On June 23, 1942, six months after the United States entered World War II, the Bendix Aviation Corporation held a celebratory banquet at the prestigious Waldorf Astoria hotel in New York City to honor its president, Ernest K. Breech. Later heralded for saving the Ford Motor Corporation (he became chairman of the board in 1957), Breech was being honored for his role in the success of Bendix’s aviation instruments, then being used in every wartime aircraft. The title for the night’s entertainment—“The Invisible Screw”—was company shorthand for its “insertion aviation instruments, accessories and controls,” and the program featured the drummer Panama Francis and his swing band. The “Invisible Screw” was an umbrella term for five instruments then “serving with American fighting machines,” each of which lent itself to sexual double entendres: the Stromberg Injection Carburetor, the Eclipse Direct-Cranking Starter, the Scintilla Aircraft Magneto, the Bendix Direct-Reading Compass, and the Pioneer Turn-and-Bank Indicator. On the printed program, each was pictured in an inset box and appeared to serve an erotic function; for example, the coils of the magnetos were drawn as a pair of disembodied breasts.

The relationship of women and machines in Euro-American male erotic fantasy gets its full treatment in this program, dominated as it is by a graphic fantasy of clear skies filled with heavenly female bodies enjoying sexual relations with “insertion aviation instruments, accessories and controls.” Eight goddess-sized naked women dominate the heavens as various mechanical phalluses make ready to pleasure them. One
woman joyfully straddles a fighter plane; another gasps with pleasure at the carburetor injecting her upper thighs; the largest blonde figure sports a pressure gauge for a pubic triangle while also poised to throw a javelin-shaped phallic crank like a thunderbolt. Two brunettes lie on their back with their legs spread: one has her legs in the air, holding an air pressure gauge between her feet; the other sleeps unaware that two different “insertion aviation instruments” are sneaking up on her (both look like guns). One woman is shown happily bent over and prone, awaiting two large screws poised perpendicularly above her backside. Two women function as bookends for the scene on a smaller scale. On the bottom right side, a standing nude preens against an imaginary wall, her breasts pushed forward like weapons. On the bottom left, a relaxed, chummy blonde straddles the Bendix logo, leaning forward and offering her breasts for her country. The logo consists of cutaway airplanes with their noses in the air, repeating into infinity, and slants right (a graphic motif commonly used to indicate speed) to point to these words: “The Invisible Screw: Bendix Assignment Corporation.”

There are no men in the graphic; only unmanned machines give pleasure to these women. But in fine print there appears a recruitment call for young men between the ages of 18 and 26 for “screw training” to learn how to “fly to victory with the U.S. Army, Navy or Marine Corps.” Such heroic men would use the Bendix parts that “helped fliers put the finger on the Bottom” and assisted “the U.S. battle boys that blasted the Virgin Islands.” The erotica of machine aesthetics is quite clear in 1942: “In every duty, ‘The Invisible Screw’ is fast, precise, alert . . . [as] are the more than 40,000 trained workers of . . . Bendix.” What are you waiting for, the subtext of this erotic fantasy fairly shouts, “Join America’s invincible screw!”

The development of the American pleasure machine—that is, the techno-dialogic of eroticized popular culture—is the subject of this chapter.

In the 1920s the transformation of American society by mass production drew more intellectual bemoaning than constructive criticism regarding the loss of communal purpose, local traditions, individualism, and spiritualized virtue (to name a few romantic ideals). But a generation after Henry Adams perceived that “the machine” had replaced Christianity as the driving erotic force of Western civilization in “The Dynamo and the Virgin,” white male liberal intellectuals such as
Mumford, Chase, Dewey, and Anderson did attempt to assess the social benefits and liabilities of machines, arguing for the need to reaffirm “human values”—for them, a self-evident concept comprising Enlightenment individualism, Christian piety, and a heroic masculine resistance to religious and political tyranny. Even in the 1920s, working-class Euro-Americans, African Americans, and immigrants—those without the luxury of nostalgia—were drawn to cultural forms that integrated machine aesthetics into their everyday lives. As I have suggested, one social adjustment came through the development of a new machine-driven tempo in music.

