

LIGHTING THE UNDERGROUND: LONDON, 1863-1914

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Lighting the Underground: London, 1863-1914

Underground space is frequently associated historically with underworld activities of a criminal or politically subversive nature, or with the underbelly of the city: a place to bury or flush away waste products, including the city's dead. For these activities, light was either unnecessary or positively avoided. But the introduction of underground railways necessitated a degree of artificial lighting at least sufficient to facilitate efficient operation and to assure the travelling public of their personal safety. This paper examines debates surrounding the lighting of the earliest underground railways in London, beginning in the 1860s when trains were still steam-operated and lighting was principally by gas, a potentially lethal combination of asphyxiants and combustibles, but tolerable for the sake of the benefits offered by underground transportation in a city characterised by congestion.

Railways and Lighting: Intersecting Technologies

Most studies of lighting in cities focus on streets and above-ground public spaces, and therefore on the problems and opportunities for city life associated with night time, i.e. the hours when there is insufficient natural light. For Joachim Schlör, three themes dominate cities after dark: security, morality and accessibility¹. But these themes are also critical when we examine attitudes to cities' underground space where, in a

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1. Joachim Schlör, *Nights in the Big City: Paris, Berlin, London, 1840-1930*, London, Reaktion, 1998.

sense, it is always night. As scholars interested in popular and artistic representations of space have noted, the underground might be imagined as infernal or dystopian, hell under the earth, but also as utopian, the locus of modernity where the vital infrastructure to support modern life – gas and water pipes, electric cables and conduits, sewers, railway tunnels and, by the late twentieth century, entire underground cities – might be located. As David Pike comments: «There was simply no cognitive recognition that there was... any contradiction between, on the one hand, conducting a respectable everyday life underground, and, on the other, writing off whole sectors of the modern city as ghetto under-worlds inhabited by neotroglydites.»²

While public transport underground was established in most major cities only when electricity became available to light the way, London was exceptional, first in tunnelling under the Thames between Wapping and Rotherhithe, a venture that took the Brunels eighteen years to complete (in 1843), and then in opening an underground railway in 1863, the Metropolitan Railway between Paddington and Farringdon Street, subsequently extended – mostly underground – by the Metropolitan and its partner-cum-rival, the Metropolitan District Railway, to constitute an Inner Circle – today's Circle Line – by 1884. The early underground lines were not tube railways, in tunnels bored at depth using a Greathead shield, but «cut and cover», mostly constructed by cutting a shallow trench, ideally following a public road, laying railway tracks in the trench and then covering them over to restore the original roadway at the surface. Nor were they electrically powered, but worked – until 1905 – by steam locomotives specially equipped to condense their own steam. In practice, the condensing apparatus never worked as efficiently as hoped, and as the service intensified over time, ventilation problems steadily worsened³. From the beginning, ventilation shafts and open cuttings were incorporated wherever possible, thereby permitting at least some natural light to penetrate into the Underground at the same time as allowing smoke and steam to escape into the atmosphere⁴.

2. David L. Pike, *Subterranean Cities. The world beneath Paris and London, 1800-1945*, Ithaca, Cornell University Press, 2005, p. 16-18; see also Haewon Hwang, *London's Underground Spaces*, Edinburgh, Edinburgh University Press, 2013; David Ashford, *London Underground. A cultural geography*, Liverpool, Liverpool University Press, 2013; David Welsh, *Underground Writing. The London Tube from George Gissing to Virginia Woolf*, Liverpool, Liverpool University Press, 2010.

3. David Bownes, Oliver Green and Sam Mullins, *Underground. How the Tube shaped London*, London, Allen Lane, 2012; Stephen Halliday, *Underground to Everywhere*, Stroud, Sutton Publishing, 2001; Christian Wolmar, *The Subterranean Railway*, London, Atlantic Books, 2004.

