Player Piano

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Abstract and Keywords

Despite falling out of widespread use after the end of the 1920s, the player piano remains one of the most important technological innovations of the twentieth century. The instrument, in its various forms, has been a lightning rod for vigorous debates about the nature of music, performance, and the ethical status of technology itself. Yet the player piano remains deeply misunderstood in both its cultural and technological workings. This article surveys the course of the instrument's development, distinguishes its various manifestations, and charts its varied and unforeseen uses. It shows how the instrument served a variety of cultural ends, from the immortalization of great pianistic interpreters, to leisurely domestic entertainment, to experiments in modernism such as "mechanical music." The player piano serves as an example of the seemingly unlimited potential for creative appropriation and a warning against the pitfalls of technological determinism.

Keywords: technology, instrument, mechanical music

Nearly a century after its heyday in public awareness, the player piano is a widely recognized and enduringly fascinating piece of musical technology. Yet the device remains, in the words of Rex Lawson, "one of the most misunderstood musical instruments in the world."[1] This confusion corresponds in some degree to the nature of the phenomenon itself. As this articleshows, the term *player piano* colloquially refers to a variety of distinct but related instruments, produced by manufacturers in different countries and answering to varying technological, social, and aesthetic ends. The player piano was not so much a singular artifact as a technological system that cannot readily be reduced to any single purpose or function. In this respect it demonstrates the phenomenon that philosopher Don Ihde has dubbed "technological multistability"—the unforeseeable variety of uses that technologies engender, apart from their creators' intentions.[2]

The most remarkable thing about the player piano, to state the obvious, was that it played by itself. Although it was not the first automatic instrument, it was the most famous: by coupling mechanical automation with the near-ubiquitous piano, it brought the prospect of "music without musicians" into the forefront of cultural awareness in the early twentieth century. The player piano can thus be seen as the marker of a technological paradigm shift that reached fruition by the turn of the twenty-first century with the rise of the personal computer and its attendant process of digitization. The instrument stands as a vis-

ceral symbol of technological progress, its threat of dehumanization, and its promise of newfound powers.

Technological Precedents

The player piano in its myriad forms was both a key component of early-twentieth-century musical culture and a crucial link in a centuries-long thread of technological evolution. New inventions do not sprout miraculously from out of nowhere but rather build on and combine aspects of earlier artifacts or, in some cases, natural phenomena.[3] The emergence of the player piano in the late nineteenth century must be viewed in the broader context of the history of mechanical or automatic musical instruments, which can be defined as devices that produce sound according to human designs but without synchronous human involvement. The history of automatic instruments is significant also for how it relates the history of music to the broader phenomenon of mechanization as such. The underlying principle of the player piano and the earlier forms of mechanical instruments from which it evolved—the encoding of information on machine-readable physical media—belongs to a technological lineage leading directly to the digital computer of the late twentieth century. This history calls into question the priority of "practical" inventions over what anthropologist Alfred Gell has called "technologies of enchantment": the entwined histories of automatic musical instruments and systems of automated industrial production suggest that practical and aesthetic instruments develop hand in hand.[4]

This elaborate technological prehistory is too complex a matter to cover in this context, but a few important points should be mentioned. Mechanical instruments date back at least to Hero of Alexandria (first century AD), who invented a number of well-documented musical automata.[5] But these early examples were fixed with regard to the actions they could perform: their musical directions were, so to speak, built into the mechanism itself. They were not yet "progammable machines," defined as "[automata] that can execute (significantly) different functions depending on the information stored on one or more material information carriers."[6] The breakthrough invention that allowed music to be encoded upon media that were physically separable from the playing mechanism itself was the pinwheel. This was a cylinder studded with small pins or rods that, as it revolved, activated a sound-generating mechanism and thus triggered a series of tones according to the spatial disposition of the pins. The oldest known example of a programmable machine is the flute player of the Banu Musa, three brothers working in Baghdad in the ninth century. In their treatise *al-'Āla allatī tuzammiru bi nafsiha* (The Instrument That Plays by Itself), they describe an automatic hydraulic organ in which the pins on a rotating drum open the holes on a flute positioned in parallel.[7] This early automatic instrument is an example of a programmable machine and thus anticipates in mechanical form the later software/hardware paradigm of the digital computer.

The basic principle of the pinwheel would be maintained through a variety of physical forms in the centuries to follow. It first appeared in Europe in the form of the automatic carillon, which is documented as early as the thirteenth century in the Netherlands. The

pegs on the instruments' cylinders were affixed with hammers that struck a row of bells as the cylinder turned. Carillon-building and playing flourished in the Low Countries for many centuries. Later devices such as the music box and its variants represented in essence a miniaturization of the basic principle of the carillon: a tiny pinned cylinder triggered a metal comb whose teeth were tuned to the notes of the scale. But the high point of mechanical instruments in terms of their cultural cachet was the period from the early eighteenth to the early nineteenth century. The prestige of such instruments in this period is evidenced by the elaborate instructions for the creation of pinned cylinders in treatises such as Dom Bédos de Celles' *L'art du facteur d'orgues* (1766–1778) and Marie Dominique Joseph Engramelle's *Tonotechnie, ou l'art de noter les cylinders* (1775). All three members of the great triumvirate of Viennese classicism wrote music for automatic instruments: Haydn (Hob. XIX: 1–32) and Mozart (K. 594, 608 and 616) created music for the *Flötenuhr* or mechanical organ, and Beethoven composed the famous *Wellingtons Sieg*, Op. 91 for Maelzel's Panharmonicon, later rewritten for orchestra.

