Haydn's compositions for musical clock, and even devote a few studies to Beethoven's collaboration with inventor Mälzel.¹ Generally, however, these instruments are examined either in isolation from the culture of their time, or else treated as musical freaks lurking in the shadows of mainstream musical culture. However, the recurrence of these instruments permits us to view them as repositories of the elements of music that captured the public's imagination. Whether mechanical or automatic, they were designed to satisfy perceived musical needs, and therefore reflected the aesthetics of the time. The eighteenth century, for example, viewed the physical motion of performance as a strong sign of emotion and passion. Pierre Jacquet-Droz's automaton, "La Musienne"—a female keyboard player—embodied this equation of movement and feeling. Not only endowed with flawless technique, she dazzled her audience with her life-like performance: her bosom heaved gently while she played. The barrels of automatic instruments preserve contemporary ideas of "correct" performance, since their builders were compelled to engage with issues of the interpretation of musical notation in their attempts to ensure the performance was rhythmically nuanced.² Perhaps the most obvious example is the glass harmonica, whose distinctly vocal sonority helped the instrument escape criticisms commonly lodged against instrumental music. Builders tried to replicate in their instruments what was called for by prevailing taste. By examining the motivation behind the creation of these instruments, we may gain a closer understanding of the general surrounding climate. *Bogenflügels*, too, were designed to solve particular aesthetic problems.

The *bogenflügel* is a member of a family of instruments generally known as *sostenente pianos*—that is, keyboards with mechanisms that allow tones to be sustained indefinitely after they are sounded. Acoustician and inventor E. F. F. Chladni considered Wasianski's instrument—built by the mechanic Garbrecht in the early 1790s—to be the most successful attempt at such an instrument, even calling the *bogenflügel* the “older brother” of his clavicylinder, which he invented in 1800 (Chladni 1800:308). The concept of a keyboard instrument that could both sustain tones indefinitely and vary the dynamic of individual tones after they were struck had fascinated inventors for centuries. The earliest attempt was Hans Haiden's *geigenwerk* of 1575, which worked on the principle of the hurdy-gurdy: the performer used a foot treadle to set a number of rosined wheels in motion, and when keys were depressed, the corresponding strings were lowered onto these wheels. The speed of the wheel controlled the volume, so that with maneuvering the performer could crescendo and decrescendo. Haiden's own description of the instrument enumerated its many merits. Not only did it allow for this subtle nuance of single tones, it was capable of imitating the lute, *viola bastarda*, shawm, and bagpipe, and, “one [could] play court music and band music on it, making it sound as if twelve trumpets and *clarinos* were playing together” (Blumenfeld 1980:70). Here we find an important difference between Wasianski's description of his *bogenflügel* and that of Haiden. Though Haiden recognized the *geigenwerk*'s potential to imitate numerous instruments, including massed winds, he could not, as Wasianski did, describe it as imitating an orchestra, for his invention predated the final consolidation of the orchestra as a musical body, concept, and institution. It is here that we find an essential difference between the two instruments: though one can identify basic goals shared by both instruments, the context in which Wasianski's *bogenflügel* thrived was sharply different than that of the *geigenwerk*. His seemingly casual remark that the instrument could imitate a “symphony with full orchestra” crucially depends upon the presence of an orchestral tradition. And while it may seem natural that an instrument that captures the massed string core of the orchestra should eventually enter into orchestral discourse, the underlying impulse for this inclusion is quite revealing.³

Indeed, this discursive shift reflects a broader trend in the late eighteenth century; the *bogenflügel* was but one of a variety of instruments designed to imitate the sounds of the orchestra. In contemporary journals, we find reports of instruments with fanciful names and amazingly elaborate mechanisms; perhaps most importantly, it is during this period that the term “orchestrion” emerged.

The industrialization of orchestrion building in the late nineteenth cen-

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ture gave rise to the standard use of this term; today “orchestrian” usually conjures a large, late-nineteenth century mechanical instrument that plays pre-programmed music from a pinned barrel or perforated “book” and uses a combination of organ stops, percussion, and often mechanically-played wind and string instruments to imitate the sounds of the orchestra.

