Instruments for New Music

Thomas Patteson

Published by University of California Press


For additional information about this book
https://muse.jhu.edu/book/63421

For content related to this chapter
https://muse.jhu.edu/related_content?type=book&id=2274560
“The Joy of Precision”

Mechanical Instruments and the Aesthetics of Automation

It is not the automaton that plays the flute; it is the mechanic, who measured the wind and set the fingers in motion.¹

—Jean-Jacques Rousseau

On the evening of July 25, 1926, an unusual concert took place in the small Black Forest town of Donaueschingen, Germany. Presented as “original compositions for mechanical instruments,” the event featured three pieces by Ernst Toch, six “Polyphonic Études” by Gerhart Münch, and two works by Paul Hindemith, all written especially for a model of piano called the Welte-Mignon, which played automatically by means of a pneumatic mechanism activated by a spinning paper roll. The finale was an experimental stage performance called the Triadic Ballet, with costumes and choreography by the Bauhaus teacher Oskar Schlemmer and accompaniment for mechanical organ by Hindemith. A contemporary account captured the strange scene as the music began:

The hall was illuminated by unseen sources. It was absolutely quiet as Hindemith wound up the device. [. . .] The piano began to play: music like an étude, toccatas with otherwise unplayable harmonic progressions, with a speed that could never be approached even by the most virtuosic of players, with an exactitude of which a human could never be capable, with a superhuman sonic force, with a geometrical clarity of rhythm, tempo, dynamics, and phrasing, which only a machine can produce. [. . .] The piano finished the composition and there was an uneasy pause. Should one applaud? There’s no one sitting there. It’s only a machine. Finally a quiet applause, growing louder. Calls of “da capo.” And sure enough, the piano played it again, without hesitation, as precisely as the first time.²
This concert, and its successor the following year, presented a collection of original compositions written not for a human performer to play, but for the mechanical piano itself. These pieces, though written by a handful of different composers, shared certain stylistic traits. They were all miniatures in scale, with the longest piece clocking in at a mere four and a half minutes. A brisk or very fast tempo and a medium-to-loud dynamic level were dominant throughout most of the compositions. In terms of genre, the pieces tended toward either preclassical contrapuntal or ornamental models. This predilection for polyphonic forms, on the one hand, and quasi-improvisatory showpieces, on the other, was typical of the modernist style of the mid-1920s.3

In Hans Haass’s *Capriccio Fugue*, the fugal subject is presented straightaway, the entries of the voices rapidly accumulating to a densely layered polyphonic haze. The audible structure of the piece quickly disappears amid a bewildering sequence of *trompe l’oreille* effects—cloudlike agglomerations of tones, trills, parallel motion in several octaves at once, and cascading scalar passages. Haass exploits the Welte-Mignon’s capacity for breakneck speed not only in the general prestissimo pace of the music but also in particular passages where the succession of tones surpasses the temporal resolution of the human ear. At these moments the listener can no longer register individual pitches but instead perceives only tonal blurs and smears, effects that are almost entirely dissociated from the conventional timbral palette of the piano.

At the other end of the spectrum is the fourth of Gerhart Münch’s *Six Polyphonic Etudes*, a strikingly understated example of the Welte-Mignon’s technical capabilities. Entitled “Fugato,” the piece presents three distinct registers of activity spanning the entire range of the piano: a sparsely populated bass zone, a somewhat more active middle register, and an upper voice proceeding in shuffling pairs of notes (dotted-eighths followed by sixteenths). Each voice seems to go about its business more or less unaware of the others, with the upper two parts tracing meandering downward paths that reach their nadir and then abruptly “reset” to the top of their range. Because the repeated patterns in the middle and upper voices are slightly out of phase with each other, the musical motion is at once audibly cyclical and subtly disorienting. Just after the midpoint in the brief “Fugato,” each of the voices is doubled at a different interval, creating an effect of harmonic blurring that amplifies
the piece’s ambiguous finish: instead of concluding, it simply cuts off midphrase.

The 1926 concert in Donaueschingen was the first public manifestation of a short-lived but intense engagement with the artistic potential of new instruments. For a brief span in the middle of the decade, the “mechanical music” phenomenon transfixed the German musical intelligentsia. In flurries of articles in musical journals, untold hours of labor in composers’ studios, and a handful of concerts, this movement ran its spectacular course, bringing technology and its role in modern music to the forefront of European consciousness. In 1927, as the mechanical vogue had already begun to fade, Hindemith wrote that “no other aspect of musical life has been so hotly disputed in recent times as that of music made by mechanical instruments.” By separating performance from the presence of musicians, the advocates of mechanical music challenged conventional aesthetic assumptions and raised unsettling questions about the technological mediation of musical expression, eliciting debates that would continue to reverberate through the remaining years of the Weimar Republic.

**MUSICA EX MACHINA**

The machine—as symbol and reality—captivated the imagination of early twentieth-century Germany. Between unification in 1871 and the outbreak of World War I in 1914, the country embarked on a rapid process of industrialization that transformed it into a technological and economic superpower. Modern technology—from airplanes and automobiles to film and photography—came to represent a revolutionary force that promised, for good or ill, to reshape life in all its dimensions. After the war, Germany, along with the United States and the Soviet Union, was among the countries that most eagerly embraced the new marvels of the machine age: from the Ford-style production line to radio broadcasting, modern technology promised to usher in a new world of prosperity and progress.

Though the arts had shown the influence of modern technologies since even before the turn of the century, beginning around 1920 the “machine aesthetic” began to surface everywhere. The French architect Le Corbusier’s manifesto *Vers un architecture* featured photographs of biplanes, ocean liners, automobiles, and grain silos alongside the examples of modern architecture, while the anthology *Buch neuer Künstler* interleaved reproductions of contemporary abstract art with images
In Germany, the foremost exponent of this spirit was the art school known as the Bauhaus, which was founded in the immediate aftermath of the war by architect Walter Gropius. In 1923, Gropius gave a lecture entitled “Art and Technology: A New Unity,” which signalled the school’s program of synthesizing fine arts and industrial techniques of production. For Bauhaus artists, the beauty of the machine symbolized the modern spirit: simplicity of power tools, cogwheels, and ventilators.⁶

over convolution, efficiency over ornament, universal over particular. Instead of expressing a willful artistic personality, the machine was thought to manifest an unconscious and collective creative impulse. Oskar Schlemmer explained: “If today’s arts love the machine, technology, and organization, if they aspire to precision and reject anything vague and dreamy, this implies an instinctive repudiation of chaos and a longing to find the form appropriate to our times.”

Music, too, fell under the spell of the machine aesthetic. Many composers cultivated an unnuanced, “mechanical” style in reaction to the nineteenth-century ideal of music as a seismograph of psychological fluctuations. Examples of this new tendency began to turn up soon after the war. Stravinsky, who would become the foremost exponent of the antiromantic animus of the 1920s, could think of no higher compliment for a performance of his Concertino for String Quartet (1920) than to compare the motoric regularity of the ensemble to the clatter of a sewing machine. Hindemith directed the performer of the “Ragtime” movement from his Piano Suite op. 26 (1922) to “play this piece very wildly, but always firmly in rhythm, like a machine,” and American composer George Antheil’s piano technique was described by one observer as “a mixture of frenzy and precision. [. . .] A machine seemed to be playing the keys.” While the piano seemed especially suited for the musical approximation of the machine, the orchestra could serve the purpose as well, as in the musical steam engine of Arthur Honegger’s famous Pacific 231 or Alexander Mosolov’s Zavod, in which heavy percussion and obsessive repetition evoke the industrial frenzy of a steel foundry.

