THE CULTURE OF TIME AND SPACE 1880-1918

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Harvard University Press Cambridge, Massachusetts

swift revenge and wreck the luxury liner. And, he asked Hans, "are you not afraid of the hurricane which is the second circle of the Inferno" that whips and whirls those who sacrifice reason to desire? Settembrini concluded his argument with a suggestive image of Hans, like a small boat, "flapping about in the gale, head over heels"[23] (The *Titanic* went down in a calm sea, but her stern did flip straight up in the air before the final plunge.) The age had its doubts and hesitations, but it was essentially characterized by hubris that ignored the warning messages and pushed the throttle full speed ahead.

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SPEED

In 1897 Germany embarked on a policy of *Weltpolitik* and began to build a battle fleet to challenge British control of the seas. That same year the German passenger steamer *Kaiser Wilhelm der Grosse* took away from the British Cunard Line the Blue Riband for the fastest Altantic crossing. In 1903, with its national prestige at stake, the British government subsidized the construction of a vessel capable of reaching 25 knots and beating the German record. The Cunard yards produced the *Mauretania*, which regained the Blue Riband in 1907 and re-

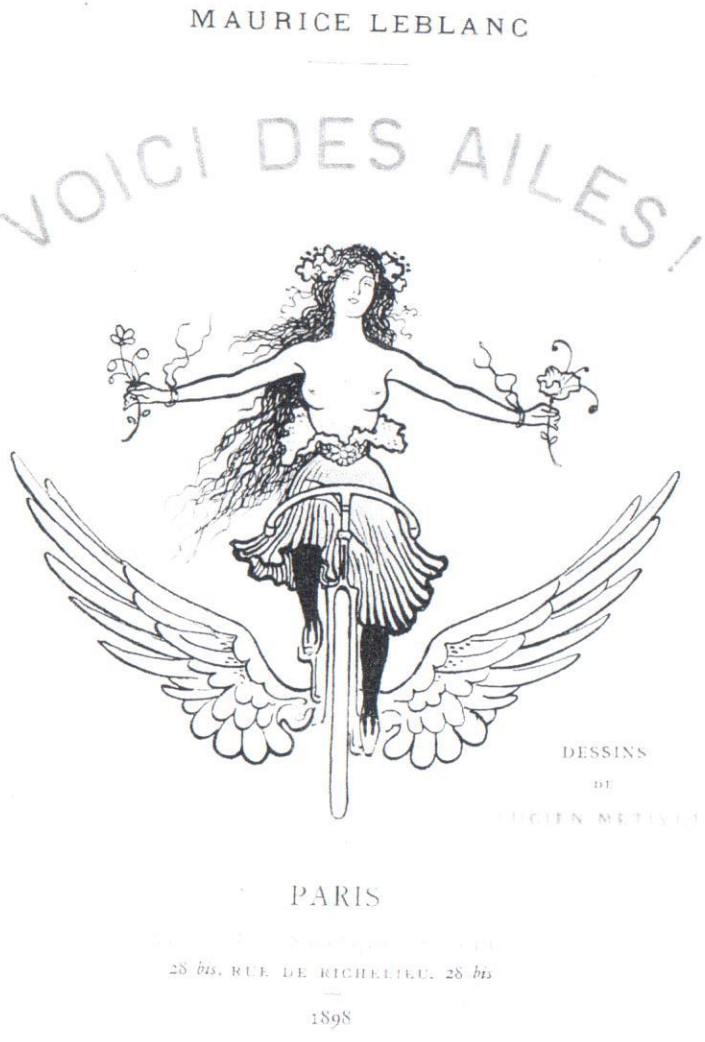

Fig. 3. Title page from Maurice Leblanc, *Voici des ailes!* 1898.