The terminology of late eighteenth century and early nineteenth century was far more complex. In 1814, E. T. A. Hoffmann published his fantastical story “Automata” in the *Zeitung für die elegante Welt*. In the course of the story, the main characters, Lewis and Ferdinand, attend a mechanical concert at the house of an unsavory professor whose automata have been on public display. They are subjected to a wind-up orchestra of musical clocks and automaton instrumentalists, including a flute-playing man and a keyboard-playing woman. “In the background,” Hoffmann writes, “our two friends noticed an orchestrian (which was an instrument already known to them).” He goes on to describe the frightening performance as the automata are set in motion and begin playing, one by one, “an andante in the style of a march” with utmost precision. Last of the instruments, Hoffmann tells us, “the orchestrian set to work, and drummed and trumpeted fortissimo, so that the whole place shook” (1967:94). Hoffmann’s “orchestrian” behaves much like the later orchestrians, a clear precursor to the later nineteenth century machines. His offhand remark that the orchestrian “was an instrument already known to them,” suggests that the orchestrian already had gained some notoriety; it apparently needed little explanation within Hoffmann’s story.

Just eight years earlier, however, the “orchestrian” crops up in a very different context. In his essay on the character and worth of musical instruments, C. F. Michaelis devotes a paragraph to instruments that he believes have genuine aesthetic value, but lack widespread use because their performance requires specialized knowledge of a nature usually reserved for the inventor (1807:261). He mentions, among others, the euphon and the clavicylinder, two glass instruments invented and performed on by Chladni, the *bogenhammerklavier* (another variation of *sostenente piano*), and the “orchestrian.” This orchestrian, however, is an instrument much different from that in Hoffmann’s “Automata”: it was not a self-playing instrument, but required a real musician to operate it.

In other words, both the term and the notion were elastic. Some instruments that were called “orchestrians” were clear precursors to the later nineteenth century version; others with the same name were quite different. Yet others functioned the same as orchestrians, but used different names, and, to complicate matters further, there was a family of instruments, loosely related to the above, with unique and fanciful names. This sundry list of

instruments, however, was united by a common theme: each, whether automatic or not, attempted to capture the essence of the orchestra. That a cluster of similar terms denoted a variety of related instruments testifies to a fervent interest in creating an instrument with symphonic capabilities.

The first known use of the term “orchestrion” was for a combination organ and piano with swell invented and performed on by Vogler in 1789. Michaelis, indeed, may be referring to Vogler’s orchestrion in his essay. Or perhaps not, as the concept—an instrument that combined several contrasting sonorities and had the potential for great variety of tone and volume—was taken up by a number of other inventors. Thomas Anton Kunz used the term for an instrument he completed in 1798 (fig. 1), a similar combination organ and piano (Kunz 1798). In 1812, the *Allgemeine musikalische Zeitung* reported on a recently exhibited instrument by maker Hunn. It too was called an “orchestrion” and consisted of a “fortepiano with forte, piano, clarinet, bassoon, and pedal” (Anon. 1812:803). The most romantic version was surely Leppich’s panmelodion of 1809, which combined the sounds of a fortepiano, organ, glass harmonica, waldhorn, and bassoon (Anon. 1810:488) (fig. 2).

The automatic orchestra machines grew out of mechanical organ building in the eighteenth century. Their precursors were petite organs that were often housed in the body of a clock and played short pieces automatically from pinned barrels at predetermined times of the day. Earlier musical clocks were quite limited in terms of variety of sound, but throughout the eighteenth century builders began to increase the number of stops, finding ingenious ways of expanding the number of effects in their compact mechanisms. Petter Strand’s organ clock of 1794, for example, not only had two stops, but could move gradually between them, dynamically shading the tone—an effect unthinkable for a human organist.⁴ By the 1790s, these clocks grew into great machines capable of grand effects. Father Primitivus Niemecz, librarian of Prince Nicholas Esterházy, created a number of especially fine musical clocks for which Haydn composed and arranged music.⁵ These were typically smaller organs, but in 1798 he completed a large mechanical organ with forte, piano, and echo effect, that played grand overtures—an instrument that clearly hovered on the threshold between mechanical organ and mechanical orchestra. It seems to have taken some time for a new name to be applied to the larger orchestral organs. In London, instrument builder George Astor published a pamphlet advertising his latest barrel organs in 1799, writing he “respectfully solicits the Attention of Merchants, Captains of Ships, and the Public in general, to his Barrel Organs with Drum and Triangle, which are particularly calculated for Country Dances, having the effect of a Band” (Astor 1799). Though he promised his barrel organs could