As these examples demonstrate, however, there was an important difference between the machine aesthetic in music and in the visual and plastic arts. New technologies had revolutionized the productive basis of many of the other arts: architecture had been fundamentally altered by modern building materials such as steel and sheet glass, painting reflected the naturalistic influence of photography, and the new medium of cinema emerged directly from contemporary technological developments. In music, by contrast, the link to the machine was still only metaphorical. The classical instrumentarium had remained largely unchanged since the middle of the nineteenth century, and some modernist musicians chafed at what they felt to be unbearable technological constraints. They sought not merely to evoke or imitate machines through music but to use machines to make music. As the critic Erich Steinhard argued, “For several years now Stravinsky and other young composers
have been writing unsentimental, motoric, physiological music, which is meant by design to be played ‘cold.’ It is simply a logical consequence that one should now entrust such mechanical music to a machine, or even—perhaps for the first time this century—authorize original compositions for machines.”

The idea of mechanical music as it emerged in the 1920s, then, was to move beyond the mimetic suggestion of the machine in human performance to the actual production of sound by mechanical means.

Although both its advocates and its critics often regarded mechanical music as a symbol of modernity, the phenomenon long predated the twentieth century. The oldest sense of the term referred to automatic instruments such as music boxes, orchestrions, and automata, devices that belong to an important and underappreciated chapter in the history of European music. In the seventeenth century, the Jesuit scholar Athanasius Kircher described the basic mechanism of early automatic instruments as the “phonotactic cylinder.” A spindle made of metal or wood is turned by means of a gear system driven by water pressure, gravity, or some other force. The spindle is bedecked with tiny pins that are precisely placed so as to activate an adjacent row of metal tongues or a similar sounding element. Provided the entire mechanism is turned at a consistent pace, it is capable of reproducing the relationships of pitch and rhythm as they are encoded in a typical musical score. Pinned wheels and barrels fitting Kircher’s description were used as early as the eighth century A.D. By 1700 (around the time of the invention of the pianoforte), keyboard instruments such as organs, virginals, and spinets were being outfitted for automatic reproduction.

In the middle of the eighteenth century, the composer Johann Joachim Quantz noted that “with skill a musical machine could be constructed that would play certain pieces with a quickness and exactitude so remarkable that no human being could equal it either with his fingers or with his tongue.” Quantz thought that such a machine could only excite astonishment, a sensation that would soon wear off once listeners understood how the mechanism worked. In his view, mechanical instruments ultimately served to highlight the aesthetic primacy of live performance, which could be attained only by human musicians. But such dismissals did nothing to dampen the rage for mechanical instruments. Guidebooks such as La Tonotechnie ou l’Art de noter les cylindres, published in 1775 by Marie-Dominique-Joseph Engramelle, provided detailed instructions on the practice of encoding music on pinned cylinders. So great was the cachet of automatic instruments
in the eighteenth century that the triumvirate of Viennese classicism—Haydn, Mozart, and Beethoven—all wrote original compositions for mechanical devices, treating them as entirely worthy means of realizing their musical conceptions.\textsuperscript{14}

The nineteenth century was a golden age of mechanical instruments, from the dainty jangle of the music box to the elaborate symphonic simulation of devices such as the orchestrion.\textsuperscript{15} Among their most famous creators was the inventor Friedrich Kaufmann, whose numerous instruments were displayed in his “Acoustic Cabinet” in Dresden. Astonished critics wrote that “the machines appear to be a living being, thinking and feeling,” and marveled at the automata’s “wonderful and spiritual” performance. Applying a musical Turing test, one observer even declared that “one totally forgets that one is hearing a machine here.”\textsuperscript{16} Such devices continued to be built and enjoyed through the century, although they faced continuous skepticism from those who perceived mechanical instruments as a threat to music’s purportedly nontechnological essence.

With the emergence of the gramophone and phonograph in the early twentieth century, mechanical music took on a new meaning. Critics of the new recording technologies now used the term as a slur. Gramophone records, one German critic claimed, offer nothing but “a soulless jingling, an ugly tone, bereft of all sensual charm”; instead of enjoying the music, gramophone listeners merely marvel at the mechanism that plays it.\textsuperscript{17} Such attacks were echoed on the other side of the Atlantic as well. In a 1906 article entitled “The Menace of Mechanical Music,” American bandleader and composer John Philip Sousa decried “these talking and playing machines” that threaten to “reduce the expression of music to a mathematical system of megaphones, wheels, cogs, disks, cylinders, and all manner of revolving things, which are as like real art as the marble statue of Eve is like her beautiful, living, breathing daughters.”\textsuperscript{18} Thus, in the early twentieth-century mechanical music came to mean essentially “recorded music”; though the term was still used to refer to the products of older devices such as orchestrions and music boxes, it more often referred to newer ones such as gramophone records. In both cases, the expression had a decidedly negative connotation. For most people who invoked the phrase, “mechanical music” meant at best a shoddy substitute for the real thing and at worst a technological perversion of the natural order. The emergence of a new concept of mechanical music would accordingly demand a complete revision of the term’s historical meaning. The instrument that made this possible was the mechanical piano, also popularly known as the player piano.
THE PLAYER PIANO

The automation of the piano began in the late nineteenth century, with devices called—confusingly, in light of later developments—“piano players.” First developed in the 1870s, the piano player typically took the form of a cabinet on wheels which was rolled up to the piano when in use. In order to store a greater amount of musical information than was allowed by the older cylinder and its variants, the notes were encoded as tiny perforations on a spooled paper roll. As the holes on the roll passed over a component called the tracker bar, air was let into the vacuum chamber, and the difference between the atmospheric pressure of the outside air and that in the chamber generated the force required to trigger a set of wooden “fingers,” one for each of the piano’s keys. The machine’s “feet” likewise activated the piano’s pedals.

By the turn of the twentieth century, the piano player had been almost entirely replaced by the player piano, in which the playback mechanism was built into the instrument. Here, again, the machine was not entirely automatic: only the pitches and their rhythmic relations were encoded on the roll, while the “player-pianist” controlled other aspects of the reproduction, such as tempo and dynamics, via dials and also operated the instrument’s pneumatic pump by means of a foot pedal. Unlike many other mechanical instruments, the early versions of the player piano were not designed for passive listening. Creating an artistic rendition of a given roll required manual skill and close familiarity with the score, though indications were often printed on rolls to guide the novice player. These instruments thus occupied a place between the traditional piano and fully mechanical devices such as music boxes and gramophones: they enabled domestic musicianship but demanded much less skill than traditional piano playing.