In the nineteenth century, the development of mechanical instruments converged with the that of the piano itself, a process that would lead to the emergence of the player piano around the turn of the twentieth century. The challenge of mechanizing the piano was addressed by means of two technological innovations that were developed in tandem: the use of paper rolls (replacing the pinwheel and later forms such as metal wheels and stiff paper boards) for the encoding of musical notation and pneumatic systems through which the tiny perforations on the rolls could activate the playing mechanism of the piano. The paper roll, and the pneumatic system that accompanied it, had a number of advantages over the pinned cylinder: it was lighter and more portable, it could fit more notation, and it was more durable and reliable.[8] Both were products of complicated technological evolutions on either side of the Atlantic in the second half of the nineteenth century. By the 1890s, then, the basic elements of the player piano had been established. Future innovations in the instrument, though many and important, would leave untouched these organological fundaments.[9]

The invention of the paper roll was but a late step in the history of recording media used to store not traces of acoustic events (phonography) but instructions for the reproduction of such events. One of the most intriguing aspects of the player piano concerns the particular form of notation represented by the paper piano roll and its predecessors. The piano roll as a musical graphism must be distinguished from more familiar forms such as notation and phonography. Like notation, it is prescriptive, conveying directions for the production of sound. Like phonography (recording), however, it bears a causal or indexical relation to the sound it produces, as opposed to the symbolic relationship in notation. Phonographic notation, such as the grooves of a record, is readable only by the machine designed to play it; symbolic notation is readable only by humans who can interpret the signs on the page with the help of learned conventions. These seemingly theoretical distinctions between types of musical inscription would become fodder for legal arguments in the first decade of the twentieth century. In the case *White-Smith v. Apollo*, a federal appeals court in New York ruled in 1906, and the Supreme Court confirmed in 1908, that the manufacturers of piano rolls were exempt from paying royalties to composers. The

reasoning hinged on precisely the question of legibility: the Court ruled that piano rolls were not “a written or printed record in intelligible notation.”[10]

The Golden Age: 1900–1930

Because the terms *player piano* and its frequent equivalent *pianola* are often used indiscriminately to refer to a number of related but distinct technologies, questions of nomenclature cannot be avoided. For our purposes, we distinguish between the *player piano* (Pianola being, originally, a particular brand of that device) on the one hand and the *reproducing piano* on the other. The essential differences between these two instruments are outlined in the following. Meanwhile, in search of a catchall term to encompass both types, the period term *mechanical piano* comes in handy, in spite of its being a somewhat misleading retronym: all pianos are mechanical, just as all guitars are “acoustic.”[11]

Though closely related in technological terms, the player piano and the reproducing piano served distinct aesthetic ideals, as discussed later. What they have in common is an underlying technological foundation. Both instruments function by using the difference between atmospheric air pressure and the partial vacuum in a chamber inside the piano as a motive force. An unspooling paper roll is passed over a “tracker bar,” which detects tiny perforations in the roll that correspond to the 88 distinct hammer-action mechanisms in the piano. (Early versions of the instrument were able to play fewer notes.) As the perforation passes over the corresponding hole in the tracker bar, outside air rushes into the partial vacuum of the inner chamber. The force of the air’s entry generates the mechanical energy required to trigger the hammer action and strike the appropriate string.

To make things even more confusing, both the player piano and the reproducing piano were originally constructed in the form of an external apparatus known as a “piano player” or “push-up”(German: *Vorsetzer*). It was a mobile cabinet-like device containing a set of felt-covered “fingers,” which, when the device was placed in front of a conventional piano, played the instrument’s keys. It also had “feet,” likewise controlled via the pneumatic system, which depressed the piano’s pedals at the appropriate times. Precedents such as Alexandre Debain’s *Antiphonel* were patented as early 1846; it was a rectangular box placed on top of the keyboard whose fingers were triggered by cards. Napoléon Fourneaux’s *Pianista,* built in 1863 along similar lines, was also the first known pneumatic piano-playing device.[12]

The Player Piano

The player piano can be simply defined as a mechanical piano in which playback is controlled by a human performer. While the basic pitch and rhythmic relationships of the music are encoded on the roll and automatically reproduced by the machine, significant elements—tempo, dynamics, pedaling, and the air supply for the pneumatic mechanism—are provided by the human operator, known as a “pianolist” or “player pianist.” The player piano, as opposed to the reproducing piano, allows the user to intervene in music-making in a new and distinctive way: without the painstaking exercises associated with convention-

al musicianship, to be sure, but still requiring some sense of artistic sensitivity and familiarity with the music encoded on the rolls.

Two major brands of player piano emerged nearly simultaneously around 1900: the Phonola of the German firm Hupfeld and the Pianola of the American company Aeolian. The Phonola, in distinction to the Pianola, used primarily rolls based on artists' interpretations (*Künstlerrolle*), while the Aeolian used rolls that were created by hand. In both cases, however, the rolls were intended as a mere framework for interpretation: the player pianist was able to create customized versions by means of the instrument's playback controls. To sensitively interpret a piece of music required familiarity with the original, the ability to interpret the piano roll's expressive notation, and, no doubt, old-fashioned practice. The player piano was very far from being a fully automatic instrument, and many of the negative opinions about its "mechanical" style of performance were likely responses to its misuse by those who mistook it for something it was not.[13]