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Figure 1: Thomas Anton Kunz's "orchestrien" of 1798.

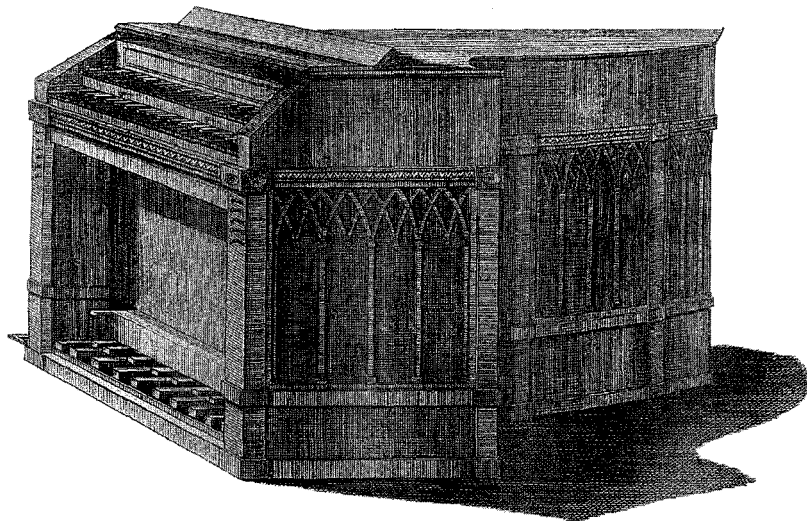


Figure 2: Leppich's panmelodion of 1809.

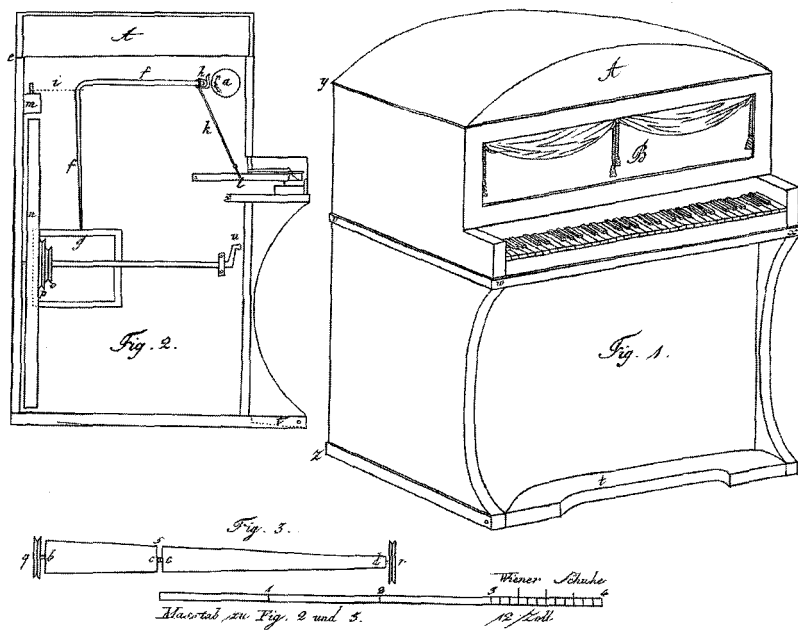
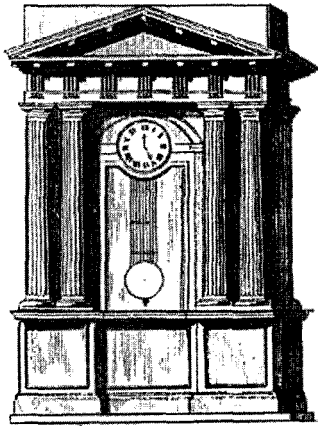
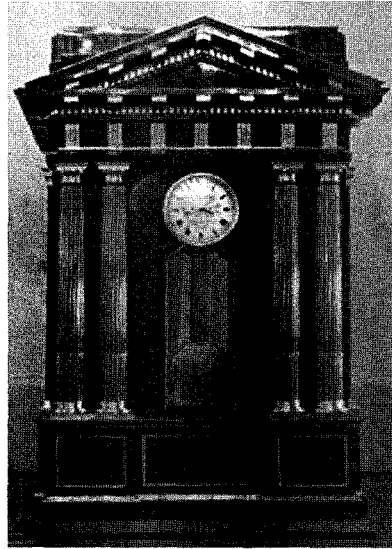