A new kind of mechanical playback arrived in 1904, when the Welte Company in Freiburg introduced the world’s first “reproducing piano,” the Welte-Mignon—so called because the original model was a compact cabinet unit without a keyboard. In contrast to earlier player pianos, the Welte-Mignon was capable of fully automatic playback. Even the pneumatic pump at the heart of the instrument, previously operated by a foot pedal, was now electrically powered. (For this reason, the Welte-Mignon and similar instruments were sometimes called “electric pianos,” adding another layer of potential terminological confusion: their motive force was electrical but not the sound they produced.) As its name suggests, the reproducing piano also had a different purpose
than the earlier, semi-automatic models. These devices were designed to record and faithfully re-create the performances of the world’s great keyboard virtuos. Using the same basic technology as the earlier player piano, it could capture every movement of a pianistic performance and later reproduce it down to the slightest nuance. The instrument was envisioned as an alternative to the gramophone, which in the early twentieth century was incapable of convincingly reproducing the sound of the piano.\footnote{21}

The recording of pitch and duration on the Welte-Mignon was relatively straightforward. Each key of a specially built “recording piano” was affixed with an electrical contact. These contacts were connected to an external recording apparatus, which contained a paper roll and eighty-eight quills or ink wheels attached to electromagnets, as well as two additional quills for the pedals. When a key was struck on the piano, an electrical circuit was closed, activating the appropriate quill in the recording mechanism, which left a line of ink on the paper roll for as long as the key was held down. Because the roll turned at a constant speed, rhythmic relations were captured in the spacing of the markings along the roll. After recording, the roll was punched by hand, following the indications left by the ink markings.\footnote{22} (The Welte-Mignon could also capture dynamics in the recording process, although the technique is still the subject of speculation. The company closely guarded the secret of the dynamic recording process, and all of the recording pianos were destroyed when the Welte factory in Freiburg was bombed during World War II.\footnote{23}) Unlike the gramophone, which registered the actual vibrations of sound, the Welte-Mignon recorded a set of directions for the later reproduction of music; in this, it anticipated later technologies such as the Music Instrument Digital Interface (MIDI) of the 1980s.

For the advocates of mechanical music, the fully automated piano represented the inevitable final stage of a lengthy process of technological evolution. In this view, the very design of the piano lent itself to the quantification of its motions. As Arnold Schoenberg argued, the piano and other instruments had already been “mechanized” to such an extent that the removal of the human agent required no great technological or conceptual leap:

The objections touched off by the rather provocative expression “mechanization of music” collapse when one realizes how much mechanization has taken place in our most important instruments. Do not merely compare the piano with the violin: on the piano, even apart from the mechanism proper, the system of levers, the tones themselves are ready-made and unalterable,
whereas on the violin each tone, according to its pitch, has first to be produced. Or compare the organ with the horn. On the organ the player in reality carries out a manual movement which has nothing whatever to do with sound-production, merely giving the signal for it to happen. But think simply of the clarinet’s keys, the horn’s valves, the harp’s pedals, the guitar’s frets, and finally the very scroll of the violin, and then decide whether we can do without the mechanical element in our tools for producing sound and whether it has made music worse. It is sentimental to wail about mechanization and unthinkingly believe that spirit, so far as it is present, is driven out by mechanism.24

Converting the reproducing piano into an instrument of mechanical music, then, required only that one bypass the recording process and compose directly onto the medium by punching holes in the paper roll by hand. With this relatively simple modification, the piano—since the time of Beethoven the veritable icon of soulful expression—was rewired into the perfect musical machine.

Perhaps the first musician to attempt to compose directly onto the piano roll was the Italian-German composer and pianist Ferruccio Busoni. Around 1907–08, Busoni sketched an original work for the Aeolian Pianola, the famous American brand of player piano whose name would later become synonymous with the instrument in its manifold forms. Busoni left this piece, entitled simply “Für die Pianola,” incomplete, but even as a torso, it provides an intriguing counterpart to the technological speculations in his Sketch of a New Aesthetic of Music, which he wrote contemporaneously.25

The first substantial explorations of 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. Evans predicted that mechanical instruments would liberate composers from the limitations of physical technique, allowing them to “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.”26 Inspired by Evans’s ideas, Ernest Newman wrote an article entitled “Piano-Player Music of the Future” later that year. 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.”27 He argued that composers of keyboard music had
always had to exert considerable effort to overcome the limitations of their instruments, from the elaborate ornamentation that compensated for the quickly decaying tone of the harpsichord to the use of the sustain pedal as a “clumsy third fist” which allowed the piano to emulate the rich sonority of the nineteenth-century orchestra. In order to fully exploit the technical capabilities of the instrument, it was necessary to
“forget the mechanism of the pianoforte, and the ten fingers to which it has pleased a niggard Providence to restrict us.” Only then would “a genuine piano-player idiom of composition” begin to take shape.  

Later that year Evans sent out requests for original compositions to about twenty composers throughout Europe. Among those contacted was Igor Stravinsky, who submitted his *Étude pour pianola*, which he had already begun when Evans’s letter arrived. More compositions trickled in over the next several years, including original works by Alfredo Casella, Eugène Goosens, Herbert N. Howells, and Gian Francesco Malipiero. As the Aeolian was a player piano, not a reproducing piano, these pieces were not fully automated and required a player-pianist to apply the necessary adjustments of tempo and dynamics according to directions supplied by the composers. The works were premiered in a concert at Aeolian Hall in London on October 13, 1921, following an introductory lecture by Evans. But that was the last most people heard of the music. Aeolian, a focused on profit above artistic novelty, apparently didn’t even bother to advertise the rolls.

**THE STUCKENSCHEIDT CONTROVERSY**

Whereas in England the appearance of original music for the player piano took place without much fanfare and was quickly done with, in Germany it became a sensation. The appearance of this new form of mechanical music was preceded by a period of intense speculation and debate that revolved around technology, the nature of performance, and the relationship between composers and interpreters. The primary catalyst in this musical controversy was a young composer and writer named Hans Heinz Stuckenschmidt. Born in 1901 in Strasbourg, Stuckenschmidt established himself early in the 1920s as a tireless provocateur for the cause of modern music, organizing concerts, publishing widely in major journals, and earning notoriety as a polemical but perceptive observer of the contemporary musical scene.

In August 1924, Stuckenschmidt published a short article entitled “Mechanization of Music” in the Hungarian modernist journal *Ma* (Today). This was the opening salvo of a barrage of writings in which Stuckenschmidt introduced a new concept of mechanical music into contemporary discourse. In the following two years, this essay was printed in various slightly modified forms in no fewer than six different periodicals in Germany, Austria, Czechoslovakia, and the United
With deliberate sensationalism, Stuckenschmidt set out in these articles to champion the mechanization of music as an inevitable and welcome development. In his view, the nuance and unpredictability of human performance were nothing but defects. “The performer’s character, his momentary feelings, his private opinions are quite irrelevant to the essence of the artwork,” he wrote. “The more ‘objective’ the interpreter, the better the interpretation.” The ideal musician is not an interpreter at all but rather an “administrator” (Verwalter) of the composer’s directions. Thus, musical machines such as the player piano and the gramophone could be used to capture definitive performances of canonic works once and for all, rendering new interpretations superfluous. Furthermore, Stuckenschmidt declared, in light of the economic crisis of the early 1920s, performances of classical music had become untenable luxuries. Mechanical reproduction thus ensured the survival of this music, as the interpretation of existing works could be entrusted once and for all to new technologies such as the player piano and gramophone. “In the foreseeable future the musical instrumentalist will be only the stuff of legend,” Stuckenschmidt proclaimed. “Today’s instruments will fill the cabinets of antique collectors.”

Stuckenschmidt’s crusade against meddlesome interpreters was in part a reaction to the perceived liberties taken by interpreters in the early twentieth century, which went beyond nuances of tempo and dynamics. Recordings of performances from this period reveal that it was not uncommon for pianists to improvise entire passages “in the spirit” of the notated music. For example, three different Welte-Mignon recordings of Liszt’s “Liebestraum” show three different endings: one player shortens the piece by a full ten measures, another repeats the final bar, and a third adds a bit of extemporized music. Stuckenschmidt’s position represented the leading edge of a new emphasis on fidelity and the supposedly inalterable form embodied in the score, a view that would become second nature over the course of the twentieth century.