4. Richard Dennis, «Making the Underground underground» *London Journal*, 38, no. 3, 2013, p. 203-225.

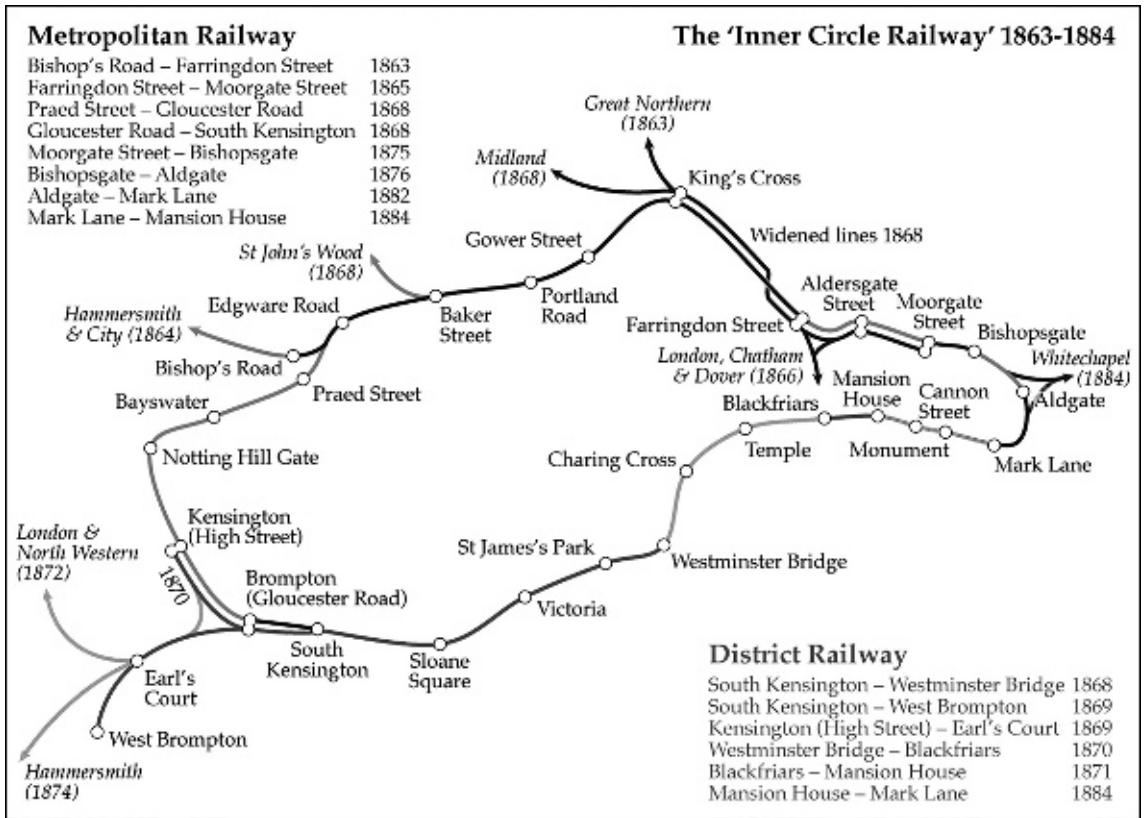


Figure 1 : Underground Railways in London, 1863-1884.

In histories of the early Underground, most attention is given to the ventilation problem, because the build-up of smoke and steam in tunnels was not only unpleasant but positively unhealthy and occasionally unsafe, when drivers were unable to see signals, and signalmen were unable to see the trains passing by their signal boxes. But another hazard to health and safety was the dependence on gas for lighting. From the late 1870s, there were experiments with electric lighting, first on station platforms and then in carriages, but the Metropolitan and District Railways remained essentially dependent on gas lighting until the 1910s.

The experience of operating and travelling on the Underground in London prior to the opening of deep-level tube lines was, therefore, fundamentally different from that of the Paris Métro (1900) or the New York Subway (1904), both of which were powered and lit by electricity from the outset, a power source that had already been proved by two decades of

above-ground tramways, elevated railways and street lighting⁵. Remarkably, in the entire period from 1863 to 1905, there were no fatal accidents on London's underground railways attributable to the hazards of either steam traction or gas poisoning, while the first major disaster on the Métro, at Couronnes in 1903, caused by a prolonged electrical fire spreading smoke into a station plunged into darkness by the knock-on effects of the fire, demonstrated the fragility even of supposedly safer, cleaner electricity⁶. It was an accident which might have been expected if the system had involved a mixture of steam power and gas, where sparks from the locomotive could have ignited leaking gas or a collision or derailment might have caused the puncture of a gasbag; but it was not what was anticipated with electric trains and electric lights.

Wolfgang Schivelbusch has provided original and provocative histories of both the experience of rail travel in the nineteenth century and the «industrialisation of light»⁷. Schivelbusch drew attention to parallels between the gas industry and the railway industry – as offspring of the industrial revolution, products of coal-based technology, and networks of centralised supply (gas mains and rails) which led to the loss of individual control associated with candles or oil lamps and with private transport. But he did not discuss the railway's own need for artificial light, nor did he pay any attention to trains travelling through darkness, whether at night or underground, apart from passing references to the experience of travelling through tunnels on otherwise above-ground mainline trains. In his study of lighting, he paid most attention to public spaces – streets and theatres and the fostering of nightlife – and to the evolution of lighting technology, from bare gas flares to sealed gas lamps to Welsbach's system of incandescent gaslight, and from outdoor arc lighting to Edison's incandescent electric light bulb. We can see the relevance of these successive improvements in experiments conducted by London's Metropolitan and District Railways, which effectively delayed the widespread use of electric light, both by improving the safety and efficiency of gas lighting, and through the distraction of ultimately impracticable, unvarying and locally generated arc lighting. Schivelbusch's comments on the boulevard as an interior out-of-doors, «marked off from the surrounding darkness as if

5. Carlos López Galviz, «The politics of a new technology: electricity and the city railway in London and Paris, c.1880-1910,», *Métropoles*, 6, 2009, p. 140-70.

6. David Pike, *Subterranean cities*, op. cit., p. 52-3; Roger H. Guerrand, *Mémoires du Métro*, Paris, La Table Ronde, 1961, p. 101-11.