The control features of the player piano ranged from the fairly superficial, such as the Boyd Autoplayer's "Deletor," which allowed the instrument's operator to quickly pass over sections of the roll, to the more elaborate and conventionally "musical." The most prominent of these was the "Metrostyle," introduced by Aeolian in 1904 and copied widely thereafter, which consisted of a lever above the keyboard that adjusted the speed of the roll and thus the tempo of the music. Aeolian rolls were created with a sinuous red line that represented fluctuations of tempo—a kind of composed *rubato*—and the player pianist was to follow the line with the pointer on the end of the Metrostyle lever. Most often the Metrostyle line was written by the same technicians who punched the piano rolls by hand, but occasionally composers would provide their own "autograph" versions of tempo interpretation, as Edvard Grieg did for Aeolian in 1904.[14]

Techniques were also developed to allow for player control of dynamics, such as the use of special "theme holes" placed on the edge of the roll just in advance of the notes to be accentuated. The most prominent version of this technique was the "Themodist," introduced by Aeolian in 1906 and soon copied by other manufacturers. This allowed the player pianist to highlight certain notes or phrases by activating a switch that fed a burst of additional air into the pneumatic system, thus temporarily increasing the volume. The technique made use of separate air reservoirs for the upper and lower half of the keyboard, so that bass and treble passages could be emphasized independently of each other.

Playing well thus required a tactile familiarity with the instrument's controls. A diagram published by Hupfeld shows the player's hand stretched out over the instrument's controls, which are located just in front of the piano's keys: the parallel to the pianistic fingering exercises is unmistakable.[15] Ord-Hume calls such augmented devices "expression pianos," suggesting a distinction between the objective musical data of the encoded notes, reproduced by the machine, and the nuances of tempo and dynamics supplied by the sensitive pianolist.[16]

In many early instruments, the player also responsible for pumping a pair of foot pedals to feed air into the pneumatic mechanism. In simple terms, the pedals determined how much air was let into the system, so that more active and louder passages required more vigorous pedaling, while slower and quieter parts needed only gentle pumps. But this seemingly menial activity, an echo of the "treading of the bellows" in pipe organ playing, was seen by some as the key to producing sophisticated player piano interpretations. As Alfred Dolge wrote in his classic 1911 text *Pianos and Their Makers*, playing the player piano "not only requires practice, but earnest and intelligent study to learn the use of the expression and accentuating devices, and more especially to master the pedaling, because, after all, the secret of proper shading and phrasing in rendering a composition depends mainly upon the artistic use of the pedals. The 'touch,' this all-controlling factor in producing the various shades of tone on the piano, is controlled by the pedals almost entirely."[17]

Questions of skill, expertise, and commodification swirl about the player piano, then as now. The instrument has been a lightning rod for criticism from both ends of the cultural-political spectrum. For cultural conservatives and elitists, it was a symbol of the vulgar masses and the triumph of effortless entertainment over hard-won culture. For critics of a Marxist bent, on the other hand, the player piano figures along with the phonograph as a handmaiden of commodification, signaling "the transformation of musical experience into an object of consumption."[18] The tension between the artistic ethos of disciplined expression and the more passive consumer mentality of the dawning twentieth century was reflected too in the marketing of the player piano, as shown by this advertisement by the Aeolian company from 1901:

> Broadly speaking, the Pianola is an instrument by means of which anyone can play the piano. This includes those who literally do not know one note from another. The Pianola does the finger-work, striking the notes in the right relation one to another as they are printed on the music-sheet—the performer still being the pianist, with all the pleasure of producing the music, because he has full control over the expression.[19]

The marketing of the instrument reveals a cunning attempt to have it both ways: the player piano was both a perfectly easy device that anyone could master *and* a sensitive musical instrument not to be confused with a mere soulless machine.

To be sure, one did not have to read music to offer sensitive interpretations on the player piano, but it is surely an exaggeration to state that the instrument "required no particular skill on the part of the operator."[20] Lisa Gitelman's notion of "paraliteracies"—new forms of reading and interpretation that lie between classical instrumental proficiency and a completely passive reception—does better justice to the in-betweenness of music-making practices occasioned by the player piano.[21] Even in the case of the fully automatic playback of the reproducing piano, new modes of listening and musical knowledge were at play. Take, for example, Aeolian's "Author's Rolls" for its Duo-Art reproducing piano, which featured information about the writer of the song and its complete lyrics, as well as

rolls of classical works that included scores, synopses, and snippets of notation. Ord-Hume notes, “Quite often the first eight feet of paper on the rolls were intended to be read prior to making mechanical music.”[22] As Gitelman suggests, the inclusion of song lyrics on piano rolls assumes that players know the tune but not the words of the music—a distinctly oral (or aural), as opposed to literate, kind of knowledge. The player piano opened up a new field of music-making activities in between the two poles of professional musicianship and passive listening. In this respect, the player piano could be seen as a precursor to later technologically mediated musical practices such as Karaoke singing, hi-fi culture, and remix/mashup. Likewise, even as the player piano threatened to put pianists and piano teachers out of work, it gave rise to new professions, as expert player pianists were sought after both as concert performers and as demonstrators in music shops where player pianos were sold.[23]

The German satirist Alexander Moszkowski was perhaps the first to perceive the hidden valences of the player piano. In his 1911 pamphlet *Das Pianola: Ein Beitrag zur Kunstphilosophie*, he argued that the instrument’s mechanistic mode of performance was a feature, not a flaw: “Pianistic man must and shall be discarded; in place of the acrobatic medium the machine will step forward, which, precisely because it’s soulless, is ideally suited as the most obedient executor of compositional intent.” At the same time, however, Moszkowski called attention to the skill required to render artful interpretations at the player piano:

> Let us not forget that the Pianola also involves a person who treads the bellows, minds the pedals, and guides the modulation lever according to his own will. Superficially observed, he might be seen as the pianist of this instrument. In fact he is to the actual piano-player as the wizard is to the meager sorcerer’s apprentice. […] In the manipulation of the Metrostyle lever, in the registration, and above all in the economization of the airflow through artful pedalling, there opens up the whole spectrum of skill from the awkwardness of the beginner to absolute mastery.[24]

For Mozskowski, the machine’s technical mastery of the note-to-note mechanics frees the performer for the more sophisticated artistry of shaping the music’s large-scale formal breathing. The player is more like a conductor than an instrumentalist.