Pascal comments on the dimensions of experience opened up by the bicycle. Steam and electricity only serve man, but the bicycle alters his body with a faster pair of legs. "This is not two different things like man and horse. There is not a man and a machine. There is a faster man." Speeding along he finally declares his love for Guillaume's wife and shouts "we have wings"—to escape the narrow spatial framework of their former city lives, the constricted social world of their ill-suited marriages, the physical confinement of corsets and tight clothing, and the emotional restrictions of their sexual morality.[12]

The automobile captured the imagination in the 1890s and became a major means of transportation in the first years of the twentieth century. In France there were about 3000 automobiles in 1900 and about 100,000 by 1913. Between 1896 and 1900 at least ten journals about "automobilism" appeared, all attentive to the ever breaking speed records, which by 1906 had exceeded 200 kilometers per hour. Commenting on its impact the French novelist Octave Mirbeau mixed metaphors as rapidly as the movement of his subject—the mind of modern man. Under the impact of the automobile it has become an "endless race track." "His thoughts, feelings, and loves are a whirlwind. Everywhere life is rushing insanely like a cavalry charge, and it vanishes cinematographically like trees and silhouettes along a road. Everything around man jumps, dances, gallops in a movement out of phase with his own."[13]

In England the Highways and Locomotives Act of 1878 required that any vehicle using public roads be preceded by a man on foot and not exceed a speed of four miles per hour. This law was abolished by another of 1896 that opened public roads to the faster "light locomotives," but as the number of traffic accidents rose opposition mounted. In 1903 the *Daily Telegraph* campaigned for a new speed limit, about which C. S. Rolls protested: "Our hereditary instincts are shocked at seeing anything on the road faster than a horse, but as our senses become educated we shall recognize the fact that speed of itself is not dangerous but the inability to stop is dangerous."[14] Parliament was not fooled by such doubletalk and in 1904 imposed a limit of 20 miles per hour on public highways, 10 miles per hour if required by local authorities. During the next year 1,500 motorists were charged with reckless driving. The number of traffic fatalities in London increased from 769 in the period 1892–1896 to 1,692 in the period 1907–1911.[15] In April 1914, when a child was killed by the chauffeur-driven car of Hildebrand Harmsworth, son of

minimum "unit times," and reconstructed jobs with composite times as a standard. Although there was nothing new about cracking the whip, scientific management was, as the name implied, scientific, or at least systematic, and avoided the caprice of a foreman's shifting moods. Wages were raised as workers approached their maximum efficiency rate, and those who fell short of a minimum rate were discharged. One of Taylor's reports shows the kind of psychological harassment caused by this systematic speedup: "it was found necessary to measure the output of each girl as often as once every hour and send a teacher to each individual who was falling behind to find what was wrong, straighten her out, and encourage her and help her to catch up."[25] He began to publicize his methods in 1895, stressing that workers complete jobs in the shortest possible time.[26] The following year a Massachusetts builder, Sanford Thompson, devised a "watch book" with stop-watches concealed in the cover, so that they could be operated without the worker's knowledge. Taylor disapproved of "spying" because it undermined the mutual commitment to speed and efficiency between worker and management that he thought essential, but he conceded that some workers object to being timed, and for them concealment might be necessary.[27]

Taylor's disciple, Frank B. Gilbreth, applied the methods of scientific management to work in space. A "motion study" of bricklaying in 1909 enabled him to devise an adjustable scaffold for piling up bricks that tripled worker output. He conducted research by means of "cyclegraphs" produced by attaching small electric lights to the body and making photographic time exposures of motions that appeared as continuous white lines. These made it possible to see the path of a motion and reconstruct it in three dimensions with a stereoscopic light. For more precision he adapted a motion picture camera to take "chronocyclegraphs," which would show "the paths of each of several motions made by various parts of the body and their exact distances, exact times, relative times, exact speeds, relative speeds, and directions."[28] In an article on scientific management of households Gilbreth boasted that with chronocyclegraphy "we can now for the first time record the time and path of individual motions to the thousandth of a minute."[29] His wife, Lillian, who collaborated with him, conceived of a new managerial position—the "speed boss"—whose job was to demonstrate to a worker how a task is to be done in the specified time.[30] But not all was rush, work, and profit. The Gilbreths also sought to reduce worker fatigue, and their

book on that subject stressed the need to offset the dreariness of factory routine by providing a certain number of "Happiness Minutes" for the workers: they concluded with the uplifting thought that "the good in your life consists of the quantity of 'Happiness Minutes' that you have created or caused."[31]

