The Railway Journey

Trains and Travel in the 19th Century

by

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3. Railroad Space and Railroad Time

> Economically, the railways' operation . . . causes distances to diminish . . . Lille suddenly finds itself transported to Louvres; Calais to Pontoise; le Havre to Poissy; Rouen to Sèvres or to Asnières; Reims to Pantin; Strasbourg to Meaux; Lyon to a place halfway between Melun and Corbeil; Marseilles to Nemours; Perpignan to Pithiviers; Bordeaux to Chartres or to Étampes; Nantes to Arpajon, etc.
>
> — Constantin Pecqueur, 1839

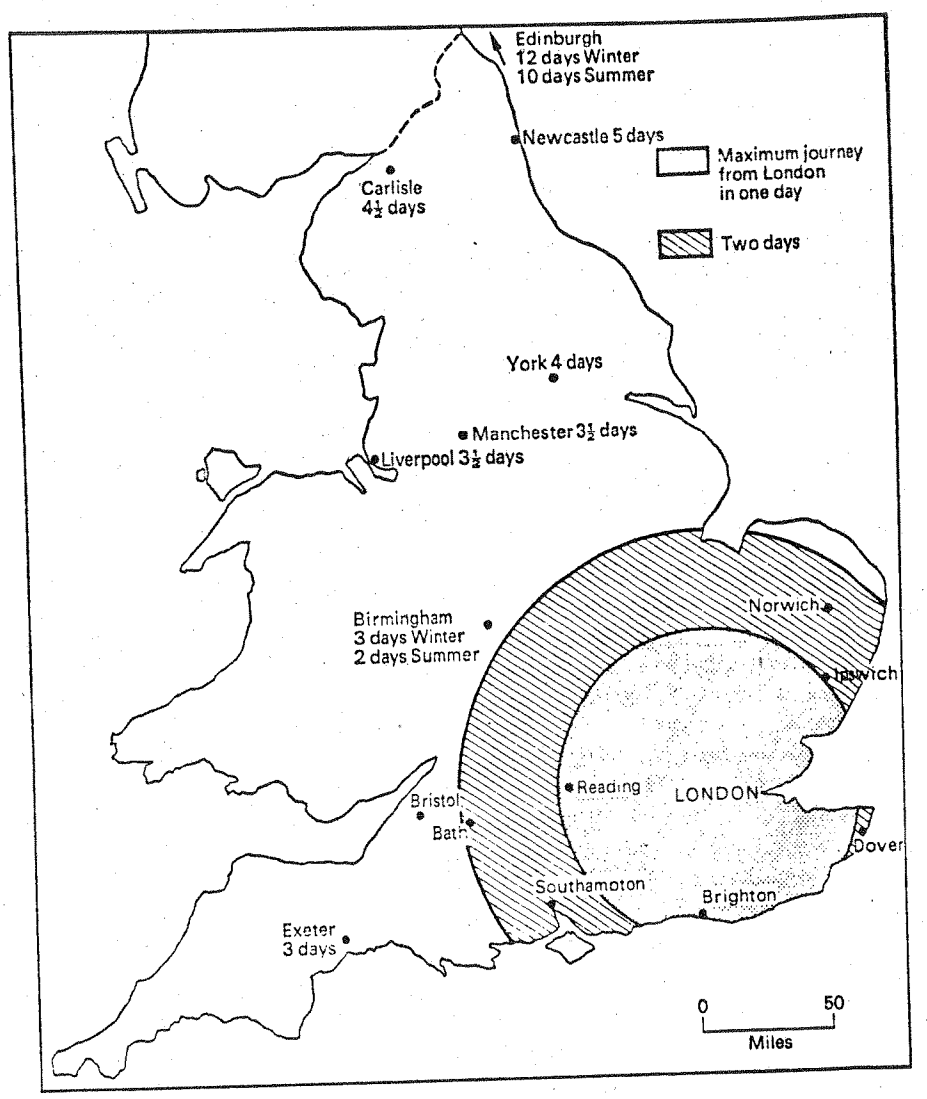
"Annihilation of space and time" is the early nineteenth-century characterization of the effect of railroad travel. The concept is based on the speed that the new means of transport is able to achieve. A given spatial distance, traditionally covered in a fixed amount of travel time, can suddenly be dealt with in a fraction of that time; to put it another way, the same amount of time now permits one to cover the old spatial distance many times over. In terms of transport economics, this means a shrinking of space: "Distances practically diminish in the exact ratio of the speed of personal locomotion," Lardner says in his *Railway Economy*.[1]