The Reproducing Piano

Shortly after the turn of the century, a new form of automatic piano was developed with a very different purpose: to record and reproduce the interpretations of the great performers of the time. These became known as “reproducing pianos”—a name that, like “pianola,” began as a trademark of the Aeolian Company but later became a generic term. The reproducing piano represented a significant technological variant on what had come before. In contrast to the player piano, it was fully automatic. Everything was encoded on the roll, from the pitches and rhythmic relationships to pedaling and subtle shadings of volume. Accordingly, the reproducing piano lent itself to a different purpose: not the par-

ticipatory model of domestic music-making but the immortalization of great works and the virtuoso musicians who performed them.

The recording function of the reproducing piano had a considerable history of its own. An Englishman named Creed suggested the idea in a paper published posthumously in 1747. Around the same time, the German mechanic Johann Friedrich Unger presented his own design for a similar machine, which was built by the Berlin mechanic Hohlfeld in 1752.[25] Known in German as the "Fantasiermaschine," it was intended not for capturing interpretations of published works but rather for notating musicians' otherwise evanescent improvised performances. Such a device became something of an organological philosophers' stone in the nineteenth century, the numerous solutions all ultimately foundering on the problem of accurately notating tempo and rhythm. These efforts ultimately converged with the development of the reproducing piano around 1900.

The earliest fully automatic reproducing piano was the Welte-Mignon, a product of the Freiburg-based instrument firm M. Welte & Söhne. Karl Bockisch and Edwin Welte developed and patented the recording mechanism in 1904, and the instrument was unveiled the following year. Each of the piano's keys, in addition to triggering its corresponding strings, activated a stylus that marked a paper roll that unfurled at a mechanically regulated pace. Thus the mechanism could notate performances in real time, with all the rhythmic nuance that the player might bring to bear. The recording of dynamics, however, proved to be a most elusive goal. Before the 1920s, dynamic indications were added to the piano roll after the fact, by engineers who had listened and taken notes at the recording. Gramophone recordings of the original performance were used to capture the dynamics as well. This technique was obviously subjective, though the engineers in question often had musical training as well, and their markings were typically subject to the approval of the recording pianist.[26]

Later technological advances allowed for more objective means of registering performers' dynamic variations. In 1926, the American Piano Company's Ampico reproducing piano was outfitted with a device called a "spark chronograph," invented by Clarence Hickman. Its recording apparatus used two sheets of paper to notate all the instrument's movements. The chronograph registered the velocity of the hammers—and thus dynamics—by firing two sparks through the paper: one when the hammer flew and another just before it struck the string. By calculating the minute differences in timing between the marks left on the roll, engineers could reconstruct the details of performance on fairly sound scientific footing. Welte also developed a technique for recording dynamics around the same time, but the firm was famously tight-lipped about the details and no recording mechanisms survive; remarkably, the precise manner of its working is still the subject of speculation.[27]

Surviving rolls created for the reproducing piano reveal not only different interpretations but an understanding of interpretation itself radically different from that which developed in the later twentieth century. As Jürgen Hocker details, many of the pianists who recorded rolls for reproducing pianos took considerable liberties with the scores they played—

not only extremes of *rubato*, freely applied dynamics, and sustain pedal but also additions such as playing passages in octaves and "filling out" chords and arpeggios according to taste and even omitting or substituting entire passages. Such free interpolations were undertaken not only by interpreters of canonic works but also by composers playing their own music. The reproducing piano rolls of the early twentieth century thus provide valuable documentation of the quasi-improvisatory practices of piano technique that would soon be swept away by a new focus on composers' supposedly inviolable artistic intentions as laid down in "the music itself."[28]

The list of pianists and composers who recorded rolls for the various models of reproducing piano in the early twentieth century reads like a veritable who's who, including such figures as Busoni, Debussy, Fauré, de Falla, Gershwin, Glazunov, Grieg, Landowska, Mahler, Paderewski, Mahler, Rachmaninov, Ravel, Reger, Rubinstein, Saint-Säens, Scriabin, and Richard Strauss. Quotes such as the one attributed to Rachmaninov—"Gentlemen, I have just heard myself play"—were no doubt manna from heaven for the marketing staff of firms such as Welte.[29] But the complex and interlinked processes of recording, editing, and producing the final product were much more complicated than such images of fidelity suggest. The original rolls underwent a lengthy editing process in which details of interpretation such as dynamics were added and "wrong notes" set aright. (Paderewski noted on one of his rolls, "I didn't play that evenly. Can you make it even for me?"[30]) "Authentic" in this context did not mean "true to the score" but simply "authorized," as recording pianists would typically signal their approval by signing the finished roll before it was sent out for duplication. The rolls offer a faithful record not of a single performance but of the performer's notion of an ideal realization. In this regard, as Francis Bowdery suggests, the production of rolls for the reproducing piano anticipates the patently artificial studio techniques famously championed by figures such as Glenn Gould in the 1960s.[31]