Scientific management, the motion studies of Muybridge and Marey, early cinematography, Cubism, and Futurism reflect aspects of each other across the cultural spectrum like images in a house of mirrors. As the Cubists broke up and recreated bottles and guitars, Gilbreth broke down and reconstructed work processes. He made wire models of workers' movements from cyclegraphs similar to the wire-and-plaster models of birds in flight that Marey made from chronophotographs. Gilbreth's use of successive photographs to analyze motion derived from Muybridge's serial photographs of a galloping horse. Muybridge later used the technique to capture the grace of a woman stooping to pick up a basket; Gilbreth applied it to improve the speed of workers picking up bricks. Cinema was the technological link: Muybridge and Marey were searching for a way to make moving pictures; Gilbreth used the motion picture camera to make chronocyclegraphs; the term for a film's composition—"montage"—is the French word for the assembly of a product from component parts; around 1912 the Cubists began to experiment with "Cubist Cinema"[32]; and the Futurists were inspired by its suggestion of new possibilities for a kinetic visual art. Marcel Duchamp observed that "the whole idea of movement, of speed, was in the air," and acknowledged that his *Nude Descending a Staircase* was inspired by chronophotographs and motion pictures.[33] The cinema reproduced the mechanization, jerkiness, and rush of modern times.[34]

The very name of the new medium identified its effect—moving pictures. The turning projector supplied movement of images on the screen. In 1896 one of Lumière's cameramen, M. A. Promio, hit upon the idea of taking pictures from a moving boat along the Grand Canal of Venice.[35] With creative editing action could move as fast as it did in Griffith's last-minute rescues or at a more leisurely pace in cuts between widely separate places. The story could change settings as rapidly as the interval between frames, and since in the early movies the picture was taken at 16 frames per second and projected at 24, the actors themselves seemed to hurry across the flickering screen. The cinematograph so exaggerated the quickness of movement that some actors moved more slowly than they would in real life in order to give the final result a normal tempo.[36] One critic ex-

His first subject was the dachshund in *Dynamism of a Dog on a Leash*, scurrying along next to its mistress (see Figure 2 above). With *Rhythm of a Violinist* he depicted several different movements simultaneously—vibrating strings, gliding bow, left hand grasping the neck, and sound vibrations pulsating through air. *Girl Running on the Balcony* did not picture speed better than the action of the dog or the violinist, but with it he began to shift from concrete to abstract movement. There is a suggestion of a swirling skirt and running feet, but the girl's motion is generalized and her successive forms are of equal value, rendered alike in size, shape, composition, and color. In 1913 Balla produced a series of paintings of the flight of swifts in successive stages, wing overlapping wing as in a Marey chronophotograph, strung like links on a chain of continuous flight. With *The Swifts: Paths of Movement + Dynamic Sequences* (1913) he approached abstract movement. The schematized birds flutter all over the canvas without any specific direction and follow oscillating, luminescent lines that both channel and break up their patterns. Balla then turned to painting automobiles, but with barely recognizable forms. The speeding windows flash like facets of a turning gem, and spinning wheels spiral into lines of force. The title of one listed the themes: *Speed of an Automobile + Light + Noise*. Toward the end of 1913 he entirely abandoned concrete subject matter and rendered simply *Abstract Speed*. The force lines that formerly eddied about birds and autos now coil out of artistic forms alone. The arcs of force lines bend from movement itself; light reflects along lines of unidentifiable objects, energized by unknown sources.

While Balla was pursuing the image of abstract speed, Boccioni sought to create continuous movement, and at the end of 1913 produced his masterpiece, *Unique Forms of Continuity in Space* (Figure 4). He worked up to it over several years with statements of purpose and partial solutions of the artistic problems in drawings and sculpture. In a manifesto of 1910 he proclaimed the Futurist intention "to express our whirling life of steel, of pride, of fever and of speed." The artist will render not a fixed moment but the dynamic sensation of movement itself.[47] Boccioni was intrigued by Bergson's distinction between relative motion (that we know from outside) and absolute motion (that we intuit from within), but challenged Bergson by insisting that an artist could synthesize both in a single image. The title of a manifesto of 1914 expressed the argument as an equation: "Absolute Motion + Relative Motion = Dynamism."[48] This dynamism avoided two bogus methods of rendering movement—chronophotog-