The average traveling speed of the early railways in England is twenty to thirty miles an hour, which is roughly three times the speed previously achieved by the stagecoaches.[2] Thus, any given distance is covered in one-third of the customary time: *temporally* that distance shrinks to one-third of its former length. In early nineteenth-century writings the temporal diminution is expressed mostly in terms of a shrinking of space. An article published in the *Quarterly Review* in 1839 speaks of "the gradual annihilation, approaching almost to the final extinction, of that space and of those distances which have hitherto been supposed unalterably to separate the various nations of the globe," and continues:

> For instance, supposing that railroads, even at our present simmering rate of travelling, were to be suddenly established all over England, the whole population of the country would, speaking metaphorically, at once advance *en masse*, and place their chairs nearer to the fireside of their metropolis by two-thirds of the time which now separates them from it; they would also sit nearer to one another by two-thirds of the time which

> now respectively alienates them. If the rate were to be sufficiently accelerated, this process would be repeated; our harbours, our dock-yards, our towns, the whole of our rural population, would again not only draw nearer to each other by two-thirds, but all would proportionally approach the national hearth. As distances were thus annihilated, the surface of our country would, as it were, shrivel in size until it became not much bigger than one immense city.[3]

The image of a temporal shrinkage seen as a spatial one appears in an even more extravagant guise in the work of Constantin Pecqueur, the economist and Saint-Simonian, whose *Economie sociale* received a prize from the Institut de France in 1838. Here, the temporally shrunk transport space appears as a new geography of France, a geography based on the new conditions of speed, a condensed geography, as it were. The cities of France approach each other while simultaneously advancing on Paris. These changes in location, enumerated in the epigraph to this chapter, are summarized in Pecqueur's statement



The Age of Coach Travel in England around 1750.

From: Philip S. Bagwell, *Transportation Revolution*, London 1974.

that it is now possible to see "the new France as fitting into the space of the *old* Île-de-France, or its equivalent."

The diminution of transport distances seems to create a new, reduced, geography, yet it does not actually alter the size of the spaces between the points connected by the new mode of transport. "Yet by a sort of miracle," says the *Quarterly Review* article, after describing the shrinking process, "every man's field would be found not only *where* it always was, but *as large* as ever it was." Pecqueur expresses the same notion in literary hyperbole: the diminished transport geography of France contains the true geography of France within it in a condensed form: "Each bit of terrain, each field on this surface would still remain intact; so would every house in a village, the village itself, or the town; every territory with its village in the center would remain a province; on the map of the imagination, all of these would finally be reproduced and reduced down to the infinitely small! As for Louvres, or Pontoise, or Chartres, or Arpajon, etc., it is obvious that they will just get lost in some street of Paris or its suburbs."[4]

The notion that a French town will fit into a Paris street demonstrates that the alteration of spatial relationships by the speed of the railroad is not simply a process that diminishes space, but that it is a dual one: it both diminishes and expands space. The dialectic of this process states that this diminution of space (i.e., the shrinking of transport time) causes an expansion of transport space by incorporating new areas into the transport network. The nation's contraction into a metropolis, as described in the *Quarterly Review*, conversely appears as an expansion of the metropolis: by establishing transport lines to ever more outlying areas, the metropolis tends to incorporate the entire nation. The epoch of the suburbs, of the amoebic proliferation of the formerly contained cities into the surrounding countryside, begins with the railroads. This is Lardner in 1851:

> It is not now unusual for persons whose ~~place~~ of business is in the centre of the capital, to reside with their families at a distance of from fifteen to twenty miles from that centre. Nevertheless, they are able to arrive at their respective shops, counting-houses, or offices, at an early hour of the morning, and to return without inconvenience to their residence at the usual time in the evening. Hence in all directions round the metropolis in which railways are extended, habitations are multiplied, and a considerable part of the former population of London has been diffused in these quarters.[5]

The notion that the railroad annihilates space and time is not related to that expansion of space that results from the incorporation of new spaces into the transport network. What is experienced as being annihilated is the traditional space-time continuum which characterized the old tranpsort technology. Organically embedded in nature as it was, that technology, in its mimetic relationship to the space traversed, permitted the traveler to perceive that space as a living entity. What Bergson called the *durée* (duration, the time spent getting from one place to another on a road is not an objective mathematical unit, but a subjective perception of space-time. The dependence of this perception on transport technology illustrates Durkheim's notion that a society's space-time

perceptions are a function of its social rhythm and its territory.[6] "What is decisive," says Erwin Straus, discussing the psychology of distances, "is not the objectively measured distance, but the relation of such distance to potentiality."[7] Transport technology is the material base of potentiality, and equally the material base of the traveler's space-time perception. If an essential element of a given sociocultural space-time continuum undergoes change, this will affect the entire structure; our perception of space-time will also lose its accustomed orientation. Sorokin, who following Durkheim, distinguishes between sociocultural and physicomathematical notions of space-time, describes the hypothetical effects of a sudden replacement of customary sociocultural time measures with purely mathematical ones: "If we try to replace sociocultural time by a purely quantitative time, time becomes devitalized. *It loses its reality, and we find ourselves in an exceeding difficult position in our efforts to orient ourselves in the time process, to find out 'where we are' and where are the other social phenomena on 'the bridge of time'.*" (Italics in original.)[8]