Figure 3: Johann Strasser's mechanical orchestra clock of 1801.



*Orchestre mécanique
Inventé et fait par J. S. Strasser.
horloger à St. Pétersbourg.*



imitate a band, Astor did not invent or use a name that reflected the instrument's increased capabilities. This suggests that there may have been more large barrel organs with orchestral effects in the late eighteenth century than can be identified today.

One of the first mechanical orchestras to be called such was the work of Johann Strasser, a Viennese clockmaker living in St. Petersburg. Strasser spent over eight years creating an enormous mechanical orchestra with clock that he completed in 1801. Housed in a mahogany columned temple, Strasser's instrument used a variety of stops (reed, wood, and metal) to imitate the different sonorities of the instruments of the orchestra. Though the organ's mechanism was separate from the timepiece, the massive creation nonetheless featured one of the most accurate clocks of its day.⁶ The instrument originally had fifteen barrels that played extended compositions, including the overture to the *Magic Flute*, the March and Chorus from *Le Clemenza di Tito*, and the Allegretto to Haydn's *Military Symphony* (Doppelmair 1801:738). One of the few instruments to survive from this time, it was recently restored in St. Petersburg and is currently on display in the Hermitage (fig. 3).

In 1810, Joseph Gurk (also spelled "Gurck"), former apprentice to Niemecz, completed a large mechanical organ that had occupied him for the better part of a decade. Gurk's instrument was first exhibited in Vienna

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in 1810 and then in London at Wigley's Exhibition Rooms in Spring Gardens in 1811. When the instrument reached London, the *Times* drummed up interest with a lengthy description of its mechanism, and even claimed that Haydn saw and inspected the instrument:

Thus, after about seven years of incessant labor, [Gurk] had the gratification of bringing his instrument to perfection just at the propitious moment for him, which preceded the great Haydn's last illness and death. That veteran Orpheus . . . was one of the first who viewed the result of Mr. Gurk's application and genius . . . "And what's to be the name of it," asked Haydn, after minutely examining every part of the work. "My child," replied Gurk, "has no name as yet; might I presume to request the Father of Harmony to stand its godfather?" Haydn promised to think on the manner, and the next day sent a German note to the following purport: "Dear Sir, Call your instrument the PANHARMONICON; and, if anybody ask you any question about it, tell him the name proceeds from old Haydn." (*Times* 1811:4)

Rather than using organ pipes to imitate orchestral sounds as Strasser's creation did, Gurk's organ was composed of actual instruments: in addition to a variety of percussion, the instrument contained French horns, oboes, clarinets, trumpets, and flutes in profusion, each one bored to produce a single note. The Spring Garden advertisement (fig. 4) for Gurk's panharmonicon boasts that the machine consists of no fewer than 210 instruments, and is "equally grand as a full orchestral band" —a slight cheat, since Gurk required a separate instrument for each pitch, with the result that it was an organ of five or six stops; in other words, Gurk's instrument was a modest sized, though quite noisy, chamber organ. Notwithstanding false advertising, the instrument was overstuffed with trumpets, flutes, and drums and seemed quite grand. The reviewer for the *Times* exclaimed, "Upon the whole, we confess, that both the sight of the complicated mechanism of this unique instrument, and the witnessing of its powers and effect, excited in us the strongest emotions of rapturous surprise" (*Times* 1811:4).