7. Wolfgang Schivelbusch, *The Railway Journey. The industrialization of time and space in the nineteenth century*. Leamington Spa, Berg, 1986; Wolfgang Schivelbusch, *Disenchanted Night. The industrialization of light in the nineteenth century*, Oxford, Berg, 1988.

by walls, which run along the edges of the lit-up area »⁸, may be applied to the experience of travelling by train at night and underground, especially on lines such as London's Inner Circle, where tunnels alternated with cuttings and it was hard to judge whether the darkness outside the carriage was the darkness of a tunnel or the darkness of night. In *The Railway Journey*, he suggested that train travel was experienced as a projectile fired through the landscape, confined to the «barrel» of rails, cuttings and tunnels, in which features close to the train window flashed by too quickly to be visible, causing travellers to focus on more distant objects. Underground, however, there were no distant objects; the «panorama» was the blur of the tunnel wall. Schivelbusch's conclusion about the desirability of reading on train journeys, to obviate the strain of looking at the passing panorama, trying to accommodate sight to a rapid succession of near and far objects, and also to avoid the embarrassment of staring at fellow passengers who were strangers, was even more true of travelling underground⁹. On a short urban journey with few familiar fellow travellers and no panorama at all, reading became even more necessary, but this, in turn, made good quality carriage lighting even more essential.

Discussions of the history of street lighting have typically referred to «colonising the night», displacing natural rhythms, allowing the same range of activities by night as by day; or to artificial lighting being «as good as a policeman», indicating its disciplinary character, exposing and deterring, or at least displacing, sin, making the night safe for otherwise vulnerable groups, especially women¹⁰. But the reality was that street lighting was rarely very bright, it only gradually became independent of natural lighting – gas lights might be switched off when there was a full moon – and it was accepted that there should still be some variability in the intensity of light between lamp posts lining city streets. *The Engineer* observed of London in 1895 that «the principal streets are lighted in a manner which... incites the American to contemptuous scorn». Elizabeth Robins Pennell, herself American, reported that «London streets, except here and there, still wait for the electric light »¹¹. So, when boosters likened

8. Wolfgang Schivelbusch, *Disenchanted Night*, *op. cit.*, p. 149.

9. Wolfgang Schivelbusch, *The Railway Journey*, *op. cit.*, p. 54, 64.

10. David Nasaw, «Cities of light, landscapes of pleasure», David Ward and Olivier Zunz (eds.), *The Landscape of Modernity: Essays on New York City, 1900-1940*, New York, Russell Sage Foundation, 1992, p. 273-286.

11. Wolfgang Schivelbusch, *Disenchanted Night*, *op. cit.*, 90-1; *The Engineer*, 2 August 1895, p. 112, cited in Chris Otter, *The Victorian Eye. A political history of light and vision in Britain, 1800-1910*, Chicago, Chicago University Press, 2008, p. 8; Elizabeth Robins Pennell, «London's underground railways», *Harper's New Monthly Magazine*, 92, January 1896, p. 272-288.

the underground railway – and even the tunnels between stations – to well-lit city streets, we should not think they were describing very bright underground spaces. Just as street lighting varied between streets, contrasting well-lit middle-class neighbourhoods with unlit streets inhabited by the poor, and within streets, illuminating small areas around lamp posts but leaving intermediate spaces in shadow, so underground, there were contrasts between relatively well-lit first-class and poorly lit third-class compartments and, on station platforms, alternating strips of light and shadow which may have annoyed passengers but delighted artists.

Guerrand notes that, in early twentieth century Paris, the Métro attracted painters such as Edouard Vuillard and Gino Severini, the latter claiming that his futurist painting, « Le Nord-Sud », was designed to express « the idea of the speed at which an illuminated body traverses tunnels alternately dark and lit up »¹². There were similar artistic reactions to the London Underground, a generation earlier and complicated by the presence of steam and the yellow glow of gaslight. A recurrent theme was the rhythm of darkness and light, whether natural as trains passed from dark tunnel through short but sunlit open cuttings and back into tunnel, or artificial (as in Paris) as journeys through darkness were punctuated by (relatively) brightly-lit stations, which served to accentuate onward progress and give a sense of speed which was missing in journeys through either constant darkness or constant light. Consider Edmondo De Amicis' account of a trip on the Underground in 1873 :

« I go down two or three stairs and find myself suddenly thrown from daylight into obscurity, amid feeble lights, people and noise, trains arriving and departing in the dark... Then begins a new spectacle... At first we are buried in thick darkness, then we see for an instant the dim light of day, and again plunge into obscurity, broken here and there by strange glowings; then between the thousand lights of a station, which appears and disappears in an instant; trains passing unseen; next an unexpected stop, the thousand faces of a waiting crowd, lit up as by the reflection of a fire... now more darkness, trains and streaks of daylight, more lighted stations. »¹³

The experience of sunshine and shadow, streaks of light amid the darkness, was also portrayed artistically by Fred T. Jane's « Round the Underground on an Engine »¹⁴. Jane realised that the Underground,

12. Roger H. Guerrand, *L'Aventure du Métropolitain*, Paris, La Découverte, 1986, p. 97 ; Henry Grabar Sage, « The essence of Paris : the growth of the Métro and ideas of space, 1900-1914 », *Yale Historical Review*, Spring 2012, vol. 11 (1), p. 7-24.