Fig. 4. Umberto Boccioni, *Unique Forms of Continuity in Space*, 1913.

mated accelerations as if the fingers could not wait for the next beat. Contemporary music critics suggested possible connections between ragtime and life style. In an article of 1915, one critic wrote: "Our children dance, our people sing, our soldiers march to rag-time." And in an essay on the "current unrest" in American society, published in 1914, Walter Lippmann observed: "We make love to ragtime and we die to it."[53]

Around 1900 in New Orleans another new music was created by blacks. Unlike ragtime, which remained locked within a steady tempo, jazz made constant inventions and variations in the tempo and allowed a free *rubato* style. Its new orchestral timbre enforced the rhythmic irregularity. Wild squawks of a saxophone and squealing cries of a muted horn accentuated the strangeness of unfamiliar cross-rhythms, polyrhythms, or other unidentifiable rhythms. While jazz had its slow parts, the early Dixieland bands especially seemed to keep to the quick step of modern life. One of many speculations about the origin of its name was that "jazz" was a slang term for speed.[54]

In concert music the climax of the breakup of traditional metres was the rhythmic pyrotechnics of Stravinsky's *Le Sacre du printemps*. The 1913 audience was shocked on opening night. They interrupted the first dance with laughter, then began to shout, and the noise became so loud that the dancers could not hear the music. Stravinsky recalled the scene: "During the whole performance I was at Nijinsky's side in the wings. He was standing on a chair, screaming 'sixteen, seventeen, eighteen'—they had their own method of counting time."[55] Indeed. Even without the din from the audience, the complex rhythms were extremely difficult to execute. Throughout the composition there are frequent metre changes, and in the first thirty-four bars of the climactic *Danse sacrale* it changes twenty-eight times. In that finale the entire orchestra turns into a percussion section with blaring horns, pizzicato strings, and hooting woodwinds dominated by timpani, bass drum, and cymbals all beating a savage rhythm for the sacrificial dancer who leaps and spins to her death.

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The barrage of new speeds brought out the dark side of modernity in mournful jeremiads, snap judgments, and threatening prognoses. In

1881 George M. Beard, who introduced the diagnostic category of neurasthenia (nervous exhaustion) into psychiatric nomenclature, published his *American Nervousness*, which set the tone for literature on the increasing tempo of life and its nefarious consequences. Beard argued that the telegraph, railroads, and steam power have enabled businessmen to make "a hundred times" more transactions in a given period than had been possible in the eighteenth century; they intensified competition and tempo, causing an increase in the incidence of a host of problems including neurasthenia, neuralgia, nervous dyspepsia, early tooth decay, and even premature baldness.[56] An article on old age by Sir James Crichton-Browne in 1892 attracted a good deal of attention with comparative death statistics for the periods 1859–1863 and 1884–1888. He found that heart disease in England killed 92,181 in the former period and 224,102 in the latter. Deaths from cancer and kidney disease revealed a similar increase, which he explained by the tension, excitement, and incessant mobility of modern life.[57] Max Nordau added these statistics to similar figures on the rise of crime, madness, and suicide to fuel his impassioned lamentation about the degeneration of man. Never before, he argued, did inventions "penetrate so deeply, so tyranically, into the life of every individual," and the result has been a drain on the nervous system, a wearing down of body tissue. "Every line we read or write, every human face we see, every conversation we carry on, every scene we perceive through the window of the flying express, sets in activity our sensory nerves and our brain centers. Even the little shocks of railway travelling, not perceived by consciousness, the perpetual noises and the various sights in the streets of a large town, our suspense pending the sequel of progressing events, the constant expectation of the newspaper, of the postman, of visitors, cost our brains wear and tear." In spite of his cultural hypochondria, Nordau did not follow Beard in the assumption that man is capable of just so many sensory impressions per unit of time. He believed that people can respond to most demands made upon them if there is time for gradual adaptation. But the onset of modernity came too fast. "No time was left to our fathers. Between one day and the next, with murderous suddenness, they were obliged to change the comfortable creeping gait of their former existence for the stormy stride of modern life, and their heart and lungs could not bear it."[58]