Thus, the idea that the railroad annihilates space and time has to be seen as the reaction of perceptive powers that were formed by a certain transport technology who suddenly find that technology replaced by an entirely new one. Compared to the eotechnical space-time relationship, the one created by the railroad appears abstract and disorienting, because the railroad — in realizing Newton's mechanics — negates all that characterized eotechnical traffic; the railroad does not appear embedded in the space of the landscape the way coach and highway are, but seems to strike its way through it.

Heinrich Heine captures the disorientation experienced by the traditional space-time consciousness when confronted by the new technology; apropos the opening of railway lines from Paris to Rouen and Orléans in 1843, he speaks of the "tremendous foreboding such as we always feel when there comes an enormous, an unheard-of event whose consequences are imponderable and incalculable," and calls the railroad a "providential event," comparable to the inventions of gunpowder and printing, "which swings mankind in a new direction, and changes the color and shape of life." Heine continues in this vein:

> What changes must now occur, in our way of looking at things, in our notions! Even the elementary concepts of time and space have begun to vacillate. Space is killed by the railways, and we are left with time alone. . . . Now you can travel to Orléans in four and a half hours, and it takes no longer to get to Rouen. Just imagine what will happen when the lines to Belgium and Germany are completed and connected up with their railways! I feel as if the mountains and forests of all countries were advancing on Paris. Even now, I can smell the German linden trees; the North Sea's breakers are rolling against my door.[9]

We have now clearly stated the two contradictory sides of the same process: on one hand, the railroad opens up new spaces that were not as easily accessible before; on the other, it does so by destroying space, namely, the space between points. That in-between space, or travel space, which it was possible to "savor" while using the slow, work-intensive eotechnical form of transport, disappears on the railroads. The railroad knows only points of departure and destination. "They [the railways] only serve the points of departure, the way stations, and

the terminals, which are mostly at great distances from each other," says a French author in 1840; "they are of no use whatsoever for the intervening spaces, which they traverse with disdain and provide only with a useless spectacle."[10]

As the space between the points — the traditional traveling space — is destroyed, those points move into each other's immediate vicinity: one might say that they collide. They lose their old sense of local identity, which used to be determined by the spaces between them. The isolation of localities, which was created by spatial distance, was the very essence of their identity, their self-assured and complacent individuality. Heine's vision of the North Sea breaking on his doorstep in Paris is tinged with "tremendous foreboding" because both localities — Paris and the North Sea — are still presented in their mutually isolated state, "worlds apart": thus their collision appears unfathomable. Thirty years later, as an interlocking network of railroad lines connects all of Europe, that kind of consciousness is no longer realistic. The regions appear, regardless of their geographical remoteness, as close and as easily accessible as the railroads have made them. One generation after Heine, the more privileged inhabitants of Paris have the option of letting themselves be transported, in a matter of hours, to a region that is as distant from their city as Heine's North Sea. The Mediterranean does not extend its shores right up to Parisian thresholds, but it can be reached so much more quickly than before, that the journey there is no longer experienced as such. The Parisians who migrate south in the winter see nothing but blue skies and the sea. As Mallarmé writes in the winter of 1874/5, in *La Dernière Mode,* the journal he edits, they are "calm, self-absorbed people, paying no attention to the invisible landscapes of the journey. To leave Paris and to get to where the sky is clear, that is their desire."[11] These are no longer travelers — rather, as Ruskin puts it, these are human parcels who dispatch themselves to their destination by means of the railroad, arriving as they left, untouched by the space traversed.

Even though the railroad cannot bring the remote regions physically to Paris, the speedy and comfortable accessibility of those regions creates a consciousness of distance that approximates Heine's vision of space, but without the sense of foreboding. The region that can be reached by train from Paris *realizes itself* for the Parisians by means of the train. It then appears as the product or appendage of the railroad, as in a phrase of Mallarmé's: "Normandy, which, like Brittany, is part of the Western Railway."[12]

But if Normandy and Brittany are part of the Western Railway, being its destinations, then the point of departure of that same railway, the station in Paris, becomes the entrance to those regions. This is a common enough notion in the nineteenth-century: it can be found in every one of Baedeker's travel guides that recommends a certain railroad station as the point of departure for each excursion.