But the idea that mechanical instruments would replace musicians as performers of existing music was the less provocative of Stuckenschmidt’s assertions. His more radical notion was that new compositions could be written for mechanical instruments, conceived specifically for their performative capabilities and free from the conventions and limitations of human musicianship. “The real significance of these machines,” he wrote, “lies in the possibility of authentically writing for them. [. . .] One can compose directly [for the piano roll], as one used
to compose in notes, with all imaginable nuances, with tempi, dynamics, and phrasing of mathematically exact determination.” Though these statements echo the earlier proclamations of the Britons Evans and Newman, Stuckenschmidt was likely unaware of their work. Rather, he was channeling the ideas of the Hungarian visual artist László Moholy-Nagy, whose writings of the early 1920s had sketched the theoretical possibility of creatively refunctioning reproductive media such as the gramophone. (Moholy-Nagy’s influence on the movement for new instruments is traced in greater detail in chapter 4.) Stuckenschmidt’s innovation was to apply Moholy-Nagy’s idea to the musically more viable medium of the player piano: “With this method,” wrote Stuckenschmidt, “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.” Instead of creating the illusory presence of “live” music, the player piano could be used to eliminate the performer altogether, to create music “directly and authentically.” In Stuckenschmidt’s view, this way of working fulfilled composers’ long-held desire for absolute creative autonomy. Like painters or sculptors, they could now produce complete and self-sufficient works, free from the interference of artistic middlemen.

Not surprisingly, given their provocative tone, Stuckenschmidt’s essays unleashed a firestorm of criticism in the musical press. The composer Heinz Pringsheim threw down the gauntlet in a parodic account of mechanical music that presents a humorous parallel to the description of the concert quoted at the beginning of this chapter:

The concert of the future: in the middle of the stage stands the beautiful new Flettner Rotorophone: the bell rings; with solicitous care the “orchestral servant”—the most important personality, so to speak the Furtwängler of the dawning golden gramophone age—puts the authentic record in place and sets the mechanism in motion; a reverentially listening audience, in festive garb, fills the rows of the concert hall into the furthest corners.

Pringsheim argued that the essence of music lies in the act of performance: “What is music,” he demanded, “if not the content of music making? [. . .] Why go to a concert, when there’s no longer an artist to see?” This irreducible basis of music justifies even the reviled cult of the virtuoso, which Pringsheim traced to the “unconscious recognition [. . .] that the musical work is according to its primary definition the object
of the music-making person, whose ideal type is honored and deified in the performing artist.” All efforts to counteract this are based on the mistaken notion that music is a “purely abstract matter.”

Other critics lined up to attack Stuckenschmidt along similar lines. The composer Heinrich Kaminski demanded, “Is it necessary to state the obvious, that the musical human being is a membrane (physically, psychically, and intellectually), and thus an indispensable factor of the genuine creation of music?” Another, Heinz Tiessen exhorted, “Would the composer really be served by his work merely being heard by armchair listeners? No! The composer wants to be played, and the lively actions of an artist who actively champions his work cannot be replaced with the most perfected mechanism, even if it spoke with the tongues of angels.” Erwin Stein likewise insisted that music is inseparable from playing (musizieren). It is not a matter only of acoustics but of artistry, in which the presence of the performing musician is indispensable. For Stuckenschmidt’s critics, then, music was indissolubly connected to the living human being who performed it. Mechanical reproduction estranged music from its origin in human gesture and reduced it to a meaningless play of sounds. Pringsheim brought the matter to its polemical crux: “Does music exist in order to be heard,” he asked, “or in order to be made?”

For Stuckenschmidt, however, the notion that the presence of the performer was somehow essential to music was nothing more than a baseless superstition. “For you,” he admonished his critics, “the human being is the primary factor of music. For us the tones are all that matter. It has not yet been demonstrated that music is made of anything other than ‘rhythms and intervals.’” The mechanical piano was the technological proof of Stuckenschmidt’s musical materialism. Every note the pianist plays is reducible to three factors: the instant of attack (its temporal relation to other notes), the duration, and the speed with which the hammer hits the string (loudness). Each of these can be captured on the piano roll and mechanically reproduced, or even created by hand without any performance. There are quantifiable mechanical actions, and there is the resulting acoustic phenomenon, and that is all:

Ten more or less trained fingers set the keys in motion. The manner of these motions is determined by the mind of the player. But in the moment they are executed, they have ceased being mind and soul. They are now mechanical, controllable, concrete. They can be captured, recorded, filmed, as it were. One would be hard pressed to find a soul in there. Of course, the spirit of
the player is contained in these motions. But it is transformed, material-
ized. [. . .] Every expressive nuance that the pianist creates by the movement
of the keys can also be achieved and captured by mechanical means.\textsuperscript{45}

Denying the primacy of the performer, Stuckenschmidt identified mu-
ic with the physical manifestation of sound, whatever its provenance.
Adopting a tone of hectoring sarcasm, he assailed his critics: “We have
learned that music is something that is perceived by the ears. But ears re-
spond only to acoustic phenomena, that is, to tones. Thus [. . .] it seems
clear that you have an entirely different understanding of music than
we do: something that is not acoustic, which one doesn’t hear—which
is perhaps perceived with the eyes, the nose, or the other senses.”\textsuperscript{46} Thus,
a debate ostensibly concerning a technological matter—the suitability
of the mechanical piano both as a replacement for conventional mu-
cal interpretation and as a medium for original compositions—turned
out to hinge on questions of what might be called musical phenom-
enology. While his critics insisted that the ritual and social character
of concert performance were essential to genuine musical experience,
Stuckenschmidt redefined music as a purely acoustic phenomenon. The
human musician, previously the indispensable vessel through which
tone is borne into the world, was for him merely a potential distraction.

\textbf{MUSICAL MATERIALISM}

Stuckenschmidt’s assault on the verities of classical music, however out-
rageous to his critics, was consistent with many of the radical cultural
currents of the time. The controversy around mechanical music was
only a single front in a wider war between the deeply rooted humanism
of German culture and the burgeoning new order of modern techno-
sience. Stuckenschmidt’s campaign against musical traditionalists par-
alleled the efforts of the Vienna Circle, a group of scientists and philoso-
phers who sought to replace the “metaphysical and theological debris of
millennia” with a modern worldview rooted in radical materialism.\textsuperscript{47} By
subjecting intellectual discourse to rigorous logical analysis, they hoped
to root out the fruitless speculation that occupied much contemporary
philosophy. The group’s mission bore a striking resemblance to Stuck-
enschmidt’s polemics:

[We seek a] neutral system of formulae, a symbolism freed from the slag of
historical languages. Neatness and clarity are striven for, and dark distanc-
es and unfathomable depths are rejected. In science there are no “depths”;
there is surface everywhere: all experience forms a complex network, which
cannot always be surveyed and can often be grasped only in parts. Everything is accessible to man; and man is the measure of all things.\textsuperscript{48}

In a 1929 recruitment flyer, the members of the Vienna Circle sounded the alarm against the creeping irrationalism that threatened to halt the progress of modern society: “We live in a critical spiritual situation! Metaphysical and theological thought is taking hold in certain groups; astrology, anthroposophy and similar movements are spreading. On the other side: ever more conscious efforts for a scientific worldview, logical-mathematical and empirical thought.”\textsuperscript{49} Like Stuckenschmidt, the members of the Vienna Circle saw their position vindicated by inexorable trends in technological development. The mechanization of the world through industrial mass production would once and for all replace meaningless “metaphysical ideas” with the strictly materialist logic of cause and effect.\textsuperscript{50}