The turn of the century brought no letup from the fear of progressive degeneration. The title of John Girdner's book of 1901, *Newyorkitis*, identified a new disease—a special kind of inflammation

sides, nothing unexpected ever occurred . . . The rhythm of the new speed had not yet carried over from the machines, the automobile, the telephone, the radio, and the airplane, to mankind; time and age had another measure."[67]

Many writers, however, welcomed the collapse of old palisades and viewed the new speed favorably as a symbol of vitality, a magnification of the possibilities of experience, or an antidote to provincialism. Some, like the Futurists, became so giddy with the thrill of it that their one-sidedly positive assessment lacked nuance. In a more sober vein, the French psychiatrist Charles Féré challenged the vogue of deploring the hurried pace of life by arguing that active and challenged minds became more resistant to nervous breakdown and better able to cope with diverse stimuli, precisely as they become more complex. He presented evidence that many breakdowns occur after long years of hard work when one is suddenly idle and argued that the mind deteriorates more from lack of use than from overuse, more from ignorance than from a surfeit of culture.[68] He also pointed out that improvements in transportation and public safety had made it possible for a contemporary woman to take a long voyage by herself with less strain and less anxiety and in far less time than would have been possible a century earlier for a prudent man armed to the teeth.

Yet there was often a touch of regret for the end of an era even among those admiring the new technology of speed. Octave Uzanne's *La Locomotion à travers le temps, les moeurs et l'espace* (1912) is a good example. Uzanne will miss the slow rhythmic clopping of horses along the road, their heavy breathing pulling up hills, but he is still carried away by the "fever of speed." The automobile, he explained, has broken down class barriers and reduced sectionalism. "Magnificent" long railway lines such as the Berlin-Bagdad and the Trans-Siberian have promoted international understanding. His enthusiasm is expressed with rapturous praise and immoderate metaphor. "The citizen is a mole with his undergrounds; he is an antelope, thunderbolt, cannon ball with his automobiles; he is an eagle, sparrow, albatros with his airplanes." Modern life is undergoing a "stupefying transfiguration" and "the rapid movement which sweeps us in space and piles up a variety of impressions and images in a short time gives life a plenitude and a unique intensity." Here the torrent of new stimuli that Beard thought inherently pathogenic, and Nordau, too fast to assimilate, Uzanne sees as a liberation from the impoverished routines and wearisome repetition of daily life.[69]

Among the many responses to the new technology those of the alarmists appear more impassioned and more numerous than those of the defenders of speed. But protests, however moving, cannot negate the fact that the world opted for speed time and again. People complain about the intrusion of a telephone but rarely do without one and organize their lives with as many time-saving devices as they can. Despite all the mixed feelings, however, it can be said without qualification that the new speed had a profound impact on civilization.

It is precisely this consensus that invites further interpretation, because in the dialectic of experience opposites are linked, and whenever one dynamic is so markedly pronounced we must look for unconscious countercurrents. If a man travels to work on a horse for twenty years and then an automobile is invented and he travels in it, the effect is both an acceleration and a slowing. In an unmistakable way the new journey is faster, and the man's sense of it is as such. But that very acceleration transforms his former means of traveling into something it had never been—slow—whereas before it was the fastest way to go. Suddenly his old horse has become obsolete. Thus for Zweig the way his father walked up stairs never used to seem particularly slow or relaxed—it was the way things were. But years later the course of history transformed his memories, and his father's gait became a symbol of "the Golden Age of Security." So, in the larger world, the impact of the automobile and of all the accelerating technology was at least twofold—it speeded up the tempo of current existence and transformed the memory of years past, the stuff of everybody's identity, into something slow.