Johann Nepomuk Mälzel, ingenious and infamous inventor and showman, also created two orchestra machines. The *Allgemeine musikalische Zeitung* enthusiastically reported on his first machine in 1800, carefully detailing the instrument's features (Anon. 1800). Like many other early orchestra machines, Mälzel's is unnamed. However, he gave the name "panharmonicon" to his second expanded machine of 1812. Though the relationship between Mälzel and Gurk remains unclear, it is likely that Mälzel—who never suffered qualms about "borrowing" his contemporaries' intellectual property—simply used Gurk's name, since it had acquired some fame at the time. Like Gurk, he used real wind and percussion instru-

Figure 4: Advertisement for Joseph Gurk's panharmonicon, 1811.

ROYAL GREAT ROOMS,
Spring Gardens, Charing Cross.

PANHARMONICON
Exhibition of Music,

BY MECHANICAL POWER,
EQUALLY GRAND AS A FULL ORCHESTRA BAND.
Performing the most select Pieces of Military Music,
COMPOSED
By MOZART, HAYDN, KROMMER, ROMBERG, &c. &c.

INVENTED BY
from

THIS
Panharmonicon

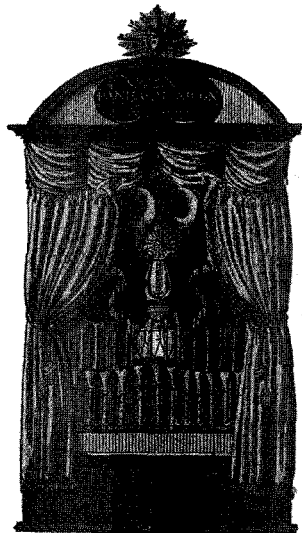
CONSISTS OF
210
INSTRUMENTS,

VIZ.
French Horns,

Kettle Drums,

CLARINETS,

Cymbals,



J. J. GURK,
Vienna.

GREAT DRUM

Trumpets,

BELLS,

OBOES,

BASSOONS,

Triangles,

Common Drum

AND

German Flutes.

Commences playing precisely at 1 o'Clock until 4, and from 7 to 10 in the Evening,
ADMITTANCE ONE SHILLING AND SIXPENCE.

N. B. The whole of the Music is performed in each Hour, concluding with God Save the King, or Rule Britannia.
Private Parties may command Admission from 4 to 6, paying 3s. each Person.

A coloured Engraving of the Panharmonicon may be had at the Rooms, price 6d.

TOPPING, PRINTER, Blackfriars, London.

ments, and his later panharmonicon included violins and cellos (achieved by means of clever organ stops). It was for his later instrument that Beethoven composed the notorious battle piece *Wellington's Victory*, Op. 91. The most popular piece for these instruments, however, was undoubtedly the Allegretto from Haydn's *Military Symphony*. Its grand orchestration, with its many contrasts and exciting use of Turkish percussion, made it an ideal

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showpiece for mechanical orchestras, while its military character helped excuse any stiffness in its performance.

This sample of inventions demonstrates the flexibility of the “orchestra machine.” It could take the form of an instrument anywhere along a spectrum that ranged from *bogenflügels*, to piano-organ orchestrions, to the fully automatic panharmonions—even pianos of the time were made more orchestral by the common addition of janissary and other stops. This wild array of concrete inventions splendidly illustrates how the ideal of the “orchestron” had captured musical imagination.