The identification of the railrad station with the traveler's destination, and the relative insignificance of the journey itself, are expressed by Mallarmé, who prints in *La Dernière Mode,* under the heading *Gazette et Programme de la Quinzaine,* the following subheadings representing equally important institutions for entertainment: *Les Librairies, Les Théâtres, Les Gares* (the last sometimes replaced by *Les Voyages*). Thus a railroad journey appears not different from a

visit to the theater or the library — the purchase of a train ticket is equivalent to that of a theater ticket.

A generation after Mallarmé, Marcel Proust, in *Remembrance of Things Past*, discusses the difference between a journey by train and one in a motorcar:

> The journey was one that would now be made, probably, in a motor-car, which would be supposed to render it more interesting. We shall see too that, accomplished in such a way, it would even be in a sense more genuine, since one would be following more clearly, in a closer intimacy, the various contours by which the surface of the earth is wrinkled. But after all, the special attraction of the journey lies not in our being able to alight at places on the way and to stop altogether as soon as we grow tired, but in its making the difference between departure and arrival not as imperceptible but as intense as possible, so that we are conscious of it in its totality, intact, as it existed in our mind when imagination bore us from the place in which we were living right to the very heart of a place we longed to see, in a single sweep which seemed miraculous to us not so much because it covered a certain distance as because it united two distinct individualities of the world, took us from one name to another name; and this difference is accentuated (more than in a form of locomotion in which, since one can stop and alight where one chooses, there can scarcely be said to be any point of arrival) by the mysterious operation that is performed in those peculiar places, railway stations, which do not constitute, so to speak, a part of the surrounding town but contain the essence of its personality just as upon their sign-boards they bear its painted name.[12a]

The fate wrought upon the outlying regions by the railroads affects *goods* even sooner: as long as production and consumption are strictly regional — which they were until the beginning of modern transportation — the goods remain part of the local identity of their place of production. Their route of circulation can be perceived at a glance. Only when modern transportation creates a definite spatial distance between place of production and place of consumption do the goods become uprooted commodities. In *Grundrisse*, Marx makes an observation about the relation between spatial distance and the nature of commodities; it tells us a good deal about how modern transportation has affected our perception of goods: "This locational movement — the bringing of the product to the market, which is a necessary condition of its circulation, except when the point of production is itself a market — could more precisely be regarded as the transformation of the product *into a commodity*."[13] (Italics in original.)

With the spatial distance that the product covers on its way from its place of production to the market, it also loses its local identity, its spatial presence. Its concretely sensual properties, which are experienced at the place of production as a result of the labor process (or, in the case of the fruits of the land, as a result of natural growth), appear quite different in the distant marketplace. There the product, now a commodity, realizes its economic value, and simultaneously gains new qualities as an object of consumption. No longer is it seen in the context of the original locality of its place of production but in the new locality of the marketplace: cherries offered for sale in the Paris market seem to be

products of that market, just as Normandy seems to be a product of the railroad that takes you there. Pecqueur touches on the notion of the unity of the realization of economic value and the biological process, using the example of the ripening of fruit: "For instance, economically speaking, and for the sake of freshness and price, the cherries of Montmorency really ripen on the uncultivated summits of the Quartier Lafayette; the roses of Fontenay burst into bloom and fragrance in the flower beds of the Jardin du Luxembourg; the peaches of Montreuil in the Parc de Monceaux, and the grapes of Fontainebleau, too, ripen on some hill closer to Paris than the one where the Surênes is still greening."[14]

The regions, joined to each other and to the metropolis by the railways, and the goods that are torn out of their local relation by modern transportation, share the fate of losing their inherited place, their traditional spatial-temporal presence or, as Walter Benjamin sums it up in one word, their aura.

The detaching of the remote region from its original isolation, its opening-up by the railroad, can well be defined as the loss of its aura, as Benjamin characterizes the aura and its loss in his essay "The Work of Art in the Age of Mechanical Reproduction." The notions of spatial-temporal presence and distance are integral parts of Benjamin's concept of the aura. He defines the "aura of natural objects" as "the unique phenomenon of a distance, however close it may be."[14a] The aura of a work of art is "its unique existence at the place where it happens to be."[14b] This spatial-temporal singularity, this "happening-but-once-ness," this *genuineness* of the object, is, according to Benjamin, destroyed by reproduction. "The situations into which the product of mechanical reproduction can be brought may not touch the actual work of art, yet the quality of its presence is always depreciated."[14c] It is tempting to apply this statement to the outlying regions that have been made accessible by the railroad: while being opened up to tourism, they remain, initially at least, untouched ~~in~~ their physical actuality, but their easy, comfortable, and inexpensive accessibility robs them of their previous value as remote and out-of-the-way places. "The staple of the district is, in fact, its beauty and its character of seclusion and retirement," Wordsworth writes in 1844, defending the Lake District against the intrusion of the railways.[15] The *devaluation* of outlying regions by their exploitation for mass tourism, by means of the railroad in the nineteenth century and air traffic in the twentieth, is a familiar occurrence. As soon as the railroad reaches the seaside towns of southern England that had been strongholds of the aristocracy far into the nineteenth century, the middle classes take them over. Then the aristocracy retires to remote localities such as Scotland, Ireland, and the Lake District.[15a] Contemporary airplane tourism is engaged in further devaluation of formerly exclusive, very remote regions.