Memories have the potential for becoming nostalgic only after changes have made comparisons possible and the past seems irretrievably lost. As steamships monopolized ocean travel, sailing vessels suddenly appeared to be majestic and graceful, instead of unreliable and cramped. Just as contemporary reaction to airplane crashes momentarily obscures the fact that air travel is safer, mile for mile, than any other means of transportation, so the sinking of the *Titanic* raised questions about the value of speed and brought to mind the virtues of slower travel. The anger coughed up in the dust of speeding autos muted complaints about the slow pace of traveling by foot or by carriage. Modern workers looked back fondly on the good old days of "inefficient" production precisely because they suffered the drawbacks of scientific efficiency. For every speed lover like Marinetti there were thousands who preferred the way rivers

4. The Future

1. Eugène Minkowski, *Lived Time: Phenomenological and Psychopathological Studies* (Evanston, 1970), 6, 87–88. Walter Lippmann saw America in 1914 as having two possible modes of moving into the future: it could continue the current "drift" or struggle to achieve a new, active mode of "mastery." These contrasting modes were prominent in his title, *Drift and Mastery: An Attempt to Diagnose the Current Unrest* (New York, 1914), and were elaborated throughout the text.

2. Herbert N. Casson, *The History of the Telephone* (Chicago, 1910), 231.

3. See next chapter for a discussion of Taylorism.

4. Cited in William L. Langer, *The Diplomacy of Imperialism* (New York, 1935), I, 78.

5. Henry Adams, *The Education of Henry Adams* (1907; rpt. New York, 1931), 382.

6. Published in *Nature*, 65 (February 6, 1902): 326–331.

7. E. F. Bleiler, ed., *Three Prophetic Novels of H. G. Wells* (New York, 1960), 142, 41.

8. H. G. Wells, *Anticipations of the Reaction of Mechanical and Scientific Progress Upon Human Life and Thought* (1901; rpt. London, 1914), 2, 46, 59, 32, 184. For another unusually accurate prediction of the future of warfare see I. S. Bloch, *The Future of War in Its Technical Economic and Political Relations* (1897; rpt. New York, 1899).

9. Kenneth M. Roemer, *The Obsolete Necessity: American Utopian Writings 1888–1900* (Kent, Ohio, 1976), 4. He surveyed 160 such works that appeared between 1888 and 1900 and concluded that during this period the utopian novel was one of the most widely read types of literature in America.

10. Mark R. Hillegas, *The Future as Nightmare: H. G. Wells and the Anti-Utopians* (Carbondale, Illinois, 1967).

11. F. T. Marinetti, "The Founding Manifesto of Futurism" (1909), in *Futurist Manifestos*, ed. Umbro Apollonio (New York, 1973), 19–24.

12. Umberto Boccioni, Carlo Carrà, Luigi Russolo, Giacomo Balla, Gino Severini, "Manifesto of the Futurist Painters" (1910) in ibid., 24–25.

13. Antonio Sant'Elia, "Manifesto of Futurist Architecture" (1914), in ibid., 160–172.

14. Marianne W. Martin, *Futurist Art and Theory 1909–1915* (Oxford, 1968), 190.

15. Pierre Laplace, quoted in Milič Čapek, *Bergson and Modern Physics* (New York, 1971), 122.

16. Emile Meyerson, *Identity and Reality* (1908; rpt. New York, 1962), 215–231.

17. Jean Guyau, *La Genèse de l'idée de temps* (Paris, 1890), 44.

18. Henri Bergson, *Creative Evolution* (1907; rpt. New York, 1944), 220.

19. Georges Sorel, *Reflections on Violence* (1906; rpt. New York, 1961), 124–125.

20. William Thomson, "On a Universal Tendency in Nature to the Dissipation of Mechanical Energy," *Philosophical Magazine*, 4 (1852): 304, cited by Stephen G. Brush, "Science and Culture in the Nineteenth Century: Thermodynamics and History," *The Graduate Journal* (Spring 1967): 494. See also Jerome Buckley, "The Idea of Decadence" in *Triumph of Time* (Cambridge, 1966), 67. Thomson repeated this formulation forty years later in "On the Dissipation of Energy," *Fortnightly Review* (1892): 313–321.