The Concept of Timbre

The tremendous popularity of the Military Symphony highlights the principle focus of these instruments: first and foremost, they were concerned with timbre. While other instruments were designed to address issues of tuning, notation, or movement, the goal of these instruments was to capture orchestral sonority. Orchestra machines grew out of the development of two related areas of musical culture: the birth of the very concept of timbre and the rise of the modern orchestra. While timbre may seem to be an ahistorical concept—and surely musicians were aware of it throughout history—the idea that timbre could be discussed as a discrete concept, apart from performance, dates from the *Encyclopédie*, in which Jean-Jacques Rousseau defined “tymbre” for the first time. He writes,

A sound’s timbre describes its harshness or softness, its dullness or brightness. Soft sounds, like those of a flute, ordinarily have little harshness; bright sounds are often harsh, like those of the *vielle* or the oboe. There are even instruments, such as the harpsichord, which are both dull and harsh at the same time; this is the worst timbre. The nicest timbre is that which combines softness with brightness of sound; the violin is an example.⁷

Rousseau’s rather limited palette—harsh, soft, dull, bright—is due, in part, to the sheer difficulty of describing something as ephemeral as tone quality. Science had yet to explain the acoustics behind timbre, as Rousseau himself bemoaned in his entry on “sound.” More importantly, timbre was not yet considered a locus of musical beauty, and indeed, many writers in the eighteenth century were downright suspicious of any music that seemed to put sheer sound ahead of loftier pursuits, such as the depiction of emotions and imitation of appropriate subjects.

During much of the eighteenth century, aesthetics were dominated by

the doctrine of imitation. Precisely what art—and especially music—should or was able to imitate differed according to the taste of the writer. For some, music could mimic physical nature such as storms, brooks, and bird songs; for others, music's art lay in the more oblique imitation of impassioned speech through melody. Both these modes of imitation, which we might call the literal and metaphoric, were founded on the idea that music's "meaning" depended on association with the external world. The actual sounds of music, regarded in isolation, had little aesthetic worth. Examples of this thinking abound in the writings of the period. Kirnberger, for example, believed that:

A natural, spontaneous and unaffected song is a series of impassioned notes having the character of the emotion from which it sprang. Art imitates these expressions of passion through notes, which by themselves are unremarkable and betray nothing of emotion. No one would say that a single tone played on the organ or harpsichord sounds passionate. (quoted in Sulzer 1995:91)

Writers on music consistently praised vocal music's power to convey meaning and emotion—the text clarified the subject, which was then amplified and heightened by melody and accompaniment. Since there was no framework in which one could assign clear meaning to instrumental sound, music without words was commonly criticized for vagueness when it tried to imitate human passions, and for triteness when it imitated thunderstorms or animal sounds. Again and again, authors in the eighteenth century complained about any music that lacked a clear subject. Batteux writes "What would one say of a painter who was content to throw onto the canvas bold strokes and masses of the most vivid colors with no resemblance to a known object? The application to music speaks for itself" (1981:49).

Pluche, a rather harsh critic of the Italian style, writes:

Let us proceed to the true cause of the error of so many musicians. Sound is the concern of the ear, as color is of the eye. But as colors are intended to distinguish objects, they do not please one for long if they are not attached to some figure, for they are out of place... the mind does not search for colors, but for colored objects. In the same way sounds, in their variety, help us to designate an infinite number of thoughts and things. But if the sounds come one after the other without being attached to an object or thought, they make us weary without our knowing why. (1994:82)

In this aesthetic climate, few could find value in musical machines that aimed primarily to reproduce orchestral timbres. Orchestrions, therefore, were an aesthetic impossibility throughout much of the eighteenth century; they

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appear only during that infamous shift in musical history that allowed music without words to be praised for all the reasons it had formerly been condemned.