In this chapter and the next, I analyze two Machine Age dance formulations in which machine aesthetics and mass-production methods were displayed for popular consumption. Here I explore a “top-down” method in which a dictatorial impresario employed chorus lines of anonymous women to produce abstract geometric patterns. Florenz Ziegfeld was the American pioneer of what I call “mechanized choreography,” and his most important heir was the director Busby Berkeley. The type of theatrical spectacle engineered by Ziegfeld was appropriate to the large-scale industrialization that characterized American economic organization. In the Ziegfeld Follies, and later in Busby Berkeley musicals, women functioned as cogs and punch cards in immense, mechanically-rotated tableaux of lavish fantasy. I call such spectacles “female-powered dynamos,” and they reflected a specifically Euro-American male cultural hunger for more pleasure within a Machine Age modern aesthetic. These spectacles were a response to industrial repression and led to the mass production of the “standardized Ziegfeld [female] body.”

Ziegfeld’s success derived in part from an “uncanny ability to combine the exotic with the familiar, the ‘high’ culture with ‘low.’” His New York audiences were the social elites; his star performers were non-white or working class in origin, and his revues toured all over the country. He dressed chorus girls in the fashions of world-class designers; employed the classical composer Victor Herbert to write his scores; introduced “ballet elements into musical-comedy numbers”; and stylized African American social dances (the cakewalk, fox-trot, shimmy, and turkey trot) for elite consumption. One theater critic highlighted this mediation of classes and tastes in a review of the 1915 Follies: “It is a monster vaudeville pageant framed in plush, an organized comedy romp in a rose garden, a high-brow scenic revel shot with good low-brow fun.”
There was also a grassroots explosion of individual dance innovation. By screwing metal taps into shoes, tap dancers industrialized—and “metallicized”—the sound of the human body in motion. Each tap dancer worked to stylize speed, precision, repetition, smoothness, and rhythmic continuity into an expressive individual dance, and tap captured the American imagination as few dance forms have before or since. Every actor, singer, dancer, and comedian needed to be able to tap in the interwar period, and the best dancers were national celebrities: Fred Astaire, Bill Robinson, John W. Bubbles, Ray Bolger, the Nicholas Brothers, and Eleanor Powell (among many others) were known for their individual styles. Tap dancers embodied the possibility of taking the nation’s speeded-up tempo onto the individual human body and were symbolic of the conflicted technological desire to assimilate and resist machine aesthetics. If Ziegfeld and Berkeley nourished a certain need for the collective expression of a new mechanized order, tap reflected a hunger for individual, body-centered rhythmic engagement. Tap and mechanized choreography occupied opposite poles of industrialized dance between the world wars.5

I juxtapose Henry Adams and Florenz Ziegfeld to highlight a cultural rift in the dissemination of technological change between the rhetoric of political leaders and theatrical demonstrations by producers of popular culture.8 For example, on May 24, 1844, Samuel Morse transmitted the first long-distance telegraph message from Baltimore to Washington, D.C., over newly laid cable along the Baltimore and Ohio Railroad’s right of way. The words struck the proper note of awe and human transgression: “What hath God wrought!” The phrase was provided by the daughter of the commissioner of patents, and the event was attended by political dignitaries to confer the proper authority and import, just as such “elders” attended the ground-breaking of railroads between the 1850s and 1869. In 1844 there still existed the fear that humans were playing with forces of divine power; God therefore had to be invoked, even if ambiguously—as much to say “excuse our human arrogance” as to call for a blessing. Thus new technological power was conducted into society by politicians and industrialists employing Christian rhetoric concerning the nature of human capability and daring.7