The destruction of aura by means of reproduction of which Benjamin speaks is an expression of the same trend that brought the masses "closer" to the outlying regions in the nineteenth century: "The desire of contemporary masses to bring things 'closer' spatially and humanly . . . is just as ardent as their bent toward overcoming the uniqueness of every reality by accepting its reproduction."[15b] The remote regions are made available to the masses by means of tourism: this is merely a prelude, a preparation for making *any* unique thing available by means of reproduction. When spatial distance is no

longer experienced, the differences between original and reproduction diminish. In the filmic perception — i.e., the perception of *montage*, the juxtaposition of the most disparate images into one unit — the new reality of annihilated in-between spaces finds its clearest expression: the film brings things closer to the viewer as well as closer together.

The regions lose their temporal identity in an entirely concrete sense: the railroads deprive them of their local time. As long as they remained isolated from each other, they had their individual times: London time ran four minutes ahead of time in Reading, seven minutes and thirty seconds ahead of Cirencester time, fourteen minutes ahead of Bridgewater time.[15c] This patchwork of varying local times was no problem as long as traffic between the places was so slow that the slight temporal differences really did not matter; but the temporal foreshortening of the distances that was effected by the trains forces the differing local times to confront each other. Under traditional circumstances, a supraregional schedule would be impossible: times of departure and arrival are valid only for the place whose local time is being used. For the next station, with its own time, that previous time is no longer valid. Regular traffic needs standardized time; this is quite analogous to the way in which the machine ensemble constituted by rail and carriage undermined individual traffic and brought about the transportation monopoly.

In the 1840s, the individual English railway companies proceed to standardize time, while not coordinating their efforts with each other. Each company institutes a new time on its own line. The process is so novel that it is repeated daily, in the most cumbersome manner, as Bagwell describes, apropos of the Grand Junction Company's procedure: "Each morning an Admiralty messenger carried a watch bearing the correct time to the guard on the down Irish Mail leaving Euston for Holyhead. On arrival at Holyhead the time was

Timetable of the London & Birmingham Railway, 1840.

From: *Bradshaw's Railway Companion*, London 1840.

Distance from London.	London to Birmingham — STATIONS.	Mixed. 6 a.m.	3rd class train, 7 a.m.	* Mixed Class 8 a.m.	First calling at M. Stns. 9 a.m.	Mixed. 9¼ a.m.	* Mail. 9¾ a.m.	Mixed Class. 11 a.m.	Mixed Class 12 Noon	* Mixed calling at 1st.cl.Stns.1 p.m.	Mixed Class. 2 p.m.	Mixed Class 3 p.m.	* Mixed calling at 1st c.stns.5 p.m.	Mixed Class. 6 p.m.	* Mail, Mixed. 8½ p.m.	Mixed, calling at mail sts. 9 p.m.	FARES. 4 in. car. by day, or 1 class 6 in. by night	1st class carriage, 6 in. side. by day	2nd class carriage, closed, by night	2nd class open, by day
Mls.	LONDON ..	6 0	7 0	8 0	9 0	9 30	9 45	11 0	12 0	1 0	2 0	3 0	5 0	6 0	8 30	9 0	s. d.	s. d.	s. d.	s. d.
11¼	Harrow ..	..	7 40	8 30	..	..	..	..	12 30	..	2 30	3 30	5 30	6 30	..	..	3 6	3 0	2 6	2 0
17¾	Watford ..	6 45	8 0	8 50	..	..	..	11 45	12 45	1 45	2 50	3 50	5 45	6 50	..	..	5 0	4 6	4 0	3 0
24½	Boxmoor..	..	8 30	9 10	..	..	..	..	1 5	..	3 10	4 10	..	7 10	..	..	7 0	6 6	5 6	4 6
28½	B.Hampstd	..	8 45	9 20	..	..	..	..	1 20	..	3 20	4 20	..	7 20	..	..	8 0	7 6	6 6	5 0
31	Tring	7 25	9 0	9 35	10 22	10 52	11 0	12 25	1 35	2 25	3 35	4 35	6 25	7 35	9 56	10 26	9 6	8 6	7 0	5 6
	Aylesbury	..		10 15	..	..	..	..	2 15	..	..	5 15	..	8 15	..	..		8 6		5 6
41	Leighton ..	7 50	10 0	10 0	..	..	..	12 50	..	2 50	4 0	..	6 50	8 0	..	..	12 0	11 0	9 0	7 6
	Bletchley	..	10 25	10 15	..	..	..	..	..	..	4 15	..	..	8 15	..	..	13 6	12 6	10 6	8 6
52½	Wolverton	8 15	10 45	10 30	11 7	11 37	12 0	1 15	..	3 15	4 30	..	7 15	8 30	10 54	11 24	15 6	14 0	11 6	9 6
60	Roade	..	12 30	10 55	..	..	..	..	..	..	4 55	..	7 40	..	..	..	17 6	16 0	13 6	10 6
63¼	Blisworth	8 50	12 45	11 5	..	12 0	12 23	1 50	..	3 50	5 5	..	7 50	..	11 15	11 45	18 6	17 0	14 0	11 6
69½	Weedon ..	9 5	1 15	11 25	11 50	12 20	12 40	2 5	..	4 5	5 25	..	8 5	..	11 50	12 20	20 6	18 6	15 6	12 6
75¼	Crick	..	1 35	11 45	..	..	..	..	..	..	5 45	..	..	..	..	..	22 0	20 0	17 0	13 6
88¼	Rugby	9 40	2 0	12 5	..	12 55	1 15	2 40	..	4 40	6 5	..	8 40	..	12 30	1 0	24 6	22 0	18 6	15 0
89¼	Brandon ..	..	2 20	12 20	..	..	..	..	..	..	6 20	..	..	..	..	..	26 0	24 0	20 0	16 0
94	Coventry	10 10	2 40	12 35	12 55	..	1 45	3 10	..	5 10	6 35	..	9 10	..	1 0	..	27 6	25 0	21 0	16 6
100¾	Hampton	10 35	3 10	1 0	1 28	..	..	..	..	5 35	7 0	..	..	..	..	..	30 0	27 6	23 0	18 6
112¾	Birminghm	11 30	3 45	2 0	2 15	..	2 30	4 30	..	6 30	8 0	..	10 30	..	2 0	..	32 6	30 0	25 0	20 0