What might be called the "golden age of the player piano" comprised the roughly 30-year period between the earliest forms of the technology around the year 1900 and their eventual eclipse as a medium of domestic music-making by recording and broadcast media such as phonograph and radio. According to Ord-Hume, "By the 1920's, the range of rolls available for the player-pianist was enormous. Not only were most of the great piano and orchestral pieces transcribed in rolls form, but so were the best of the popular songs, dance music, hymn tunes—in fact the whole gamut of music."[32] From 1923 to 1925, the production of player pianos of all types surpassed that of conventional pianos by an almost three-to-two margin. (Reproducing pianos, which were much more costly, averaged between 5% and 10% of the total figure.)[33] Production peaked in the United States in 1923, whereafter it plummeted precipitously, until by 1929 it was lower than at any time in the preceding 20 years. At the same time, radio ownership in the United States increased from 40% in 1930 to 72 % in 1934.[34] The onset of the Great Depression in 1929 put the expensive player piano (and even its nonautomated ancestor) out of reach for most consumers, while recorded music was becoming ever cheaper and more ubiquitous.

Original Music for the Player Piano

Although classical music was in the forefront of the instrument's marketing, more popular forms of music comprised the bulk of piano roll publications. And in spite of the domestic imagery that dominated advertisements, player pianos were most often found in public places, where they were used to play dance and popular music.[35] In popular genres such as ragtime, even more than in the classical context, the player piano greatly complicated questions of artistic agency by distributing artistic responsibility among various actors involved in the production of piano rolls. Recordings of the music of composers such as Scott Joplin often elided the issue of whether they present a performance by the composer or a piano roll "reconstruction" of his work, and attributions in piano roll credits could mean "composed by," "performed by," "arranged by," "edited by," or any combination of these.[36]

This blurring of creative roles was epitomized by a new genre of music known as "novelty piano." A stylistic cousin of ragtime and stride piano, novelty piano (also known as "novelty rag") was pioneered by pianists who transferred the tricks of the trade learned in recording and editing piano rolls to the composition of original music. It emerged around 1920, late in the history of ragtime but near the high-water mark of the player piano. In contrast to earlier forms of ragtime, which were marketed mainly as sheet music, many pieces of novelty rag appeared only on piano roll, performed by their composers: the sheer complexity of the music meant that it was destined for listening rather than performing at home.[37]

The first concentrated investigations into the compositional potential of the player piano took place in 1917, when the British music critics Edwin Evans and Ernest Newman published articles in *The Musical Times* speculating about the possibilities of music specially conceived for the instrument. In a short "Postscript on Mechanical Instruments" appended to an article titled "The Foundations of Twentieth Century Music," Evans predicted that mechanical instruments would absolve the performer of the need of obtaining the physical technique required to perform music with his own hands. Instead, composers will "write direct [*sic*] for this improved mechanism, thereby freeing themselves from all the mechanical restrictions appertaining to the use of ten fingers, which at present limit the number, rapidity, and distance of the notes used."[38] Newman's article "Player Piano Music of the Future" appeared later that year. Declaring that new technologies require new aesthetic principles, Newman asserted that "the piano-player is not simply an old-style pianoforte sounded by pneumatics instead of by the hand: it is a *new musical instrument*, from which we shall never get the best possible results until composers learn the peculiar resources of it and how to exploit these." In order to take advantage of the full technical capabilities of the new device, Newman proposed the development of "a genuine piano-player idiom of composition." [39]

Evans sent out requests for original Pianola compositions to about 20 composers throughout Europe. Stravinsky was the first to respond to the commission, writing a short study titled "Étude pour Pianola" in 1917, a work that is generally regarded as the first com-

plete original composition for player piano. More compositions trickled in over the next several years, and Evans ultimately received 15 pieces in total: 10 arrangements and five original works by Stravinsky, Alfredo Casella, Eugène Goosens, Herbert N. Howells, and Gian Francesco Malipiero. (Again, however, the elaborate nature of many of the arrangements calls this very distinction into question.)[40] Because the Pianola was a player piano and not a reproducing piano, these pieces required interpretation on the part of the player pianist. All of the rolls in question made use of both the Metrostyle and Themodist expression elements, although it is not always clear whether these markings were supplied by the composer or by Aeolian's editors. The original compositions of the bunch were premiered in a concert at Aeolian Hall in London on October 13, 1921, following an introductory lecture by Evans. In spite of their novelty and their occasionally quite powerful musical effect, these pieces seem to have made little impact. Aeolian, which viewed its English unit of the company as an eccentric and not necessarily business-savvy branch of its operations, apparently did not bother to advertise the rolls containing the original compositions.[41]

The most sustained engagement with the player piano as a medium for original compositions took place in Germany in the mid-1920s. Apparently unaware of the similar efforts spearheaded by Evans in London, the music critic Hans Heinz Stuckenschmidt set things in motion beginning in 1924 with a series of polemical articles published in music journals in Germany and the United States. Stuckenschmidt used the player piano—or, specifically, the Welte-Mignon reproducing piano—as a cudgel to attack the nineteenth-century aesthetics of expression in the name of modernist ideals of precision and objectivity: "With [the Welte-Mignon], one can have any number of tone-masses strike at once; one can increase the volume and speed of the music over the natural limits of human technique. In a word, one will be able to realize entirely *new and hitherto unknown phenomena of sound*, whose effects can be confirmed and determined to the last detail by the composer himself."[42] The irony, of course, is that the original purpose of the Welte-Mignon and other reproducing pianos was to immortalize the great piano repertoire of the nineteenth century and to capture the very nuances of interpretation that the champions of "mechanical music" sought to ban.