Another striking analogue to mechanical music was found in the tendency known as the \textit{neue Sachlichkeit}, or the “New Objectivity.”\textsuperscript{51} Popularized by the art historian Gustav Hartlaub as the title of a 1925 exhibition of contemporary paintings in Mannheim, the phrase denoted an attitude of sobriety and matter-of-factness deliberately
opposed to the volatile aesthetic of expressionism, which dominated German culture in the prewar years and remained influential in the early 1920s. The artists associated with the New Objectivity rejected the earlier movement’s lurid distortions and transgressive outbursts in favor of the dispassionate, often jaundiced reportage of the world around them. A 1925 comparison of expressionist and “post-expressionist” tendencies in painting included some dualities whose relevance could easily be extended to music: “excessive” versus “rather strict, purist,” “dynamic” versus “static,” “monumental” versus “miniature,” “warm” versus “cool to cold,” and “like uncut stone” versus “like polished metal.” Hartlaub’s term was quickly imported into musical discourse, where it signalled the predilection for clear, transparent textures, an omnipresent motoric pulse, and mostly flat or terraced dynamic levels—in short, the total negation of the late romantic espressivo of Mahler or Strauss. The apparent affinities between the New Objectivity and Stuckenschmidt’s notion of mechanical music were widely noted. “The ensouled human as interpreter always represents a danger to the neue Sachlichkeit,” wrote the composer Fidelio Finke in 1928. “The ideal interpreter of this art is the machine; not one that hasn’t yet been invented, but rather one of those already existing devices, which the uncomprehending accuse of lack of nuance.” The musicologist Curt Sachs even claimed that the New Objectivity was an “exact parallel” of the mechanical tendency in music.

One of the earliest musical applications of the term appeared in Heinrich Strobel’s article “Neue Sachlichkeit in der Musik,” published—coincidentally—in July 1926, the month of the first concert of mechanical music in Donaueschingen. Strobel saw the new tendency exemplified in the works of Stravinsky, Reger, Busoni, and Hindemith and in the twelve-tone compositions of Schoenberg, which embodied “the striving for absolute clarity and formal consolidation, the joy of perfected handiwork, playful insouciance, and ‘objective’ forming.” In this music, according to Strobel, “expression” gives way to “construction,” and the channeling of subjective feeling is replaced by the rational organization of aesthetic forms. Strobel elaborated on the new attitude in his 1928 monograph on Hindemith:

It is no longer a question of “capturing in music” events or feelings. One constructs something with tones that is most comparable with a building. Real “creativity” lies not in the desire to “express,” but the desire to “form.” The ordering, constructive work of forming is the actual “content” of music. That it is nonetheless a kind of “expression” is self-evident—but it is not an
“expression” that can be interpreted in terms of feeling (sorrow, joy, lament, contentment, etc.), but rather expression in a higher, spiritual sense, independent of the ego—an ordering and forming.\(^{16}\)

Around the same time, the influential Viennese critic Paul Bekker—one of the leading journalistic advocates of modernist composers such as Schoenberg and Ernst Krenek—laid out an explicitly materialist musical poetics that echoed Stuckenschmidt’s earlier arguments and forged a direct link between music and the visual arts. “No art has been made into an object of metaphysical speculation to a comparable extent to music,” Bekker declared. “Every popular aesthetic boils down to the belief that music is a kind of magic, a miracle, a revelation.”\(^{17}\) In opposition to this irrational view, he argued that the musician finds ready-to-hand material equivalent to that of all other artists. The material “formed” by the composer is “an absolutely real material, a material that is in a scientific sense exactly as objectively and organically determined as stone, wood, canvas, or paint [. . .] a material with which one can experiment, which one can analyze and measure. This material of music is \textit{air}, and the tools of music with which we are familiar, human voices and instruments of all sorts, are tools for working on this material.” Thus, artistic creation is not an act of “invention” (Erfindung) but rather of “forming” (Gestaltung).\(^{18}\) Bekker’s language recalls the so-called formalist aesthetics of the highly influential nineteenth-century music critic Eduard Hanslick, and indeed, in the responses to mechanical music, one frequently encounters allusions to Hanslick’s definition of music as “tonally moving forms.” Paul Stefan, editor of the Viennese journal \textit{Musikblätter des Anbruch}, made the connection quite explicit, stating that “it has been asserted that a generation for which music is nothing more than tonally moving forms [. . .] must necessarily arrive at mechanization.”\(^{59}\) In a 1923 essay in the same journal, Bekker had drawn a connection between the new music of the postwar period and Hanslick’s aesthetics, noting, “This formalist art [. . .] presupposes the unimportance of the emotional and subjective, thus a predominantly collectivist, typical, and objectivizing kind of intellectual orientation.”\(^{60}\)

As this passage makes clear, mechanical music and the aesthetic discourse that accompanied it were by no means isolated from the ideologically charged atmosphere of the postwar years. Slogans such as “Objectivity,” “Construction,” and “Purity” served as highly charged double entendres signalling conjoined political and aesthetic attitudes. In the international avant-garde movements of the early 1920s, such
as De Stijl, the Bauhaus, and Soviet Constructivism, radically abstract approaches to art were frequently joined with more or less overt appeals to left-wing politics. Indeed, as Peter Galison has argued, the modernist quest for “transparent construction” was implicitly political: by breaking down their materials to fundamental units and passing them through the sieve of formalized technique, modern artists hoped to cleanse their work of unwanted historical resonances and traces of parochial nationalism. Hannes Meyer, the Marxist architect who took over leadership of the Bauhaus in 1928, declared in a manifesto entitled “Die neue Welt” (“The New World”), “Pure construction is the mark of the new world of forms. The constructivist form knows no fatherland; it is stateless and the expression of an internationalized way of thought.”

Stuckenschmidt’s point of entry into the politicized art world of the Weimar Republic was the November Group, one of the largest and most influential artists’ organizations of the time, which he joined in the early 1920s. Occupying positions on the political spectrum ranging from center-left democratic socialism to revolutionary communism, members of the November Group were united less by artistic vision than by a common political orientation. Among their many undertakings was a contemporary music concert series, which included a repeat performance of the Donaueschingen program of mechanical music in Berlin arranged by Stuckenschmidt shortly after he took over the leadership of the musical division in November 1926. After this point Stuckenschmidt’s political animus, often only hinted at in his earlier polemical writings, began to emerge more forcefully. Adopting the generically leftist language of the international avant-garde, he declared that the “hypertrophy of individualism” was under attack by a new tendency toward “collectivism, sobriety [Sachlichkeit], and objectivity [Objektivität].” Writing a year later in the American journal Modern Music, he was no less explicit:

The individualism of an age, now definitely passed, which neglected the universal for the personal, has given place to a more collective attitude. For years our literary and graphic arts were devoted to a hysterical glorification of the ego. […] The individual, with his impulses, tastes, and passions, must be suppressed, for unrestrained individualism has always been productive of bad and useless art. It jeopardizes fantasy, form, and purity of workmanship.

In a retrospective article on the November Group’s tenth anniversary published in 1928, Stuckenschmidt derided the notion that “intellectual
production can be imagined without connection to the external world.” In opposition to such romantic solipsism, Stuckenschmidt asserted his belief in the “materialist doctrine” according to which art is “the expression of a dominant or emerging ideology—for my part, a will to relevance, which seeks to change the world.” For Stuckenschmidt, the quarrel over mechanical music reflected the conflict between the bourgeois individualism of the nineteenth century, represented by the expressive, unique, and (as Walter Benjamin would later put it) “auratic” artwork, and technological modernity, represented by the mechanically produced and formally abstract work. Accordingly, the search for deindividuated forms of musical expression was nothing less than the artistic correlate to the socialist-collectivist reorganization of society.