The 3rd Class train takes passengers, private carriages, and horses, at the following charges:—From London to Birmingham, Passengers 14-, private carriages £3, horse boxes £4, and in proportion for intermediate stations.

ROUTES FROM NEW YORK.

To Albany, by Steam Boat.

Fort Gansewort,		2
Hamilton's monument,	2	4
Manhattanville,	3	7
Fort Lee,	3	10
Spuyten Duyvel Cr.	2	12
Phillipsburg,	4	16
Dobb's Ferry,	6	22
Tappan Landing,	3	25
Tarrytown,	1	26
Nyack, on Tappan sea,	3	29
Sparta, & State Prison,	3	32
Tellers Point,	2	34
Haverstraw & Croton,	1	35
Stony Point,	3	38
Verplank's Point,	1	39
Peckskill,	2	41
St Anthony's nose,	2	43
Fort Clinton,	1	44
West Point,	7	51
Highlands. Crows Nest Mt.	4	55
Butter Hill,	1	56
Caldwell,	1	57
Canterbury,	1	58
New Windsor,	1	59
Newburg, West side, / Fiskill landing, E. S.	2	61
Hamburg,	6	67
Hampton,	1	68
Barnegat,	2	70
Poughkeepsie,	5	75
Hyde Park,	5	80
Pelham,	3	83
Walkill Cr.	6	89
Rhinebeck,	1	90
Redhook, L. L.	6	96
Glasgow,	3	99
Redhook, U. L.	1	100
Saugerties,	1	101
Bristol,	1	102
Catskill,	9	111
(Thence to Pine Orchard, 14 miles.)		
Hudson and Athens,	5	116
Columbiaville,	5	121
Coxackie,	3	124
Kinderhook Landing,	1	125
New Baltimore,	5	130
Coeymans,	2	132
Schodack,	2	134
Castleton,	1	135
Albany,	10	145

For routes from Albany, see article "Albany."

The stage route from N. York to Albany, does not differ materially from the above.

To Boston, by Steam Boat.

Newtown Creek,		4
Hell Gate,	5	9
Flushing Bay,	4	13
Frogs Point,	3	16
Cow Neck,	2	18
New Rochelle L.,	6	24
West Greenwich,	11	35
Stamford,	8	43
Oldwell,	8	51

Timetable of an American Steamship, 1834.

This timetable does not yet contain arrival and departure times, but only the distances between the individual ports. The figures in the left column indicate the distances between consecutive ports. The right column summarizes the distances of the entire voyage.