In contrast, perhaps the best-known transcontinental telephone call was made by Florenz Ziegfeld to his wife Billie Burke. The first such call took place in 1914, and a famous one between Alexander Graham Bell and Thomas Edison on January 25, 1915. But the breakthrough was
dramatized further every night at the 1915 Follies with a reenactment of a call between Ziegfeld and Burke of a month later. In a skit called “Hello, Frisco,” the actor Bernard Granville (playing Ziegfeld) placed a call from New York to the actress Ina Claire in San Francisco (playing Burke), setting a large map of the United States in motion as “Ziegfeld girls,” playing operators, rushed to make the necessary connections. The industrial society was thus shown as unified for a constructive purpose: in effect, to create a system of spontaneous communication. The vignette symbolized both the magic of the telephone in annihilating space and, more importantly, the continued technological unification of the United States; it was a way for audiences to share in the achievements and hopes of techno-progress. “Hello, Frisco,” was the most popular song of the 1915 Follies.

That such a momentous technological innovation was conducted into public awareness by a theatrical producer and his actress wife symbolizes the communicative function of popular culture in American society, as well as the need for Americans to feel included in techno-progress. Of course, it signifies the new cult of celebrity and its vagaries of wealth as well. But Ziegfeld’s well-publicized “embrace . . . [of] the spirit of modernity”—his constant use of “telegrams, machinery, public relations”—was another way the public learned to love the tempo of modern life rather than fear it.

The 1915 Follies began the annual revue’s golden age. First, it marked the debut of the architect and theater designer Joseph Urban, whose tableaux and mise-en-scène brought the “new stagecraft” of German theater to American stages. Second, dance itself became a “unifying element” of the Follies that year and “eight major dances were performed” (not including musical numbers with movement). Third, technology became a major theme through three vignettes: besides “Hello, Frisco,” there was “Under the Sea,” dramatizing the invention of the submarine, and a production number called “Radiumland,” which featured “Radium girls.”

Increasingly, Americans with little stake in an idyllic New England past looked to the performers and impresarios of popular culture for human-powered visions of the Machine Age and the integration of machine aesthetics into their bodies and their lives. For example, one popular vaudeville routine of the time consisted of a team of men stripping a Model T Ford and putting it back together again in ten minutes. According to Susan Douglas, “By 1910, the prevailing theme in
vaudeville and popular literature was man’s mastery of and alliance with technology... supplan[t]ing] western themes glorifying the white man’s victory over the wild frontier.”

The battle I describe in the following two chapters is ultimately between the human being and the machine—more precisely, between the individual dancer and the camera. It is also a cinematic battle, between Busby Berkeley’s vision of dancers pressed into abstract patterns to serve the camera, and Fred Astaire’s insistence that the individual human body be filmed as a flowing, continuous entity.

In effect, both visions were popular with American movie audiences, and both transformed the cinematic depiction of dance. In the early years of talkies, directors often filmed pieces of the dancer’s body—ankles, heels, knees, faces, torsos—in quick succession. The camera usually reflected the music through quick cuts of just the ankles or the legs from the hip down. Astaire believed this method was ill-suited to the visual and sonic expressiveness of dance—to its rhythmic flow. In the mid-1930s Astaire used his box-office clout and artistic prestige to demand full-body shots of his dancing numbers. Filming the “full figure of the dancer... retain[ed] the flow of the movement intact,” he told an interviewer in 1937. Astaire forced his directors to place the camera “at approximately eye-level and ... shoot the dance as ‘straight on’ as possible.” Before Astaire, “the dance had no continuity, [and] the audience was far more conscious of the camera than the dance.” In disempowering the camera, what came to the fore was the grace, elegance, and controlled power of human motion through space. In forcing an artistic change of cinematic style, Astaire met machine aesthetics halfway and, in effect, won a social victory of individual human self-expression over the impersonally mechanical.