OBJECTIVE MUSIC

The polemical frenzy surrounding mechanical music blurred the distinction between two quite different meanings of the term: first, as a means of replacing the performance of preexisting music; second, and more radically, as a new compositional paradigm conceived from the ground up as music for the machine. This ambiguity lurks both in Stuckenschmidt’s writings and in the reactions of his critics, where it is often unclear which meaning of the term is at stake. But others were more careful to decouple the “productive” and “reproductive” senses of the mechanical music. In an open letter published in Musikblätter des Anbruch, Dietrich van Strassburg accused Stuckenschmidt of overemphasizing the problem of reproduction and neglecting the “more important creative problem of a ‘mechanistic music,’ a compositional technique for machines.” Writing before the 1926 premieres in Donaueschingen, van Strassburg lamented the lack of original mechanical music, which he attributed to an internalized sense of bodily limitations: “That there are still today no truly ‘unperformable’ works is certainly to be explained by the secret control that the thought of technical performability exercises, consciously or unconsciously, upon the act of composition.”

Others supported the idea of original music for mechanical instruments but rejected the notion that these instruments could replace human performers. Hindemith argued that “music reproduced by mechanical means has absolutely nothing to do with music as an art of individual performance; the two have merely the external sonic manifestation in common.” He insisted that mechanical music should be seen as a distinct form of artistic expression, intended neither to imitate nor...
to replace traditional music making: “The advantages [of mechanical instruments] lie merely in their absolute unequivocality, their clarity, cleanness, and in the possibility of the utmost precision—qualities that human playing does not possess, but which it also doesn’t need.”

Ernst Toch likewise explained that mechanical music represented no threat to traditional music but rather a new growth comparable to the rings of development encircling an old city center: “The music in question here is not just any music that is reproduced by a mechanical instrument; it is music for a mechanical instrument, just like ‘music for violin and piano’ or ‘music for orchestra’; it is composed in or out of the spirit of the instrument.”

For composers such as Toch and Hindemith, the purpose of mechanical instruments was not the reproduction of music conceived for live performance but the creation of a new and distinctive kind of music. Mechanical music, in this strict sense, is not simply music that happens to be played by mechanical instruments but music specifically composed for these instruments and their technical capabilities. What the hand-punched piano roll encodes is not the trace of a performance but a novel aesthetic phenomenon. The rejection of the medium’s recording function in favor of what might be called generative inscription could be seen as an analogue to the concurrent crisis of representation in the visual arts. Just as the canvas was no longer a medium for the reproduction of visual impressions but rather the source of abstract forms sui generis, a recording medium such as the piano roll or the gramophone record was conceived as a “sound canvas” on which to project musical phenomena with no parallels in the natural world. In the words of the painter Paul Klee, “Art does not reproduce the visible; rather, it makes visible.”

For Toch, the unique quality of mechanical music lay in the “coolness” of its sound—not a lack of warmth, he is careful to note, but the tangible presence of a “non-warmth” (Nicht-Wärme). Elsewhere, switching metaphors from touch to sight, Toch invoked the “crystalline clarity, the peculiar hyperclarity” of mechanically produced sound, in which there is no trace of human presence:

If the rolls are not produced by performance, but rather made by hand, they show an image of the most perfect, geometrical exactitude, and this corresponds to the sonic effect: a degree of precision that can never be attained by human playing; the absolute objectification, the absolute depersonalization of playing. Nothing slips in which is not fixed in the notes by pitch, meter, rhythm, tempo, and dynamics. Every trace of spontaneity, sentiment, and impulse is expunged.
At the second concert of mechanical music, which took place in 1927 in Baden-Baden, the program opened with back-to-back performances of two versions of Mozart’s F-minor Fantasy (K. 608) for mechanical organ, first from a roll made by the famous British organist Edwin Lemare and then from a hand-punched roll. Toch recalled that upon hearing the first notes of Lemare’s performance, he broke out in spontaneous laughter: “Although the cylinder was made from the playing of an excellent organist, the abject powerlessness of the human wrestling with materiality and the unavoidable side effects of the performance shone clearly in comparison to the beautifully free-floating, unlabored, and flawless objectivity of the ‘handmade’ cylinder.”

Toch’s reaction gives an insightful glimpse into the unexpected resonances of mechanical sound. He recounted that he had never before been able to shake off the feeling of the “mechanical” when listening to performances of instrumental music: only the singer is truly free of this struggle with material, while from the violin to the winds to the keyboard, instruments show a greater and greater degree of mechanical complexity. But listening to the original Mozart cylinders, Toch had a different reaction: “The insurmountable distance between player and instrument, which even for the best organists remains as the awkward imprint of the machine, fell away, and with it the entire musical sediment of the struggle. [. . .] In hearing this entirely ‘mechanical’ organ music, I became free for the first time from the impression of the machine. For I heard something serene, unquestionably self-contained and delineated: mechanical music.” Thus, at the moment of its technological apotheosis, music slips free of its material constraints; the perfect musical machine attains a state of aesthetic self-sufficiency comparable only to that of its supposed nemesis, the human vocalist.

Toch’s anecdote gives witness to a phenomenological shift in which the absence of human performers is reconceived as the presence of a new aesthetic quality. Accordingly, rather than concerning themselves with the capability of performers, composers must now attend to listeners and their perceptual abilities. The critic Erich Doflein explained, “Since playability need no longer be heeded, audibility—the artistic shaping of what is heard—must be cultivated to a greater degree.” The disappearance of the human performer collapses the distance between auditors and the musical phenomenon: the spectacle of performance is replaced with the drama of listening itself.
METAPHYSICAL MACHINES

In the eyes of advocates such as Stuckenschmidt, mechanical music was a corollary to the antimetaphysical stance of modern science, an attitude that increasingly permeated daily life as well. But the final performance of the 1926 Donaueschingen festival, a stage work called the *Triadic Ballet*, put a very different face on the mechanization of art. On the stage, three dancers in brightly colored or metallic geometrical costumes performed a series of puppetlike dances, their motions slow and deliberate, animated by a dreamlike seriousness. Offstage and out of sight, a mechanical organ intoned a musical accompaniment, its motoric rhythms seeming to animate the abstract figures onstage. Equal parts formal rigor and vaudeville playfulness, the *Triadic Ballet* was at once a multimedia showcase for the mechanical aesthetic and a bizarre critique of the entire phenomenon.

The work was the brainchild of Oskar Schlemmer, one of the foremost theorists and practitioners of the Bauhaus theater. Beginning in 1921, he led a theater workshop at the school that integrated the conventional elements of dance, acting, and set design with music, painting, and projected lights in a multimedia fusion that exemplified the Bauhaus’s characteristic blurring of aesthetic boundaries. Schlemmer hailed the “confusion of artistic concepts” as the sign of an emerging synthesis of all the arts. He saw his theatrical innovations as a continuation of the earlier experimental works of artists such as Viking Eggeling, Alexander Lazlo, and Ludwig Hirschfeld-Mack, who sought to integrate sound, light, and motion in a single creative vision. In his pedagogical activities at the Bauhaus, Schlemmer also exhibited a keen interest in music and sound as aspects of stage performance. He encouraged his students to explore the possibilities of both mechanical and traditional musical instruments and to investigate the various tonal qualities arising from different physical materials.⁷⁸

Like many artists of the time, however, Schlemmer saw the guiding spirit of the age in architecture, which served as a model of “the simplest and most powerful abstraction: the severe and clearly structured form, in opposition to nature.”⁷⁹ This passion for the abstract shaped Schlemmer’s design of the dancers’ costumes, which in turn provided the formal impetus for the overall structure of the *Triadic Ballet*. Schlemmer envisioned the costumes as a means of transcending particular, individual human shapes in order to attain ideal universal forms; they were to provide “an intermediary between absolute, (in)human marionettes and
In his theoretical writings, he distinguished four ways of relating the human form to space. The first is a kind of applied cubism, which maps the parts of the body onto “spatiocubical constructions.” The second is guided by the functional laws of the human body and results in a variety of typified shapes approximating natural forms, such as an egg shape for the head and ball shapes for the joints. Schlemmer compared the result to the form of a marionette. The third is based on the laws of motion of the human body, creating shapes based on the dynamic potential of the different body parts. The result is a “technical organism.” Finally, the fourth is a “dematerialization” of the body that converts the elements of the human form into symbolic, metaphysical shapes: the hand becomes a star, and the folded arms become a lemniscate, or infinity symbol.