From: Henry Tanner, *The American Traveller, for the year 1834.*

passed on to officials on the Kingston boat who carried it over to Dublin. On the return mail to Euston the watch was carried back to the Admiralty messenger at Euston once more."[16]

When, after the establishment of the Railway Clearing House, the companies decide to cooperate and form a national railroad network, Greenwich Time is introduced as the standard time valid on all the lines.[17] Yet railroad time is not accepted as anything but schedule time until late in the century. As the rail network grows denser, incorporating more and more regions, the retention of local times becomes untenable: in 1880, railroad time becomes general standard time in England. In Germany, official recognition comes in 1893; as early as 1884, an international conference on time standards, held in Washington, D.C., divided the world into time zones.

In the United States, the process is more complicated, as there is no cooperation whatsoever between the private railroad companies. Each company has its own time, in most cases, the local time of the company's headquarters. In stations used by several different lines there are clocks showing different times: three of these in Buffalo, six in Pittsburgh.[18] In 1889, the United States is divided into four time zones, essentially unchanged to this day; officially, at first, the times within the zones are regarded only as railroad time; in practice, these become regional standard times, although they are given legal recognition only in 1918.

Excursion: The Space of Glass Architecture

The railroad reorganizes space. In architecture, a similar reorganization occurs with the introduction of glass and steel as new building materials. The railroad machine ensemble multiplies speed and capacity of traffic; steel and glass multiply the capacity of roofed structures. Both the railroad and the glass buildings are direct expressions of the multiplied productivity brought about by the industrial revolution. The railroad brings new quantities of goods into circulation; the edifices of glass architecture — railroad stations, market halls, exhibition palaces, arcades — serve as places of transit and storage. The spatial capacity of glass architecture stands in a similar relation to the capacity of traditional architecture as the railroad's capacity stands to that of preindustrial transportation. This is due to the greater strength and resistance to stress

26. Cooke and Wheatstone introduce it from Germany to England, in the early 1830s. (Karl Zetsche, *Geschichte der elektrischen Telegraphie* [Berlin, 1877], p. 157.)
27. In Dolf Sternberger, *Panorama, oder Ansichten vom 19. Jahrhundert,* 3rd ed. (Hamburg, 1955). The passage comes from the posthumously published volume *Vom rollenden Flügelrade* (1882). The phrase "flying muscles" refers to the railroad's trademark, or symbol, the winged wheel. Sternberger quotes the passage while discussing the mutual influence exercised by technological and organic metaphors in the nineteenth century. (Also: New York & Oxford 1978 under the title Panorama of The Nineteenth Century).
28. A prosaic footnote to the poetic perception of telegraph poles can be found in an anonymous work of 1848, *Railway Appliances in the Nineteenth Century;* or, *The Rail, Steam, and Electricity* (London, 1848), p. 32. It is a proposal to determine the speed of the train (which could not yet be determined directly due to lack of technical "instinct") by means of close observation of the telegraph poles, i.e., by measuring the time that the train needs to pass from one pole to the next. "These [the poles] are generally erected about sixty yards apart, or thirty in the mile, so that the speed of the train is easily found by counting the number of poles passed in a minute and multiplying by two, which, of course, gives the rate per hour."

    Thus the telegraph poles act as a kind of gauge for determining an element of the journey, i.e., velocity, that can no longer be experienced in an immediate way. This is a factor that contributes to the traveler's alienation from the landscape.
29. Paul Verlaine, *Oeuvres poétiques complètes* (Paris, 1951), p. 106. The cycle "La bonne chanson" was written in the winter of 1869–70.

    Translation by Gertrude Hall, in *Baudelaire, Rimbaud, Verlaine: Selected Verse and Prose Poems,* (New York: Citadel Press, 1947).

Chapter 3: Railroad Space and Railroad Time

1. D. Lardner, *Railway Economy* (London, 1850), p. 35.
2. According to H. G. Lewin, *The Railway Mania and its Aftermath, 1845–52* (London, 1936), the average speed, up to 1845, was "between 20 and 30 miles per hour" (p. 95). The Great Western Express, the fastest English train, reached a speed of 46 mph (op. cit.). Lardner says the speed of the stagecoaches was a little less than 8 mph (*Railway Economy,* p. 36), whereas Lewin claims that the fastest coaches achieved 10 mph.

    The actual speed of English trains in the 1840s, i.e., their top speed, was, according to Lardner, frequently 60 to 70 mph (*Railway Economy,* p. 170).
3. *Quarterly Review,* vol. 63 (1839), p. 22.
4. Constantin Pecqueur, *Économie sociale* (Paris, 1839), vol. 1, p. 26.
5. Op. cit., p. 36.
6. Émile Durkheim, *The Elementary Forms of the Religious Life* (Glencoe, Ill., 1947), pp. 10–11, p. 440.
7. Erwin Straus, *The Primary World of the Senses* (New York and London, 1963), p. 385.
8. Pitrim A. Sorokin, *Sociocultural Causality, Space, and Time* (Durham, N.C., 1943), p. 197.
9. Heine, *Lutezia,* part 2, lvii, Elster ed., vol. 6, p. 360.
10. Charles Dunoyer, *Esprit et méthodes comparés de l'Angleterre et de la France dans les entreprises de travaux publics et en particulier des chemins de fer* (Paris, 1840), p. 104.
11. Stéphane Mallarmé, *Oeuvres complètes,* Pléiade ed. (Paris, 1970), p. 843.
12. Op. cit., p. 774.