13. Edmondo De Amicis, *Jottings about London*, London, Alfred Mudge & Son, 1883.

14. Fred Jane, « Round the Underground on an Engine », *English Illustrated Magazine*, 119, August 1893, p. 787-792.

even on a midsummer's day, provided material for the same mixture of romance, excitement and apprehension that he and other artists had already discovered in depicting the above-ground railway by night. His essay followed two earlier articles that he had written and illustrated in a series on «The Romance of Modern London». The first, on «London Railway Stations», ostensibly dealt with mainline stations at all times of the day and night. Jane claimed that «night is not essential to make a railway station look beautiful», but in practice all his most striking illustrations depicted night-time scenes¹⁵. In this respect, we might note the contemporaneous depictions of the elevated railway in New York, where, both in art – in the era of steam, Louis Sontag's «The Bowery at Night» (1895), and in the early twentieth century, John Sloan's paintings of the el by twilight – and in literature – in William Dean Howells' *A Hazard of New Fortunes* (1890), the el was celebrated through its contribution to the city nightscape¹⁶. Jane's second article, «In the Small Hours», explicitly focused on the city streets by night, following in the footsteps of Dickens' «Night Walks»¹⁷. So, when Jane ventured underground for the third of his excursions, he was seeking to extend the artistic possibilities of the night into a «bright June morning», setting out into «blackness, heavy, dense and impenetrable», but soon discovering a contrast between Stygian darkness and brilliant sunlight. Of thirteen illustrations accompanying his short essay, ten played on the contrast between darkness and light, most brilliantly in his depiction of Baker Street Junction and in his view of a bright green signal lamp caught in a «silver column of light» from a ventilation shaft. Jane, however, had the advantage of the engine driver's view, looking straight ahead from the locomotive footplate. Passengers had to make do with the less intelligible flashes and streaks of light visible laterally, suddenly and briefly.

In moving from questions of representation to contemporary political, economic and technical debates, I will consider three lighting environments – the station platforms, the tunnels, and the interiors of train compartments. My primary sources are mostly the newspaper and periodical press of the late nineteenth and early twentieth centuries. There is

15. Fred Jane, «London Railway Stations», *English Illustrated Magazine*, 117, June 1893, p. 658-662.

16. Richard Dennis, *Cities in Modernity: Representations and productions of metropolitan space*, Cambridge, Cambridge University Press, 2008, p. 338-347.

17. Fred Jane, «In the Small Hours», *English Illustrated Magazine*, 118, July 1893, pp. 705-711 ; Charles Dickens, «Night walks», in *The Uncommercial Traveller*, London, Chapman & Hall, 1861. For a recent interpretation, see Matthew Beaumont, *Nightwalking. A nocturnal history of London Chaucer to Dickens*, London, Verso, 2015.

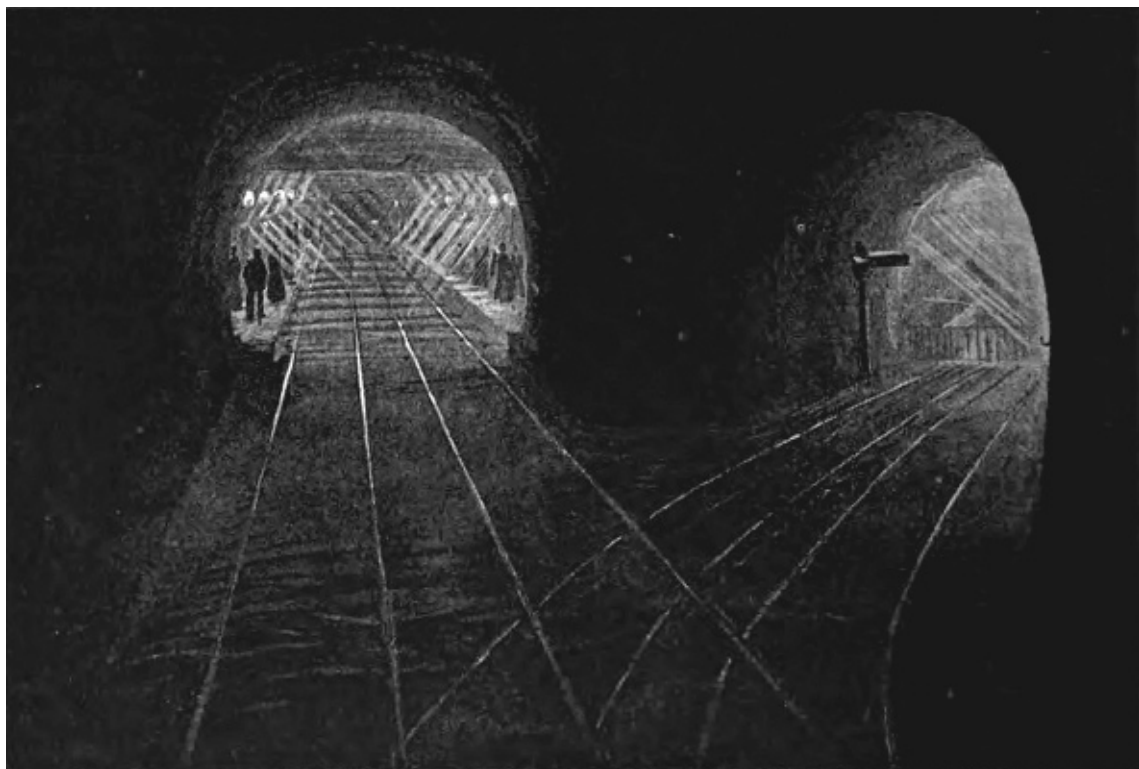


Figure 2 : Fred T. Jane, « Baker Street Junction », English Illustrated Magazine, August 1893, p. 790.