Appropriating the pejorative label "mechanical music," Stuckenschmidt called for a new form of music unique to the player piano, created by manually encoding patterns of notes onto the paper roll. Composers such as Paul Hindemith and Ernst Toch quickly took note, and the first original player piano compositions in Germany had their premiere at the Festival for New Music in Donaueschingen in July 1926. Toch and Hindemith presented both original works and arrangements of earlier piano compositions, suggesting that the style afforded by the Welte-Mignon was not so far removed from what some composers had already achieved under their own steam. In his *Piano Suite 1922*, Op. 26, for example, Hindemith had instructed the player of the "Ragtime" movement to "play this piece very wildly, but always firmly in rhythm, like a machine."

A second set of player-piano compositions appeared at the Donaueschingen festival in 1927, including another piece each by Hindemith and Toch, as well as works by Nicolai Lopatnikoff and Hans Haass. The concert featured an arrangement of George Antheil's *Ballet méchanique* (1924), which was originally to include parts for 16 Pianolas but had been scrapped due to difficulties synchronizing the instruments. (The final version featured just one automatic instrument.) In striking contrast to Antheil's provocative work, there was also a "performance" of Mozart's F-minor Fantasy for mechanical organ, K. 608, demonstrating the Germans' keenness to cite historical precedent for their investigations into "mechanical music." Advocates were eager to point out that the player piano was only the most recent stage in a process of mechanization that went back centuries and was indeed inextricable from the history of European music.[43]

For Stuckenschmdit and his party, the mechanical piano promised to produce music of pure formal self-referentiality: The critic Erwin Felber declared that "Recognition is only now being accorded to the true nature of mechanical music, which is obviously unrelated to the romantic, the sentimental, the personal or subjective, and expresses, with perfect geometrical precision, only itself."[44] On the face of it mechanical music was a typically modernist valorization of compositional prerogative over the scurrilous interventions of performing virtuosi. But the aesthetic program of Stuckenschmidt and company, for all its bluster, was riddled with paradox. First, and most obviously, the ideal of completely independent artistic production was itself a legacy of the Romantic creative genius, even if the nineteenth-century ideal of emotional expression had given way to the projection of depersonalized, "objective" forms. Second, though the composers who wrote for the Welte-Mignon were entranced by the instrument's capacity for creating "pure" music, the metaphors by which they described this music—geometry, line, surface, and the like—betray a close connection to the distinctly visual rhetoric of contemporary painters such as Mondrian and Malevich. Finally, for Stuckenschmidt in particular, inherited notions of presence and human touch were no better than humbug and superstition, and yet the very ontological self-sufficiency of the "purely acoustic" itself becomes something of a metaphysical idol.

Far from inaugurating a new form of music fit for the modern age, as Stuckenschmidt had envisioned, efforts to compose original works for the Welte-Mignon quickly petered out, eclipsed on the one hand by frustrations with the instrument's technological limitations and on the other by the emergence of newer technologies, including early electronic instruments and optical sound film, which seemed to better fulfill composers' visions of the technological mastery of sound. The demise of the movement also coincided with the decline of the player piano as such, circa 1930.

After 1930

Although the production of both player and reproducing pianos all but ceased in the aftermath of the Great Depression, the instrument has maintained a place in the public imaginary that belies its outward obsolescence. (In this it resembles another remarkable sound

machine of the early twentieth century, the Theremin.) More than any other phenomena responsible for arousing interest in the player piano since the end of its heyday are the works of the American composer Conlon Nancarrow (1912–1997), who created a remarkable body of original compositions for player piano whileworking mostly in isolation in Mexico City. The jerky syncopations of Nancarrow's early works invoked popular styles such as ragtime and blues, while his later pieces devised complicated rhythmic proportions between voices often proceeding in strict canonic imitation. His exploration of the phenomenon of "temporal dissonance" included various *trompe d'oreille* effects as in Study No. 21, an "acceleration canon" in which the lower voice begins slow and speeds up while the upper voice begins fast and slows down. To a yet more extreme degree than the earlier experimenters of the 1920s, Nancarrow summoned the prospect of a completely inhuman music, a performance art entirely divorced from conventional pianistic considerations. Many of his player-piano studies seem designed not only to push the machine to its extremes but also to test listeners' ability to perceive and distinguish the musical elements—notes, phrases, or layers—at play.[45]

The stark difference between Nancarrow's works and the player-piano compositions of the 1920s, which for all their madcap complexity never explore the "irrational" rhythmic relationships characteristic of Nancarrow's music, suggests that ideals of "medium specificity" are as variable and historically contingent as any other aesthetic desiderata. Questions of virtuosity and performability pass from the player piano to "live" music in the three books of piano *Études* (1985–2001) by György Ligeti, who helped champion Nancarrow's music in the early 1980s. Ligeti's *Études* highlight the seemingly never-settled question of what is playable and what is not: The fourteenth of these, *Coloana fara sfârşit*, originally judged impossible to play, was later rewritten by Ligeti, while the original version (now labelled 14a) was subsequently arranged for player piano by Jürgen Hocker and, yet later, performed by pianists.[46]