12a. *Remembrance of Things Past,* vol. II, *Within a Budding Grove,* I; translated by C. K. Scott Moncrief (New York, 1934, pp. 489–90).

13. Karl Marx, *Grundrisse, Foundations of the Critique of Political Economy* (London, 1973), p. 534.
14. Op. cit., pp. 34–35.

14a. *Illuminations* by Walter Benjamin (New York, 1973, p. 222).

14b. Ibid., p. 220.

14c. Ibid., p. 221.

15. William Wordsworth, *The Prose Works,* ed. A. B. Grosart, (London, 1876, vol. 2, p. 326).

15a. J. A. R. Pimplott, *The Englishman's Holiday* (London, 1947, p. 118).
15b. Benjamin, ibid., p. 223.
15c. Philip S. Bagwell, *The Transportation Revolution from 1770* (London, 1974), p. 124.
16. Op. cit., p. 125.
17. Greenwich time is the time kept at the Royal Observatory in Greenwich, founded in 1675. "The precise standardization of time measurement dates from the foundation of the Royal Observatory in 1675." (G. J. Whitow, *The Nature of Time* [London, 1972].) Like the later standard time, the original Greenwich time was created to meet the needs of expanding traffic, i.e., shipping, in the seventeenth century. Vessels carried Greenwich time with them on their chronometers, as it was necessary for orientation and navigation. However, it was *not* used as a generalized norm for the division of the day: Greenwich time was still restricted to the walls of the cabinet that contained the chronometer during the voyage.
18. John Stover, *American Railroads* (Chicago, 1961), p. 157.

Excursion: The Space of Glass Architecture

1. Alfred Gotthold Meyer, *Eisenbauten: Ihre Geschichte und Ästhetik* (Esslingen, 1907), p. 11.
2. Op. cit., p. 184.
3. Op. cit., p. 64.
4. Siegfried Giedion, *Space, Time and Architecture* (Cambridge, Mass., 1962), p. 255.
5. Lothar Bucher, *Literaturhistorische Skizzen aus der Industrieausstellung aller Völker* (Frankfurt, 1851), pp. 10–11 (also quoted by Meyer and Giedion).
6. Richard Lucae, "Über die Macht des Raumes in der Architektur," *Zeitschrift für Bauwessen*, vol. 19 (1869), p. 303. A similar comment is made by the French architect Boileau in regard to the Galerie des Machines of the Paris World Expo of 1878: "The spectator is not aware of the weight of the transparent surfaces. These surfaces are to him air and light, that is to say, an imponderable fluidity." (Quoted in Giedion, op. cit., p. 265.)
7. Max Raphael, *Von Monet zu Picasso* (Munich, 1913), p. 59.
8. Giedion says that Turner's painting *Simplon Pass* "uses a humid atmosphere to dematerialize landscape and dissolve it into infinity. The Crystal Palace realizes the same intention through the agency of transparent glass surfaces and iron structural members. In the Turner picture the means employed are less abstract, but an equivalent insubstantial and hovering effect is produced." (Op. cit., p. 253.)
9. The general economic base for this evanescence of perception is the fact that less and less labor (i.e., value) is invested in the individual product. Natural organic materials are increasingly replaced by synthetic surrogates; mass-produced objects are given built-in obsolescence; and "surface finish" is emphasized.
10. M. Luckiesh, *The Lighting Art* (New York and London, 1917), p. 210.
    Luckiesh is still aware that the price paid for such controllability is monotony. "In fact, the most striking feature of daylight is its variability and, although this is often annoying, the lack of monotony is one of the attractive features of daylight." (Op. cit.)
11. Op. cit., p. 3.
12. Op. cit., p. 85.
13. However, such radical changes occur only in the U.S. A German engineering work (Hefele, *Das Fabrik-Oberlicht* [Berlin, 1931]) presents a critical view of American efforts to eliminate the use of daylight in buildings. This argument is an excellent example of how the different developmental stages of any given industry (e.g., its degree of productivity) influence the engineering consciousness. In the Germany of 1931 an engineer can still make a case for the use of daylight because the German electrical industry is not yet as productive and dominant as the American; because artificial light has not yet been made available *en masse* and cheaply; and because there are traditional and cultural reasons for using daylight.