relatively little detailed information on lighting in the board minutes of the underground railway companies, apart from decisions to ratify contracts and frustrating references to officers' reports which rarely seem to have survived. By contrast, the contemporary press was replete with correspondence denigrating, lampooning or, occasionally, praising the services of the railway companies; with court reports and inquests that illuminate the conditions in which crimes were committed or accidents occurred; and with boosterish propaganda for new innovations. Much of this material is now available digitally and, while keyword searches are only as good as the OCR (Optical Character Recognition) software on which they are based, they access a range of everyday experiences of underground travel previously limited to published memoirs and stories penned by mostly extraordinary observers¹⁸.

18. I have used 19th Century British Newspapers, 19th Century UK Periodicals, The Times Digital Archive, and the Illustrated London News Historical Archive, all digitised by Gale; British Periodicals and The Observer, both digitized by ProQuest; and Old Bailey Proceedings Online.

Lighting the stations

Most stations were not entirely underground, but situated in cuttings, usually with a glass roof spanning the entire area between cutting walls. While the platforms would not have received much direct sunlight, they were essentially no different from stations on ordinary above-ground railways. For example, at King's Cross, there was « an elliptical wrought-iron roof, with sufficient glass to preserve an agreeable but not a glaring light », while at Portland Road, « lighting and ventilation will be effected by a pair of domes »¹⁹. Schivelbusch suggests that glass architecture created a uniform quality of light with an absence of contrast between light and shadow which could be disorientating for passengers. Once it was possible to generate inexpensive electric light for indoor use, stations could be truly enclosed or underground, daylight now treated as an unreliable variable to be eliminated²⁰. Meanwhile, in the absence of electric light, two of the Metropolitan Railway's original stations – Baker Street and Gower Street – were genuinely underground, situated directly underneath the Marylebone and Euston Roads. To contrive any natural light, they relied on angled light shafts which emerged into the front gardens of houses on either side of the roads. The *Observer* claimed these stations « receive almost as much daylight as if they stood in the air » and the light entering through these angled shafts was collected and concentrated by the apertures being lined with glazed tiles, which throw the rays direct upon the arrival and departure platforms²¹. *Once a Week* thought « The reflection of the light from so many surfaces has a very pretty effect ; there is no darkness about the matter, but quite as much light as need be, like the soft evening of a June day »²². Within a few years of opening, however, enthusiasm waned. By 1867 *The London Review* was referring to these stations as « such gloomy, ill-lighted, depressing places »²³.

Natural light through the angled shafts was supplemented by large glass globes containing gas lights. Parts of the platforms would have remained in shadow, and the gloominess was accentuated by the density of advertising that swamped the handful of modestly-sized station nameboards. There were constant complaints that, in the half light, passengers could not pick out the names of stations. There were also problems for intending

19. « The Metropolitan Railway », *Observer*, 6 April 1862.

20. Wolfgang Schivelbusch, *The Railway Journey*, *op. cit.*, p. 50.

21. « The Metropolitan Railway », *Observer*, 31 August 1862.

22. « A Journey Underground », *Once a Week*, 20 September 1862, p. 362.

23. « Underground perils », *The London Review*, 31 August 1867, p. 233.