21. Oswald Spengler, *The Decline of the West* (1918; rpt. New York, 1929), I, 129, 134, 137, 423–424.

22. Thomas Mann, *The Magic Mountain* (1924; rpt. New York, 1966), 219.

23. Ibid., 356–357.

5. Speed

1. Robert Ensor, *England 1890–1914* (Oxford, 1936), 278–279, 505.

2. Geoffrey Marcus, *The Maiden Voyage* (New York, 1969), 289–291.

3. Lawrence Beesley, *The Loss of the SS. Titanic* (New York, 1912), 237.

4. Critics cited by Richard O'Connor, *Down to Eternity* (New York, 1956), 186–190.

5. Morgan Robertson, *Futility* (New York, 1898), 1, 3, 4, 29.

6. Karl Lamprecht, *Deutsche Geschichte der jüngsten Vergangenheit und Gegenwart* (Berlin, 1912), I, 171.

7. Georg Simmel, "The Metropolis and Mental Life" (1900), in *The Sociology of Georg Simmel*, ed. and tr. Kurt H. Wolff (New York, 1950), 409–424.

8. Joseph B. Bishop, "Social and Economic Influence of the Bicycle," *The Forum* (August 1896): 689.

9. Sylvester Baxter, "Economic and Social Influences of the Bicycle," *The Arena* (October 1892): 583.

10. Ch. Du Pasquier, "Le Plaisir d'aller à bicyclette," *Revue scientifique*, ser. 4, vol. 6 (Paris, 1896): 145.

11. Paul Adam, *La Morale des sports* (Paris, 1907), 449–450.

12. Maurice Leblanc, *Voici des ailes!* (Paris, 1898), 19, 65, 77, 108, 145, 147.

13. Octave Mirbeau, *"La 628-E8"* (Paris, 1908), 6–7, cited in Pär Bergman, *"Modernolatria" et "Simultaneità"* (Uppsala, Sweden, 1962), 17.

14. Cited in William Plowden, *The Motor Car and Politics 1896–1970* (London, 1971), 47.

15. *The Times*, London, April 14, 1914, 6.

16. Edward W. Byrn, *The Progress of Invention in the Nineteenth Century* (New York, 1900), 56.

17. Harold I. Sharlin, "Electrical Generation and Transmission," in *Technology in Western Civilization*, ed. Melvin Kranzburg and Carroll W. Pursell Jr. (New York, 1967), I, 583.

18. John Brooks, *Telephone: The First Hundred Years* (New York, 1975), 115. In a short story, "In the Year 2889," Jules Verne envisioned an electronic computer, a "Piano Electro-Reckoner," *The Forum*, 6 (1888): 676. Georg Simmel, in "Die Bedeutung des Geldes für das Tempo des Lebens," *Neue*

Rouge, 1973), 9, 10, 58–59; Rudi Blesh and Harriet Janes, *They All Played Ragtime* (London, 1958), 3–23.

53. Hiram Kelly Moderwell, "Ragtime," *New Republic* (October 16, 1915): 286, cited by Edward A. Berlin, *Ragtime: A Musical and Cultural History* (Berkeley, 1980), 51; Walter Lippmann, *Drift and Mastery: An Attempt to Diagnose the Current Unrest* (New York, 1914), 211.

54. William Morrison Patterson, *The Rhythm of Prose* (New York, 1916), 50–51; R. W. S. Mendl, *The Appeal of Jazz* (London, 1927), 46; William W. Austin, *Music in the 20th Century* (New York, 1966).

55. Igor Stravinsky, *An Autobiography* (New York, 1936), 47.

56. George M. Beard, *American Nervousness: Its Causes and Consequences* (New York, 1881), 116.

57. Sir James Crichton-Browne, "La Vieillesse," *Revue scientifique*, 49, (1892): 168–178.

58. Max Nordau, *Degeneration* (New York, 1968), 37–42.

59. John H. Girdner, *Newyorkitis* (New York, 1901), 119.

60. Gabriel Hanotaux, *L'Energie française* (Paris, 1902), 355.

61. Willy Hellpach, *Nervosität und Kultur* (Berlin, 1902), 12.

62. For a survey of the *psychische Spannung* of the age in medical and imaginative literature see Andreas Steiner, *Das nervöse Zeitalter: der Begriff der Nervosität bei Laien und Ärzten in Deutschland und Österreich um 1900* (Zurich, 1964).

63. Henry Adams, *The Education*, 499.

64. William Dean Howells, *Through the Eye of the Needle* (New York, 1907), 10–11.

65. In 1913 there were 4,200 total traffic deaths in the United States. United States Bureau of the Census, *Historical Statistics of the United States Colonial Times to 1970* (Washington, D.C., 1975), 720.