The player piano's afterlife as a symbol of the simultaneous danger and allure of modern technology is documented in the work of novelists such as William Gaddis and Hans Henny Jahnn. In Gaddis' work, the player piano serves as the central figure in a pessimistic vision of cultural decline. In his last work, *Agapē Agape*, subtitled "A Secret History of the Player Piano" and published posthumously in 2002, Gaddis cannibalized his own voluminous research notes for a book on the player piano, compiled from 1945 until his death in 1998, to create a breathless, virtually unpunctuated narrative of an unnamed chronicler obsessed with the instrument as a symbol of mechanization, mass production, and the leveling of culture under democracy: "Waiting to be entertained because that's where it started and that's where it ends up, avoiding pain and seeking pleasure play the piano with your feet, play cards, play pool … Don't have to read music know a clef from a G string just keep pumping."[47] The player piano also looms as an icon of mechanization and its discontents in *Die Niederschrift des Gustav Anias Horn* (1937–1943), the second volume in the massive, three-part novel *Fluss ohne Ufer* (Shoreless River) by the German writer Hans Henny Jahnn (1894–1959), who was also an accomplished organ builder and veteran of the avant-garde technological experiments of the 1920s and 1930s. The novel's protagonist, Gustav Horn, begins by simply playing along with the piano, then progresses

to punching his own elaborations on preexisting rolls, and finally procures blank rolls on which he creates entirely original works whose staggering proliferation of forms he compares to a primeval jungle. The encounter with the player piano impels Horn into a successful career as a composer. Yet, like Gaddis' nameless narrator in *Agapē Agape*, Horn ultimately rejects the instrument. He is entranced by the godlike powers the machine confers upon him, yet inwardly he maintains his reserve toward the "wonders of electrical waves, airplanes, war machines, bridge building, water turbines, and high-pressure boilers." Later in the story, Horn renounces the player piano, and, like Prospero drowning his book of spells, declares, "Music is music, and machine machine."[48]

Beyond these literary echoes, the player piano lives on, if only metaphorically, in the world of computer music technologies. The emergence of digital protocols for communication of musical information between various devices—languages such as MIDI (Musical Instrument Digital Interface, 1983)—can be seen as innovations on the principle of the piano roll and its forebear the pinned cylinder. What underlies them all is the basic yet revolutionary notion of separating information from sound generation or, in computer terms, software from hardware. Perhaps the most remarkable vestige of the player piano is the continuing use of the "piano roll" as metaphor in digital music-making since the advent of the PC in the late 1970s. With its clear, gridlike rendering of the two-dimensional matrix of pitch and time, the piano roll offers a notational form ideally suited to the users of such programs, who are often unable to read traditional music notation. With the invention of the computer-controlled Yamaha Disklavier (1987), the player piano was united with the digital technologies in whose development its own history had long been entwined. The Disklavier is a piano with a built-in computer that can record and play back music like a traditional player piano yet with all the advantages of computer technology, such as digital storage, near-instantaneous data transfer, and nondestructive editing.

Finally, the enduring fascination of the player piano well beyond the period of its widespread use likely owes something to the instrument's indelible traces of human performativity, the way that the pneumatically depressed keys seem to suggest ghostly hands at work. Mechanical instruments inhabit an "uncanny valley" where the residue of performative gesture still haunts even the most perfect clockwork music. Likewise, the endurance of the player piano is of a piece with the resurgence of other once-obsolete technologies such as the LP record and the analog synthesizer, forms that are valorized both for their supposedly humane qualities of tactile warmth and as symbols of defiance in the face of ever-accelerating technological obsolescence. On the other hand, however, part of the instrument's charm resides in its proto-digital granulation of music into manipulable bits of information: it is very much at home amid the scatterings and juxtapositions that characterize life in the computer age.

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Notes:

([1]) Rex Lawson, “The Pianola,” liner notes to *The Aeolian Company: Original Compositions and Arrangements for Pianola*, NMC compact disc D136, 4.

([2]) Don Ihde, “Technologies—Musics—Embodiments,” in *Embodied Technics* (Birkerød: Automatic Press/VIP, 2010), 17–36.

([3]) For evolutionary perspectives on technological development, see George Basalla, *The Evolution of Technology* (Cambridge: Cambridge University Press, 1988).

([4]) Alfred Gell, "Technology and Magic," *Anthropology Today* 4, no. 2 (1988): 5–6.

([5]) *The Pneumatics of Hero of Alexandria*, trans. Bennet Woodcroft (London: Taylor, Walton, and Maberly, 1851). For a readable historical overview of early mechanical instruments, see Hugo Leichtentritt, "Mechanical Music in Olden Times," *The Musical Quarterly* 20, no. 1 (1934): 15–26.

([6]) Teun Koetsier, "On the Prehistory of Programmable Machines: Musical Automata, Looms, Calculators," *Mechanism and Machine Theory* 36 (2001): 590.

([7]) Koetsier, "On the Prehistory of Programmable Machines." For a detailed account of the Banu Musa instrument, see Henry George Farmer, *The Organ of the Ancients from Eastern Sources* (London: New Temple Press, 1931), 88–118.

([8]) Francis Bowdery, "Music for the Player Piano: A Study of Seventeen Selected Examples" (PhD diss., Loughborough University of Technology, 1995), 65–6.

([9]) Arthur W. J. G. Ord-Hume, *Player Piano: The History of the Mechanical Piano and How to Repair It* (South Brunswick: A. S. Barnes, 1970), 77.

([10]) This ruling was quickly superseded by the Copyright Act of 1909. See Lisa Gitelman, "Media, Materiality, and the Measure of the Digital: Or, the Case of Sheet Music and the Problem of Piano Rolls," in *Memory Bytes: History, Technology, and Digital Culture*, ed. Lauren Rabinowitz and Abraham Geil (Durham: Duke University Press, 2004), 199–217.

([11]) On problems of terminology, see Arthur W. J. G. Ord-Hume, "Cogs and Crotchets: A View of Mechanical Music," *Early Music* 11, no. 2 (1983): 167–71.

([12]) Arthur W. J. G. Ord-Hume, "Fourneux, Napoleon," in *Piano: An Encyclopedia*, ed. Robert Palmieri (New York: Routledge, 2003), 140.