Schlemmer’s first ideas for an abstract stage work based on geometrical costumes originated in 1912 and were inspired by Arnold Schoenberg’s groundbreaking song cycle *Pierrot Lunaire*. The *Triadic Ballet* was finally premiered in Stuttgart in 1922 and underwent a number of changes and different productions over the following decade. The title of the work alludes not to the musical phenomenon of the major or minor chord but rather to the concept of the triad on a more conceptual level. From the number three and its multiples, Schlemmer
derived the organizing principle of the entire work. The *Triadic Ballet* comprises three aesthetic dimensions (costumes, music, and dance). There are three dancers, eighteen costumes, and twelve dances. The work contains three major sections, each further subdivided into a series of short dances. Each section is characterized by a dominant color and mood: the first series is lemon yellow and “jovial-burlesque,” the second is pink and “ceremonial-solemn,” the third is black and “mystic-fantastic.” On the visual plane, Schlemmer conceived an additional organizational triad, each component of which is further subdivided by three: space (height-depth-breadth), form (triangle-circle-square), and color (red-blue-yellow). Finally, the triadic structure of the work had symbolic overtones which were at once metaphysical and political: for Schlemmer, three is the number in which “the monomaniacal ego and the dualistic opposition are overcome, and the collective begins.”

Schlemmer originally intended to use the music of three different composers (Stuckenschmidt, Toch, and Hindemith, in that order), mirroring the theme of the triad and the three parts of the ballet, but the job eventually fell to Hindemith alone. Collaboration between Schlemmer and Hindemith had started in 1921, when Schlemmer designed stage sets for performances of Hindemith’s short operas *Mörder, Hoffnung der Frauen,* and *Das Nusch-Nuschi* in Stuttgart. (In an interesting parallel to the *Triadic Ballet,* *Das Nusch-Nuschi* was subtitled “A Play for Burmese Marionettes.”) The Donaueschingen performance was the first time the ballet was performed with originally composed music. Earlier versions of the work had used a medley of eighteenth-century and contemporary classical music: pieces by Haydn, Mozart, Debussy, and others accompanied the dance of Schlemmer’s forms. Many of the critical reviews of the early production focused on the incongruity of abstract costumes and unconventional dance with traditional and even overtly “classical” music, and Schlemmer himself admitted that the music used in the early productions of the *Triadic Ballet* were determined more by convenience than by aesthetic design. His decision to present the ballet in 1926 with newly composed music for mechanical organ was likely motivated in part by these criticisms.

Hindemith’s music for the *Triadic Ballet* consisted of hand-punched rolls for the Welte-Philharmonie mechanical organ (sibling of the Welte-Mignon), which had been introduced in 1912 and in the following years had become a popular choice for musical accompaniment to silent films. This instrument, even more than the reproducing piano, could be seen as the logical endpoint of musical mechanization. Long before
the twentieth century, the organ had been regarded as a triumph in the technological mastery of sound. According to the critic Eberhard Preussner, the historical study of sound technology could be undertaken on the basis of this mechanical “ur-instrument,” whose elaborate apparatus converted the motions of the player into a highly differentiated sonic output. Another writer suggested that the very term mechanical organ was redundant, since the instrument was already a triumph of mechanization. For Schlemmer, the Welte-Philharmonie was a natural fit to the spirit of the Triadic Ballet: the music-box quality of the mechanical accompaniment, the puppetlike choreography, and the “mathematical and bodily mechanical” costumes combine to create a harmonious whole whose balance and restraint he opposed to the “psychological exuberance” characteristic of contemporary dance.

The Welte-Philharmonie was a rather modest instrument, possessing only five stops plus an automatic percussion mechanism with four drums. Hindemith noted with pride how he had wrested music of great
variety from such limited means. The character of his accompaniment is typical of the mechanical music genre, favoring sprightly tempos, polyphonic textures, and virtuosic figuration. Schlemmer, however, was not entirely satisfied with the music. Although the mechanical exactitude of the music nicely fit the precise motions of the stage figures, he found that some sought-after synesthetic correspondences—for example, between the costumes’ shimmering metallic spheres and the sound of trumpets—could not be fulfilled due to the organ’s timbral constraints.

Reviews of the *Triadic Ballet* showed the polarization typical of the time: some critics assailed the work as a mere play of forms and bemoaned the “gimmicks of constructivist intellectuals,” while others gushed that Schlemmer’s work was “unreal and yet true” and “full of meaning, though words cannot grasp it.” Erich Steinhard, whose account of the concert’s earlier performances for mechanical piano was quoted at the beginning of this chapter, questioned why, in a world of automobiles, airplanes, and neon signs, the dancers should not themselves be automatons. He drolly noted that the only thing missing was a mechanical audience that automatically whistled and clapped.

Steinhard’s jibe was prescient. Schlemmer dreamed of taking mechanization even further, culminating in “plays whose ‘plots’ consist of
nothing more than the pure movement of forms, color, and light.” In his view, this “absolute visual stage” was the inevitable outcome of the techno-aesthetic logic of mechanization: “Should the dancers be complete marionettes, pulled on strings, or better, moved about autonomously by a perfectly mechanical precision apparatus, almost without human input, unless by means of an invisible control panel? Yes! It is only a question of time and money, in order to complete the experiment in this fashion.” This idea was inspired by Heinrich von Kleist’s 1810 short story “Über das Marionettentheater,” a literary dialogue about technological mediation framed as a conversation between the narrator and a puppeteer. Controlling a puppet, Kleist’s story suggests, is no thoughtless act “like turning the handle of a barrel-organ.” In order to gracefully control the marionette, the puppeteer must “transpose himself into the center of gravity of the marionette,” performing a kind of virtual dance whose motions are transmitted through the strings to the lifeless figure below. In Schlemmer’s twentieth-century spin on Kleist’s parable, the choreographer retreats behind the scenes to direct the drama of the mechanical stage, just as, in Stuckenschmidt’s vision, the musician is replaced by the composer-technician who controls the instrument from afar.

From one perspective, then, both men pursued parallel objectives: they both sought to rejuvenate performance art—ironically—through the mechanization of performance. Schlemmer, like Stuckenschmidt, viewed the machine not as a threat but as an opportunity for new forms of artistic expression. In a 1926 journal entry, he reduced the technological enthusiasm of the Weimar Republic to a tidy formula: “Not the misery of mechanization, but the joy of precision!” While their critics took for granted the necessity of human presence, Schlemmer and Stuckenschmidt embraced mechanization as a means of reducing performance art to its phenomenal essence. Their goal was not the fetishization of technology but rather a degree of formal purity that the self-consciousness of performers could only impede.