66. Robert Musil, *The Man Without Qualities* (1930; rpt. New York, 1966), 6, 7, 30.

67. Stefan Zweig, *The World of Yesterday* (Lincoln, Nebraska, 1964), 25–26.

68. Charles Féré, "Civilisation et névropathie," *Revue philosophique*, 41 (1896): 400–413.

69. Octave Uzanne, *La Locomotive à travers le temps, les moeurs et l'espace* (Paris, 1912), vi–vii, 244–247, 304. Émile Magne surveys a number of sources which, after Zola's *La Bête humaine* in 1885, affirmed the new aesthetic of the machine: "Le Machinisme dans la littérature contemporaine," *Mercure de France*, LXXXIII (January 16, 1910): 202–217.

6. The Nature of Space

1. Albert Einstein, "Autobiographical Notes," in *Albert Einstein: Philosopher-Scientist*, ed. Paul Arthur Schilpp (Evanston, 1949), 9–11.

2. Max Jammer, *Concepts of Space: The History of Theories of Space in Physics*

(Cambridge, Massachusetts, 1969), 144–146; A. d'Abro, *The Evolution of Scientific Thought from Newton to Einstein* (New York, 1927), 35–48.

3. Lawrence Beesley, *The Loss of the SS. Titanic* (New York, 1912), 105.

4. Henri Poincaré, *Science and Hypothesis* (1901; rpt. New York, 1952), 50–58. See also his article, "On the Foundations of Geometry," *The Monist*, 9 (1898): 42.

5. Ernst Mach, *Space and Geometry in Light of Physiological, Psychological, and Physical Inquiry* (1901; rpt. Chicago, 1906), 9, 94.

6. V. I. Lenin, *Materialism and Empirio-Criticism: Critical Comments on a Reactionary Philosophy* (1908; rpt. New York, 1927), 176–189.

7. On the political context of this issue see "Lenin and the Partyness of Philosophy," in David Joravsky, *Soviet Marxism and Natural Science 1917–1932* (London, 1961), 24–44.

8. Cited by Lenin, *Materialism*, 189.

9. Albert Einstein, *Relativity* (New York, 1961), 9.

10. Ibid., 139.

11. E. de Cyon, "Les Bases naturelles de la géométrie d'Euclide," *Revue philosophique*, 52 (July-December 1901): 1–30.

12. Louis Couturat, "Sur les bases naturelles de la géométrie d'Euclide," in ibid., 540–542.

13. E. von Cyon, *Das Ohrlabyrinth als Organ der mathematischen Sinne für Raum und Zeit* (Berlin, 1908), chap. 7.

14. Jacob von Uexküll, *Umwelt und Innenwelt der Tiere* (Berlin, 1909), 195. He extended these findings in *Bausteine zu einer biologischen Weltanschauung* (Munich, 1913).

15. The other categories discussed included cause, class, substance, number, and force. There is an analysis of these arguments in Steven Lukes, *Émile Durkheim: His Life and Work* (New York, 1973), 436–445.

16. Émile Durkheim and Marcel Mauss, *Primitive Classification* (New York, 1970), 43–44, 82, 86.

17. Émile Durkheim, *The Elementary Forms of the Religious Life* (New York, 1965), 22, 32, 489–492.

18. In *Consciousness and Society: The Reconstruction of European Social Thought 1890–1930* (New York, 1958), H. Stuart Hughes interpreted this generation as having discovered "the subjective character of social thought," the necessary mediation of consciousness in the study of man and society. According to Hughes, Durkheim was one of many who "found themselves inserting between the external data and the final intellectual product an intermediate stage of reflection on their own awareness of these data"; see pp. 16, 17. For a discussion of the polarization of space between the right and left hand in the religious practices of different societies see Robert Hertz, "La Prééminence de la main droite: étude sur la polarité religieuse," *Revue philosophique* (December 1909): 553–580. The Marxist historian Henri Lefebvre has analyzed the social "production of space" (especially unique capitalistic and socialistic forms), and he has identified a breakdown of the older uniform