([13]) Rex Lawson, "The Pianola," 6; see also Jürgen Hocker, *Faszination Player Piano. Das selbstspielende Klavier von den Anfängen bis zur Gegenwart* (Bergkirchen: Edition Bochinsky, 2009), 60.

([14]) Hocker, *Faszination Player Piano*, 75.

([15]) The image is reproduced in Hocker, *Faszination Player Piano*, 60.

([16]) Ord-Hume, "Expression Piano," in *Piano: An Encyclopedia*, 2d ed., ed. Robert Palmieri (New York: Routledge, 2003), 132.

([17]) Alfred Dolge, *Pianos and Their Makers* (Covina, CA: Covina Publishing Company, 1911), 160.

([18]) Timothy Taylor, “The Commodification of Music at the Dawn of the Era of ‘Mechanical Music,” *Ethnomusicology* 51, no. 2 (2007): 291–92. Taylor notes the distinction between the player piano and the reproducing piano, seeing the latter as signaling the true arrival of musical commodification. But such an assessment ignores the fact that the reproducing piano never accounted for more than a small fraction of the overall sales of automatic pianos.

([19]) Quoted in Ord-Hume, *Player Piano*, 101.

([20]) Paul Théberge, *Any Sound You Can Imagine: Making Music / Consuming Technology* (Hanover, CT: Wesleyan University Press, 1997), 29.

([21]) Gitelman, “Media, Materiality, and the Measure of the Digital,” 208.

([22]) Ord-Hume, *Player Piano*, 100.

([23]) Hocker, *Faszination Player Piano*, 167–72.

([24]) Quoted in Hocker, *Faszination Player Piano*, 83–4. Moszkowski’s pamphlet must be taken with a grain of salt, as he was renowned as a satirist and his brother Moritz was a pianist and composer (who, intriguingly, worked for the Aeolian Company).

([25]) The whole affair is explored in great detail in Peter Schleuning’s essay “Die Fantasiermaschine: Ein Beitrag zur Geschichte der Stilwende um 1750,” *Archiv für Musikwissenschaft* 27, no. 3 (1970): 192–213.

([26]) Ord-Hume, *Player Piano*, 99; Hocker, *Faszination Player Piano*, 137.

([27]) Bowdery, *Music for the Player Piano*, 76; Ord-Hume, *Player Piano*, 96–8; Hocker, *Faszination Player Piano*, 132–6.

([28]) Hocker, *Faszination Player Piano*, 173–93.

([29]) Quoted in Ord-Hume, *Player Piano*, 97.

([30]) Quoted in Hocker, *Faszination Player Piano*, 181.

([31]) See Glenn Gould, “Prospects of Recording,” *High Fidelity Magazine* 16, no. 4 (1966): 46–63. The recording, editing, publishing, and marketing of piano rolls furnishes ample material for studies of canonization and virtuosity in the early twentieth century. The piano roll literature created in the first quarter of the twentieth century has been catalogued by Larry Sitsky: *The Classical Reproducing Piano Roll: A Catalogue-Index*, 3 vols. (New York: Greenwood Press, 1990). For a brief overview, see Hocker, 194–6.

([32]) Ord-Hume, *Player Piano*, 9.

([33]) Hocker, *Faszination Player Piano*, 168.

([34]) Frederik Nebeker, *Dawn of the Electronic Age: Electrical Technologies in the Shaping of the Modern World, 1914 to 1945* (Hoboken: Wiley-IEEE Press, 2009), 169.

([35]) Ord-Hume, “Expression Piano,” 132–3.

([36]) Andrew Durkin, “The Self-Playing Piano as a Site for Textual Criticism,” *Text* 12 (1999): 179.

([37]) See David A. Jasen and Trebor Jay Tichener, *Rags and Ragtime: A Musical History* (New York: Dover, 1978), 214–39.

([38]) Edwin Evans, “The Foundations of Twentieth Century Music,” *The Musical Times* 58, no. 894 (1917): 351.

([39]) Ernest Newman, “Player Piano Music of the Future,” *The Musical Times* 58, no. 895 (1917): 391.

([40]) See Rex Lawson, “Player Piano.”

([41]) Bowdery, “Original Music for the Player Piano,” 83.

([42]) H. H. Stuckenschmidt, “Mechanisierung der Musik,” *Ma* 9, no. 8 (1924): n.p.

([43]) For one of many examples of this argument, see Arnold Schoenberg, “Mechanical Musical Instruments,” in *Style and Idea: Selected Writings of Arnold Schoenberg,* ed. Leonard Stein (Berkeley: University of California Press, 1975), 326–30.

([44]) Erwin Felber, “Step-Children of Music,” *Modern Music* 4 (1926): 32.

([45]) On Nancarrow’s music, see Kyle Gann, *The Music of Conlon Nancarrow* (Cambridge: Cambridge University Press, 1995).

([46]) Richard Steinitz, *György Ligeti: Music of the Imagination* (London: Faber and Faber, 2003), 310.

([47]) William Gaddis, *Agapē Agape* (New York: Viking, 2002), 7–8. See also David Suisman, “Sound, Knowledge, and the ‘Immanence of Human Failure’: Rethinking Musical Mechanization through the Phonograph, the Player-Piano, and the Piano,” *Social Text* 102, no. 1 (2010): 13–34.

([48]) Hans Henny Jahnn, *Die Niederschrift des Gustav Anias Horn, vol. 2 of Fluss ohne Ufer* (Hamburg: Hoffmann und Campe, 1992), 822.

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