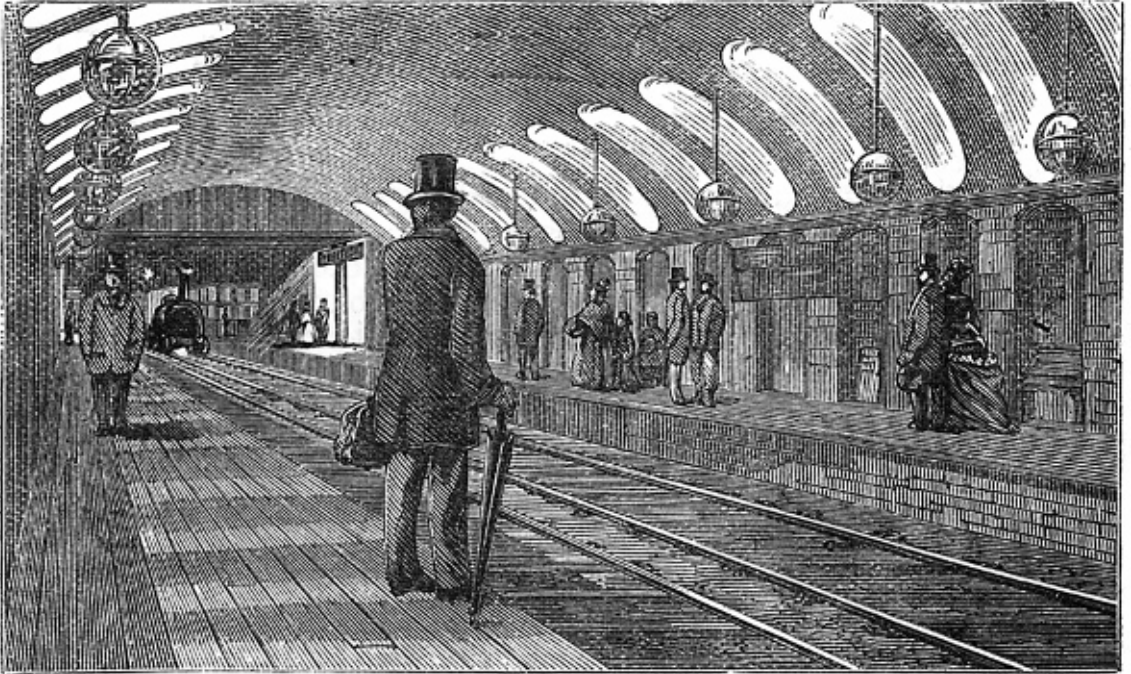


Figure 3 : Gower Street Station, c. 1880, showing light shafts and gaslight globes, from Robert Routledge, *Discoveries and Inventions of the Nineteenth Century*, 9th edition, London, Routledge, 1891 (author's collection).

passengers searching for the right class of carriage to board – there were three classes of travel, as on above-ground railways and, from 1874 onwards, when underground railways were obliged to provide both « smoking » and « no smoking » versions of each class, six types of carriages between which passengers needed to differentiate. Underground trains, running every few minutes, expected to stop for no more than 20-30 seconds at each station, unlike mainline trains which had more leisurely station stops. The combination of poor light and hurry was blamed for numerous accidents as passengers stumbled on the carriage footboards, injured themselves falling onto platforms, or, in the worst cases, slipped between platform and carriage to a grisly death under the train wheels²⁴.

From the late 1870s there were experiments with electric lighting on station platforms. The chairman (Edward Watkin) and general manager (Myles Fenton) of the Metropolitan visited Paris in 1878 to witness a

24. Richard Dennis, « Underground anxieties », Carlos Galviz and Samuel Merrill (eds.), *Going Underground. New Perspectives*, London, London Transport Museum, 2013, p. 11-19.

demonstration of arc lighting and the company tried out two electric arc lamps at Edgware Road in June 1879, which favourably compared with the 25 gas lamps normally used to illuminate the station. The lamps were placed at the platform ends, with shades to screen the intense white light from the eyes, directing the light upwards onto the glass roof, from where it was diffused over the whole station²⁵. In October 1879, arc lighting was installed at Aldersgate Street (now Barbican), using the Lontin system and Serrin lamps, similar to what had previously been installed at the PLM station in Paris (which presumably had been on Watkin's and Fenton's itinerary along with the 1878 International Exhibition, where numerous other electrical innovations were exhibited). At Aldersgate Street, eight lamps each gave a light equivalent to 600 standard candles: «The illumination was more perfect than with about 40 gas lights». The Electric Generator and Light Company thought it feasible to extend arc lighting to Moorgate Street and Farringdon Street stations, now that Lontin's regulator permitted the operation of numerous lights from a single dynamo, albeit over a short distance, and this was done in October 1881²⁶. Meanwhile, Victoria Station on the District Railway was «brilliantly illuminated» by ten electric lights, which replaced twenty gas lamps that had «only dimly lighted the station»²⁷. But arc lamps were only feasible on open platforms (or at least under the arched roof of a station open to the elements); and their intensity could not be varied. Little further progress with electric lighting was made until, following electrification of the trains in 1905, some station lights were powered by being connected to the electrified tracks; but it was only in 1911 and 1912 that King's Cross and Liverpool Street acquired full electric lighting, to be followed in November 1913 by Portland Road (now Great Portland Street) and Euston Square (since 1909, the new name for Gower Street)²⁸. Before this, in 1902, «self-intensifying» gas lamps had been installed at Gower Street, and Welsbach improved burners and mantles (which gave a brighter light, but consumed less gas, and which were described as «electric light without electricity») at Baker Street, but still contained

25. «The Electric Light», *The Times*, 11 June 1879, p. 10; T.C. Barker and Michael Robbins, *A History of London Transport, Volume I: The Nineteenth Century*, London, Allen & Unwin, 1963, p. 297.

26. «Electric light on the Metropolitan Railway», *The Engineer*, 10 October 1879, p. 277; W. Bernard Carlson, *Innovation as a Social Process: Elihu Thomson and the Rise of General Electric*, Cambridge, Cambridge University Press, 1991, pp. 92-5.

27. *Illustrated London News*, 20 December 1879.

28. Alan Jackson, *London's Metropolitan Railway*, Newton Abbot, David & Charles, 1986, p. 200; London Metropolitan Archives (LMA), ACC/1297/MET/01/026, Board Minutes, Metropolitan Railway, 24 April 1913, p. 467; ACC/1297/MET/10/749, Lighting and heating.

within the original glass globes²⁹. Even the City & South London Railway, London's first deep-level « tube », opened in 1890 and electrically powered from the outset, relied on gas lighting on station platforms³⁰.