Ziegfeld’s Dynamo

By 1920 the Ziegfeld Follies had earned a “permanent and definite” place in the theatrical landscape, the New York Times wrote, by consistently “hit[ting] the popular mark” and “not only keep[ing] pace with but anticipat[ing] the trend of the times.” Through a series of successful musical comedies, a seasonal bawdy revue called “Midnight Follies,” and annual editions of the Follies, the name “Ziegfeld” came to stand for a sumptuous theatrical visual style that blended vaudeville, variety, and burlesque into a glorified “girlie show.” Its signature selling points were theatrical spectacle, vivid tableaux, and female chorus lines;
Ziegfeld, “a dreamer, a supplier of fantasies,” began in 1907 to “breathe fire into a moribund vaudeville tradition.” The Follies mesmerized businessmen and cultural critics alike, and from 1910 to 1927 had New York’s social elite happily fighting for opening night tickets for the theatrical event of the season.

In 1923 the cultural critic Edmund Wilson declared the Follies an “institution”—with all the “persistent vitality” and “stupidity” of institutions. The annual revue was a shimmering, superficial fantasy, “a glittering vision which rises straight out of the soul of New York.” While providing “consistently gorgeous” women, spectacular tableaux, and lighting and costumes of “distinction and intensity,” Ziegfeld also presented “first-rate performer[s]” such as Eddie Cantor and Bert Williams. The Follies’ fast-paced skits, energetic dance and production numbers, precision drill chorus lines, and chaotic humor caught the energy, tempo, and recklessness of the 1920s. “Expensive, punctual, stiff, it moves with the speed of an express train,” Wilson wrote. “It has in it something of Riverside Drive, of the Plaza, of Scott Fitzgerald’s novels.”

The cultural critic Gilbert Seldes likened the Follies to a “dynamo” in its power, speed, “smoothness and balance.” Like the dynamo, the Follies “aspires to be precise and definite[,] it corresponds to those de luxe railway trains which are always exactly on time, [and] to the millions of spare parts that always fit.” He equated the revue’s torrid pace with the split-second timing and interlocking systems characteristic of mass-production methods; a Follies “production runs smoothly and the parts are neatly dovetailed.” Seldes thought the Follies best displayed machine-influenced artistic production in 1920s America; by way of comparison, he dismissed the Metropolitan Opera as both irrelevant and second-rate. Ziegfeld was the only theatrical producer artistically “in line with our [American] main development,” and the Follies were theatrical productions consciously envisioned as “mechanically perfect organisms.”

Ziegfeld’s artistic triumph lay in his role as a social interpreter of machine aesthetics. If “the machine” was the most dynamic cultural force then acting on society, the role of the artist was to engage it in dialogue. “We tend to a mechanically perfect society in which we will either master the machine or be enslaved by it,” Seldes observed. “And the only way to master it—since we cannot escape [it]—will be by understanding it in every detail. This is exactly Mr. Ziegfeld’s present preoccupation.” For example, many critics thought the aesthetic of chorus lines cold and mechanical—too much like military drill—but Seldes believed that this
was the point; the function of the Follies was “to be Apollonic, not Dionysian,” and its aesthetic was order, not emotional release. For Seldes, even the Follies’ orchestra was governed by a mechanical impulse: “Jazz or symphony may sound from the orchestra pit, but underneath is the real tone of the revue, the steady, incorruptible purr of the dynamo.”

I want to be more specific about the Ziegfeld “dynamo,” since Seldes was not simply being rhetorical. One crucial element of the dynamo, speed, was the “essence” of the Follies, according to Ziegfeld: “Something must be happening every minute.” The comedian Eddie Cantor recalled, “Every show we gave seemed to play with clock-like precision for the audience out front.” The intense, speeded-up tempo of the show, which reflected the urban soundscape, was palpable enough to its audiences that Wilson noted a rewinding-up of energy in the 1923 Follies. “The tempo of the show is now... the same as that of the life outside,” he wrote. “This is New York in terms of entertainment—the expression of nervous intensity to the tune of harsh and complicated harmonies.” The tempo was present in “the machine-like energy of Eddie Cantor,” who joined the dancer Ann Pennington and the comedienne Gilda Gray as “the three highest-pressure performers in the city.” The manic energy of these three performers provided an equilibrium between the energy of the streets and that of the theatrical stage. “When, afterwards, you take the subway home, it speeds you to your goal with a crash, like a fast song by Eddie Cantor,” Wilson realized. “In the roar of the nocturnal city, driven rhythmically for all its confusion, you can catch hoarse echoes of Gilda Gray and her incomparable Come Along!”