While it may seem obvious that machines designed to reproduce orchestral compositions should have been closely tied to the new aesthetics of instrumental music, their existence, far from a being a side effect of the shift, is bound to the central tenets of what made such a complete aesthetic turnabout possible. Scholars offer differing accounts of the so-called rise of instrumental music, and rather surprisingly, a number explain this shift with little or no reference to music itself. Instead they locate its roots in philosophical developments, such as the birth of formalism or the rebirth of idealism. Mark Evan Bonds goes so far as to assert, “The new aesthetics of instrumental music reflected fundamental transformations in contemporary philosophy and general aesthetics that were *unrelated to the music of the time*” (1997:389; emphasis added). I would like to argue, however, that the existence of orchestrions and similar instruments suggests these changes were rooted in the practicalities of musical culture. Since orchestrions exploit the timbres of the orchestra, we might examine the development of the orchestra to explain this shift. It was during this time, as Spitzer and Zaslaw show, that the orchestra solidified as an institution: expanding from its string core, it became a stable body of trained musicians; the increasing numbers and varieties of wind instruments expanded the palette of sound available to the composer (2004). In other words, the orchestra rose to power during the late eighteenth century. Evidence for this abounds, from compositions exploiting the variety of instruments to the appearance of the first proto-orchestration treatises. And it was in this period that the need to explain the orchestra through various metaphors diminished, while the orchestra itself became a powerful metaphor for the outside world. The magical combination of the ensemble’s unity, expressive range, and variety of sounds appealed to the early romantics. For example, poets began to describe nature as an “orchestra” of birds, insects, breezes, and brooks (Spitzer 1996:248).

As people came to know the orchestra, it changed their perception of the orchestra’s capacity for expression. The rise of the orchestra, and its consolidation into a powerful musical ensemble, affected the major aesthetic shift that gave instrumental music its status. Indeed, the strength of the orchestral ensemble, with its increasingly complex use of instruments, offered a new way of listening to music, one in which the listener could revel in the beauty of sound. Wilhelm Wackenroder, for instance, writes ecstatically on his experience of listening to music:

Truly, it is an innocent, touching pleasure to rejoice over sounds, over pure sounds! A childlike joy!—While others deafen themselves with restless activity and, buzzed by confused thoughts as by an army of strange night birds and evil insects, finally fall to the ground unconscious; — O, then I submerge my head in the holy cooling, wellspring of sounds and the healing goddess instills the innocence of childhood in me again... (1971:178–79)

With this new mode of listening to music came a reevaluation of the medium of sound. For Wackenroder, sound itself was imbued with romantic spirit:

no other art but music exists that has a raw material which is, in and of itself, already impregnated with such divine spirit. Its vibrating material with its ordered wealth of chords comes to meet the creating hands half-way and expresses beautiful emotions. (1971:189)

Johann Gottfried Herder argued against Kant's valuation of music through his strong belief that sound itself had an inherent aesthetic worth, and that we as humans are also inherently receptive to its effects:

Sound, the summoner of the passions, has a power we all experience. We respond to it both physically and spiritually. It is nature's voice, an inner dynamism that draws forth a response from the entire human race; it is a harmonious movement. (1981:146–47)

Other authors made it clear that it was the symphony, above all other genres of music, that offered this direct access to the power of sound. Jean-Baptiste Suard believed that the orchestra, with its "infinite variety [of] colors and shadings" was far more powerful than the human voice (Spitzer and Zaslav 2004:436); Ludwig Tieck, Wackenroder's friend and collaborator, argued that the power of art lay in its "fullness":

Thus, in every art blooms a full, luxuriant splendor in which all the fullness of life and all individual feelings unite and struggle and press in all directions and thus depict a united life with bright colors and diverse sounds. It seems to me nothing in music fills this place so well as the grand symphonies composed of manifold elements. (Wackenroder 1984:351)

Seen in this light, the image of Kant listening to passing marching bands is perhaps not quite so humorous or outlandish as it first appears. His love of loud military music, rather than an anomaly of aesthetic taste, was representative of contemporary sensibilities. The widespread interest in timbre

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was notably a fascination with military timbre. The prevalence of Haydn's Military Symphony on the barrels of orchestra machines cannot be accounted for merely by the ease with which military music could be set for these machines: outside of the realm of automatic instruments, Haydn's Military Symphony was his most loved and frequently performed instrumental composition. Rather than suggesting vagueness so commonly criticized in the eighteenth century, Haydn's symphony terrified and delighted its listeners because of the clarity with which it depicted the military scene—and this clarity stemmed directly from its evocative sonorities. One reviewer for London's *Morning Chronicle* noted that the "cymbals" (surely referring to the battery of Turkish percussion as a whole) mark and tell the story: they inform us that the army is marching to battle, and, calling up all the ideas of the terror of such a scene, give it reality. Discordant sounds are then sublime: for what can be more horribly discordant to the heart than thousands of men meeting to murder each other (Landon 1976:251).