Figure 4: Aldersgate Street station, photographed by Henry Dixon on 22 April 1880, showing electric lighting installed in August 1879, including lampposts supporting spherical lamps along the central island platform, supplemented by wall mounted lamps hanging above the side platforms.
London Transport Museum: Inventory number 1998/84029.

Contemporary writers continued to note the gloom and darkness of underground travel. Charing Cross Station (now Embankment) provided the setting for two popular magazine stories. In « A Maid Forlorn » (1873), the station was described as « lighted dimly from above... this cavern of dingy yellow »³¹, while in « The Spawn of Fortune » (1896), « the gas

29. LMA, ACC/1297/MET/01/022, Board Minutes, Metropolitan Railway, 20 February 1902, p. 518-9.

30. T.C. Barker and Michael Robbins, *A History of London Transport*, op. cit., p. 313.

31. Frederick Talbot, « A Maid Forlorn », *Belgravia: A London Magazine*, March 1873, p. 96.

burned yellow in the great glass globes» as passengers waited for «the black tunnel» to vomit smoke, heralding the arrival of «two yellow eyes» which «trembled and blinked in the darkness» as a train «came wheezing, rocking, screeching and grinding out of the blackness»³². And in Dorothy Richardson's novel, *The Tunnel* (1919, but set in the late 1890s), Miriam was «entranced by the familiar sulphurous gloom of Gower Street Station, the platform lights shining murkily from the midst of rolling clouds of grey smoke, the dark forms and phantom white faces of waiting passengers emerging suddenly as she weaves through the darkness»³³.

Lighting the tunnels

When the press reported on the partially completed railway in 1862, they noted that the tunnels between stations were lit. In January 1862, the *London Journal* observed that «it is so well lighted and ventilated that the tunnels, instead of being close, dark, damp, and offensive, are wide, spacious, clean, and luminous, and more like a well-kept street by night... than a subterranean passage through the very heart of the metropolis»³⁴. However, another press inspection, of the section between King's Cross and Farringdon in April 1862, painted a less encouraging picture: «Candles were stuck on the trucks and on the walls of the tunnel, and these just served to dispel at intervals the darkness of the road.»³⁵ Following yet another press trip in September 1862, the *Illustrated London News* felt short-changed; the experience was not dramatic enough: «The general feeling was evidently that of agreeable disappointment – the open cuttings being more extensive, and the tunnels better lighted and ventilated, than was expected.»³⁶ But, as *Chambers's Journal* explained, the gas lights in the tunnel walls were not meant to be permanent: «It is intended eventually to light up only the frequent niches in the walls, but not the walls themselves; while the carriages, on the other hand, will be brilliantly illuminated.»³⁷

The locomotives carried headlights penetrating the darkness like the bull's-eye lamps carried by policemen, but this did not prevent a variety

32. Angus Abbott, «The Spawn of Fortune», *The Ludgate*, July 1896, p. 309-315.

33. Dorothy Richardson, *The Tunnel*, cited in David Ashford, *London Underground*, *op. cit.*, p. 36.

34. *London Journal*, 11 January 1862, p. 24.

35. «The Metropolitan Railway», *Observer*, 6 April 1862.

36. *Illustrated London News*, 6 September 1862, p. 259.

37. *Chambers's Journal*, 11 January 1862, p. 26-29.

of accidents – to maintenance workers unable to find shelter from passing trains, and especially to passengers who wandered off the ends of station platforms into tunnels, apparently thinking that they were walking into the darkness of moonless streets. Inquiring into the death of a 67-year-old man who, it was thought, either «got out in the tunnel by mistake» or «got out at the wrong station, and endeavoured to get back again», the coroner recalled five inquests on persons killed in Metropolitan Railway tunnels: «They mostly seemed to be old persons who, perhaps losing their way, did not notice the difference in the light until they got too far into the tunnel to beat a retreat.»³⁸

Even more serious was when trains collided with one another in the darkness of the tunnel. There were frequent minor accidents, rarely at more than walking pace, and rarely causing the derailment of either train, but the Victorian press could not resist reporting them as major disasters. In 1873, for example, when one train ran into the back of the preceding train which had stalled on a gradient, the *Observer* highlighted how «the ordinary horrors of a collision, which are in themselves sufficiently appalling, are intensified when the accident occurs in an underground tunnel, dimly lit by gas»³⁹.

When the Metropolitan was extended from Aldgate to Mark Lane (Tower Hill) in 1882, incandescent electric lamps were installed over a short length of tunnel «with a view to determining whether sufficient illumination could not be obtained in this way without lamps in the carriages». Unsurprisingly, the experiment was quickly abandoned and the railway companies continued to rely on gas lighting inside carriages⁴⁰.

Lighting the carriages

Gas lighting on a moving train underground was not straightforward. We can note at least three issues. Firstly, where did you get the gas? – from the mains of a commercial town-gas company, or manufactured on site at the termini? How safe were gasholders positioned alongside stations or gas trucks hauled through the network at night to be in the right position to supply the following day's passenger trains? Above-ground gas explosions and fires were quite common, and the publicity given to the Nine

38. *Pall Mall Gazette*, 1 January 1870, p. 6; *Morning Post*, 1 January 1870, p. 6.