Like Seldes, Wilson also perceived the Apollonian, order-making impulse whirring in the Ziegfeldian dynamo as it rendered the chaotic urban intensity palatable to its audiences. In particular he found it in the methodical presentation of white femininity in the Follies’ famous “beauty parades.” This stage convention is familiar now from countless beauty pageants, but Ziegfeld apparently invented the form. Often the women did little but walk across the stage, or up and down steps, adorned in sumptuous fabrics and elaborate costumes; but they were trained to walk with their shoulders back, hips and pelvis thrust slightly forward, in a gait then renowned as “the Ziegfeld walk.” This famous motion “was a kind of slow, flowing series of steps which emphasized the pelvis and raised shoulders... the women entered upstage and slowly walked downstage, a smile gradually forming in recognition of the audience.”
Ned Wayburn, Ziegfeld’s dance director, claimed that overt sexuality was always downplayed in the Follies, with “dignity and impersonal pride” accentuated in carriage and demeanor. Wilson saw in this aesthetic the cold, mechanical qualities of a studied whiteness: “Ziegfeld’s girls have not only the Anglo-Saxon straightness—straight backs, straight brows and straight noses—but also the peculiar frigidity and purity, the frank high-school-girlishness which Americans like.” The intended aesthetic was expressly “not the movement and abandon of emotion”—which was left to ethnic performers of the day. Wilson complained of Ziegfeld’s “ballet . . . becoming more and more like military drill”; he was unaffected by such Apollonian order in his female fantasies. For Wilson, “watch[ing] a row of well-grown girls descend a high flight of stairs in a deliberate and rigid goose-step” was neither erotic nor aesthetically appealing, but “too much like watching setting-up exercises.”

Ziegfeld himself used the term “girl” with great relish to suggest male fantasy rather than female experience or sexual power. He offered the men in the audience “a promise . . . of romance and excitement—all the things a man dreams about when he thinks of the word girl.” The Ziegfeld “girl” Paulette Goddard (later Chaplin’s co-star in Modern Times, and his second wife) commented on her passive role. Playing “the girl on the moon” in the 1925 Follies, Goddard had only to sit on a large crescent moon that descended from above the stage. “I could tap . . . but I was never given the chance. Ziegfeld used to say I was a great sitter. I sat, and I walked.” Ziegfeld girls only had to be beautiful, to walk gracefully, and to submit their erotic power to male direction (Ziegfeld and Wayburn) and the controlling male gaze.

Wilson believed Ziegfeld hit the popular male fantasy of the time by shaping the American female ideal to “what the American male really regards as beautiful: the efficiency of mechanical movement.” Ziegfeld did not attempt to make his chorus girls individually “as sexually attractive as possible, as [at] the Folies Bergère.” They were not framed as individuals but as mass-produced “girls.” Paul Derval, the director of the Folies Bergère for almost fifty years, perceived a similar difference between the two theatrical institutions. “[The] chorus girl Americana as a species . . . [is] mass-produced, like a Chevrolet or a tin of ham.” In contrast, the methods and intent of the Folies Bergère were “entirely different,” and Derval put “greater stress . . . on the personality of each individual member of a troupe . . . [U]niformity breeds boredom . . .
I select my dancers in the hope that each will claim the attention of a certain number of spectators!” The British authors of *The Natural History of the Chorus Girl* (1975) similarly noted the lack of individuality among American chorus girls compared to English “Gaiety Girls” and the Follies Bergère.27 Here was an exciting consumer vision for American men: mass-produced wholesome girls.