The military style was emotionally evocative, conceptually clear, and easy to understand, and created a forum for the rambunctious play of new, exciting, and often exotic timbres. Its popularity inevitably led to grumbling about the overuse of percussion (the above *Morning Chronicle* reviewer had little good to say about the use of percussion in the Military Symphony's last movement); by 1809, E. T. A. Hoffmann could complain,

Formerly the bass drum and the jangle of tambourine, triangle and cymbal were heard only rarely in the theatre, but gradually they became more and more frequent and finally even entered the concert-hall. It would have done well to lock its doors against them, for seldom is a concert-hall large or an orchestra loud enough to make the deafening sound of the bass drum and the jangle of the other so-called Turkish instruments even bearable. (Hoffmann 1989:226)

Seen in this light, the shift that gave rise to instrumental music, far from stemming entirely from an abstract shift in aesthetic philosophies, was fueled by the development of the orchestra itself. The burgeoning symphonic style, with its myriad timbres and penchant for bombastic military expression, offered new ways of listening to music. The immediacy and transient nature of instrumental music, once dubious in the eyes of numerous critics, suddenly became the very source of music's profound power, and the raw material of music, formerly equated with meaningless splotches of color, became imbued with emotion and feeling.

Orchestra machines are the embodiment of the shifting aesthetics of the late eighteenth and early nineteenth centuries. Designed to capture orchestral timbre, they capitalize on the new immediacy so prized in music.

Wasianski's description of the episode involving Kant would have been unthinkable were not it were not for this shift—his language grew out of a new orchestral discourse. Far from existing on the edge of eighteenth century musical culture, *bogenflügels*, orchestrions, and panharmonicons signal a striking turning point. Their invention and the ensuing discourse about them herald the birth of a new era in the history of the orchestra: the objectification and crystallization of orchestral sonority. Just as the concept of the orchestra unified and began to be used as a metaphor to describe other objects, so too the *sound* of the orchestra became a discrete concept, one associated with powerful effects. No longer was the orchestra merely a copy of a copy, twice removed from nature; rather, it had become an object worthy of imitation.

Notes

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1. See Richards (1999), Gerlach (1998), and Sloane (1997). Arthur Ord-Hume has published several texts on mechanical instruments of all sorts.

2. Several treatises were written on the art of pinning barrels, including the Reverend Father Joseph Engramelle's monograph, *La tonotechnie* (Paris 1770), which was included whole in a later treatise by Dom Francios Bedos de Celles, *L'art du facteur d'orgue* (Paris 1766–78). For a more detailed discussion see Haspels (1987).

3. For a concise history of the sostenente piano, see Chladni (1800). C. P. E. Bach praised a "bogenklavier" by Johann Hohlfeld, "The fine invention of our celebrated Holefeld [sic] which makes it possible to increase or decrease the registration by means of pedals, while playing, has made the harpsichord, particularly the single—manual kind, a much-improved instrument, and, fortunately, eliminated all difficulties connected with the performance of a piano. If only all harpsichords were similarly constructed as tribute to good taste!" (Bach 1949:368–69). In 1783 Bach even wrote a *Sonata für das Bogenklavier*, h280 (w65.48).

4. This instrument is in the collection of the Nationaal Museum van Speelklok tot Pierement (catalog number 669) and is in playing condition.

5. See Ord-Hume (1982).

6. Arthur Ord-Hume must have been unaware that this instrument survives, for he criticizes Robbins Landon for referring to Strasser's instrument as a "musical clock," writing "certainly Strasser's orchestrion had no timepiece" (Ord-Hume 1982:38 n. 21).

7. See *Encyclopédie*, CD-Rom Version 1.0.0, s.v. "Tymbre" (by Jean-Jacques Rousseau).

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