But the two men diverged when it came to the broader meaning of mechanization. For Stuckenschmidt, mechanical instruments were weapons in the struggle between antiquated artistic obscurantism and the modern scientific worldview. Schlemmer, on the other hand, preached a parallelism between technological advancement and spiritual depth. Material progress promised to efface the very distinction between the mechanical and the metaphysical: “Possibilities are extraordinary in light of today’s technological advancements: precision
machinery, scientific apparatus of glass and metal, the artificial limbs developed by surgery, the fantastic costumes of the deep-sea diver and the modern soldier, and so forth. . . . Consequently, potentialities of constructive configuration are extraordinary on the metaphysical side as well.”

Although he was committed to the modernist project, with its emphasis on rational methods and its distrust of intuition, Schlemmer sought to incorporate many of the “spiritual” elements that Stuckenschmidt hoped to banish. For Schlemmer, abstract-mechanical art was directly linked to a higher purpose: the new theater was intended “to serve the metaphysical needs of man by constructing a world of illusion and by creating the transcendental on the basis of the irrational.” The machine, crowning triumph of rationality, frees its creator from the limits of rational thought and transfigures humankind into a “mechanistic organism.” Or, in Kleist’s paradox, “We have to eat again of the tree of knowledge to fall back again into a state of innocence.”

MECHANICAL FAILURE

This entire span of activity, from Stuckenschmidt’s first salvos to the last original compositions for mechanical instruments, lasted only about three years. After the second concert in 1927, the movement quickly came to an end. The once vast potential of mechanical instruments seemed to be suddenly and entirely exhausted. Stuckenschmidt withdrew from his proselytizing and penned an acerb critique of the musical influence of the New Objectivity. His motive may have been in part personal: in spite of his central role in the development of mechanical music, Stuckenschmidt had not been invited to write music for the 1926 concert in Donaueschingen. Several weeks before the concert, he wrote a letter to Prince Max Egon of Baden, the nominal patron of the festival, claiming he was the victim of inexplicable injustice on the part of the organizers of the concert (among them Paul Hindemith) and asking the prince to intervene on his behalf. Nothing came of it.

Ironically, it was Hans Haass, who composed the most remarkable tours de force of mechanical music, who wrote what could be seen as its obituary. In an article entitled “Über das Wesen mechanischer Klaviermusik,” published in October 1927, Haass pulled the rug out from under the movement with a critique of the key notion of musical “objectivity.” The meaning of objectivity, he argued, is “complete freedom from all individuality: that is, the exclusion of capricious or
involuntary notions on the part of the interpreter as well as (and I stress) the composer himself.” Thus, an objective piano music would be one in which “every single note, even the smallest, has a value that is determined to the most precise degree.”

But this precision is exactly what the mechanical piano lacks. Haass enumerated several technical imperfections that compromise the instrument’s “objectivity”: the sensitivity of the paper to humidity, the inaccuracy in the placement of notes upon the roll, and fluctuations in the spinning speed of the roll as the paper accumulates on the spindle. But the real problem, Haass argued, is that devices such as the Welte-Mignon have been designed from the beginning as instruments of reproduction, meant to record and re-create the highly individual playing techniques of human performers. The machine is optimized to play what human hands can play: technically difficult passages, such as arpeggios through several octaves and repeated chords, require a greater amount of mechanical energy, in analogy to the increased exertion by a performer playing these passages: “In [certain] cases, increased technical difficulty causes an increase in volume, which a purely objective music within its limits cannot make use of, precisely because this music seeks to avoid the impression of expression.” Thus, creating truly objective music with the Welte-Mignon or comparable instruments was, according to Haass, an unattainable ideal.

While Haass tempered his critique by noting that the Welte-Mignon was still capable of playing extremely fast and otherwise unperformable music, his article was an early sign of a growing unease among the advocates of mechanical music. The journalist Hans Heinsheimer anticipated the idea that the piano’s limitations were hardwired in an article published in the wake of the 1926 Donaueschingen concert. “The free reign of the musical imagination encounters in the material properties of the piano limitations scarcely different from those of the sound produced by human hands,” Heinsheimer declared. “For mechanical music we require genuinely mechanical instruments.” In writing directly for the Welte-Mignon, composers had hoped to transcend the limitations of performers, but in so doing, they were brought face to face with the constraints of the instrument itself. Before long, they found that the unique technical affordances offered by the instrument—extreme speed, sustained volume, and sheer mass of musical activity—quickly wore thin. This, too, had been foreseen early on when Hindemith admonished composers of mechanical music against the “senseless accumulation of technical complexity.”
In spite of these difficulties and disappointments, one particular use of these technologies still held out promise: the accompaniment of silent films. Mechanical music seemed perfectly suited to this purpose, because it ran at a constant tempo, just like the film reel. Hindemith was the foremost advocate for this application of mechanical instruments: he pointed out the uncanny disjunction between the “dead” filmic image and the “live” music that typically accompanied it and pleaded for original mechanical music written expressly for new films, rather than added as an afterthought. Thanks in part to his influence, the Donaueschingen festival programs from 1927 to 1929 featured a number of works for mechanical piano and organ that were composed especially for films.

But even this relatively modest application of mechanical music proved to be ill-fated: at the Baden-Baden festival in 1927, on the same day as the premiere of Hindemith’s mechanical organ soundtrack for the short cartoon film *Felix the Cat at the Circus*, there was a demonstration of the Tri-Ergon sound-film technology by Guido Bagier, a technician for Universum-Film-Aktiengesellschaft (UFA), the premier movie studio in Weimar Republic Germany. That evening, the audience was invited to compare a live performance of Hanns Eisler’s music for Walter Ruttmann’s abstract animated film *Lichtspiel, Opus III* with the same music recorded onto film via the Tri-Ergon process. Thus, no sooner had Hindemith attempted to salvage a role for mechanical music as synchronized film accompaniment than this function was eclipsed by the newer and more advanced technology of sound-on-film. Why synchronize the film reel with a mechanical organ when the music can now be recorded directly onto the sound track? The programs of the next few festivals featured various configurations of film and music, both live and recorded on sound film, but only one additional piece of film music for mechanical instruments, a collaborative piece for the Welte-Mignon by Hindemith and Werner Gräff for the Hans Richter experimental short *Vormittagsspuk* (Ghosts before breakfast). This was the last known original piece of music for mechanical instruments composed in the Weimar Republic.

The ideal of mechanical music would not be abandoned, however, but pursued in new forms. For the some disillusioned partisans, the gramophone and sound film offered the best of both worlds: like the piano roll, they provided a medium for “direct composition” without the intervention of performers. But they also opened up a new sound world far beyond the confines of the piano, a domain of infinite tonal
gradations and undiscovered timbres. Another response to the failure of mechanical music was to turn to the new field of electric instruments that had opened up in the second half of the 1920s. In these instruments, the electrical signal emitted by vacuum tubes was converted into a musical tone, allowing a new degree of control over pitch, dynamics, and timbre. The underlying principle of elektrische Klangerzeugung (electric tone generation) promised to expand the domain of sound, albeit with human performers ensconced at the controls.107

Meanwhile, a final ironic outcome of the movement inaugurated by Stuckenschmidt was that by the end of the 1920s the term mechanical music had exploded into virtual meaninglessness. In the music journals of the time, the phrase became a catchall for contemporary developments in music technology, from radio to gramophone to new electric instruments. On a more technical register, the engineer Peter Lertes, who in 1933 published the first book-length overview of the new electric instruments, used the term mechanical as a retronym to describe nonelectrophones, similar to the way the word acoustic has been used in the second half of the twentieth century.108 A few years earlier, the critic Paul Bernhard had drawn a more radical conclusion by declaring that the only nonmechanical form of music was human song, since “all music is made with machines; the throat alone is organic.”109 Perhaps Stuckenschmidt would have been pleased.