Ziegfeld’s success in articulating his audiences’ unconscious investment in mass production came from his own attitude toward technology, which was characteristically American: on the one hand, a desire for affordable abundance, and on the other, to be “always searching for the innovation . . . [o] delight the audience.” This mass-produced quality of chorines prepared them to act as automatons in skits about machine processes or technological innovation. A production number in the 1913 Follies highlighted the opening of the Panama Canal by presenting a huge ship on stage entering the locks while “the chorus poured out through the gates imitating the onrush of water.” In the 1914 Follies, Eddie Cantor and Bert Williams celebrated the erection of the Woolworth Building in a skit called “The Skyscraper on the 1313[th] Story, in Course of Construction.” Ziegfeld also experimented: with phosphorescent paint on costumes for lighting effects, with radium to provide a glow-in-the-dark look, and with 3-D glasses. He often brought scale-model airplanes and real cars onto the stage. Ziegfeld tapped the unspoken ideology of techno-progress by providing unifying cross-class symbols of American popular culture—telephones, skyscrapers, airplanes—and in so doing he helped domesticate and disseminate such technological ideas and inventions within epic spectacle.28

Ziegfeld girls occasionally also played machines. In the very first Follies (1907) women dressed up as telephone switchboards in one skit, and “each table connected . . . customer[s] to the switchboard of his choice.” In another skit the girls dressed as dirigibles and each wore a “sweeping searchlight moving over them against a . . . background of a burning city.” In the 1909 Follies there were celebrations of both the airplane and the battleship. In the airplane tribute, the chorus line dressed as aviators while Lilian Lorraine piloted a plane suspended on wires over the heads of the audience, scattering roses as she sang “Up, Up, Up in My Aeroplane.” In a tribute to the United States Navy, forty-eight chorus girls dressed as different battleships, and each wore a battleship-in-miniature as a headdress. At the end, they provided a “special effect”: the lights dimmed and “the
illuminated ships appeared riding the waves of New York harbor with the city skyline in the background."

The nexus of female beauty and new technology was not original to Ziegfeld; he simply enlarged the scope. For example, in the 1880s the Electric Girl Lighting Company rented out "illuminated girls"; dressed in filament lamps as hostesses for parties, such "electric girls" were trendy party favors. That decade's marriage of techno-progress and male fantasy "embodied both the personal servant of a passing age... and the electric light as ornamental object, a dazzling and opulent display of social status in a new age." Of course, the iconography of female-as-divine-light was codified by the Statue of Liberty's electric torch and crowned in 1886. By the 1925 edition of Ziegfeld's "Midnight Frolics," the "electric girl" could be historicized within an evolutionary model of light. One woman was costumed as "Sunlight," one as "Candlelight," one as "Lanternlight," and one as "Electric Light." To the more common male/machine interface familiar in figures such as Steam Man and Superman that celebrated strength, Ziegfeld added a female/machine interface around electricity.

Even without specific technological props, the chorines of the Follies re-created mechanical processes by conforming to the fast, steady, seamless tempo of the show. Ziegfeld girls were not required to be energetic or to provide any individual moves; they represented precision, not individuality. Energized, dynamic, individualized motion was reserved for the ethnic stars. Selles suggested that there was a need in white culture for the modeling of a reenergized body—one in step with the new American tempo—but that upper-class whites were loath to see " Anglo-Saxon" men and women selling themselves through chaotic motion, histrionic singing, or pointless silliness. Trapped within what Max Weber and Ronald Takaki have called emotional "iron cages," Euro-American elites preferred to be stirred by those adjudged as nonwhite, whether Jewish (Fannie Brice, Al Jolson, Eddie Cantor), black (Bert Williams), or even Irish (Marilyn Miller, Ann Pennington). (Cantor and Williams often appeared in blackface.) As with the primitivist perspective, they preferred to see lower-caste ethnic entertainers perform the reenergized body, in effect maintaining the dominant position of observer while others performed the emotional mood of the body politic.

**Machine Aesthetics of the Chorus Assembly Line**

On the other hand, white chorines were straitjacketed into their roles as cogs in production numbers. Sitting in on a dress rehearsal for