39. «Editorial», *Observer*, 31 August 1873, p. 4.

40. «The Inner Circle Completion Railway», *The Engineer*, 29 September 1882, p. 243; Alan Jackson, *London's Metropolitan Railway, op. cit.*, p. 157.

Elms Gasworks explosion in 1865, which killed at least nine persons, instilled fear in populations living near sources of gas⁴¹. On the Metropolitan, gas for carriage lighting had been manufactured at Baker Street, but local residents complained, so a new gasworks was built in a more suburban location at Neasden in 1881. Similar protests about gas production at Hammersmith and Bishopsgate led to all gas production being concentrated at Neasden by 1884. On the District Railway, trains were lit by coal gas supplied from the mains at Mansion House and High Street Kensington. In 1878, mains coal gas was replaced by compressed oil as the source of gas lighting, now supplied from the company's own gasworks in Lillie Bridge Yard. Gas was stored in cylindrical gasholders, which were taken on gasholder trucks to various points on the system at night and connected to standpipes at sidings where the trains were supplied⁴². No major disasters were ever reported, although *The Engineer* reported on a fire at the naphtha stores of the Metropolitan Railway at Farringdon, when naphtha vapour accidentally caught fire, setting off a « tremendous flame » which distorted the iron girders of an adjacent bridge, causing gas pipes on the bridge to fracture, thereby adding to the fire⁴³. And in October 1908, a fire on a train at Swiss Cottage was attributed to the explosion of a naphtha lamp in a luggage compartment⁴⁴.

Secondly, the system involved filling gas-bags attached to each carriage; so where should the gas-bags be positioned – under the chassis or on the roof? How vulnerable were they to random sparks from locomotives, and how often did they need charging to ensure a good quality of light? The *Observer* reported:

« On the top of each carriage is placed a small iron reservoir or gasometer, which is filled at the station from the gas mains in the same manner as the tender is supplied with water. Each gasholder will contain sufficient for several journeys, and the light in the carriages will be very agreeably diffused, and sufficiently bright to enable passengers to read with ease. »⁴⁵

The gas was carried in long India-rubber bags, 36 feet long, 4 feet wide and 12 inches deep, set inside wooden boxes, and weighted on the top so that, as the weights sank, they activated an indicator showing how full or

41. Lynda Nead, *Victorian Babylon. People, streets and images in nineteenth-century London*, New Haven, Yale University Press, 2000, p. 94-6; Chris Otter, *The Victorian Eye, op. cit.*, p. 238; Wolfgang Schivelbusch, *Disenchanted Night, op. cit.*, p. 34.

42. Alexander Edmonds, *History of the Metropolitan District Railway Company to June 1908 prepared for publication by Charles E. Lee*, London, London Transport, 1973.

43. « The Metropolitan Railway fire », *The Engineer*, 19 September 1890, p. 237.

44. « Fire on the Metropolitan Railway », *The Times*, 7 October 1908, p. 10.

45. « Completion of the Metropolitan Railway », *Observer*, 28 September 1862.

empty the bags were. The bags contained sufficient gas for about three hours' operation, but could be filled in only two or three minutes from pipes at each terminus. However, a frequent complaint was that the mains pressure was at its lowest early in the morning when the demand for town gas for domestic cooking, lighting and heating was at its greatest. Commuters found the light too weak and flickering to read their morning papers⁴⁶.

In 1876, carriages on the St John's Wood branch of the Metropolitan were fitted with Pintsch's Patent Lighting System, which used compressed gas manufactured on site (initially at Baker Street) from shale oil, and was stored in steel reservoirs located underneath each carriage. The reservoirs could hold enough gas to last at least 35 hours but, in practice, they were topped up for one minute each morning. Pintsch's system offered lighting that was cheaper than either oil lamps or coal-gas lamps, and it was quickly adopted across the entire underground network. In this case, a delegation from Paris inspected the system on the St John's Wood line during a visit when they also visited London's largest workhouse and most up-to-date hospitals⁴⁷.

So, thirdly, how reliable and how powerful was the light that gas could provide? In advance of opening, the *London Journal* domesticated the carriage lighting, «not like that usually adopted in the railways, but rather like that to be found in a drawing-room». Most above-ground companies still used oil lamps for lighting at night and through tunnels, but the Great Western Railway had experimented with gas as early as 1857, and it was the Great Western that supplied the rolling stock used to operate the Metropolitan Railway when it first opened. Two gas lights in each compartment ensured «such a brilliant light as to enable a passenger to read even the smallest print with the greatest ease»⁴⁸. In contrast, *The Observer* expressed some «disappointment, arising from... the comparative darkness»⁴⁹. On the first public services,

«throughout every journey, the gas burnt brightly, and in some instances was turned on so strong in the first-class carriages, in each of which there are two burners, that when the carriages were stationary, newspapers

46. «History of the Metropolitan Railway No. 5», *The Engineer*, 18 October 1895, p. 377-8; «Railway carriage lighting», *The Times*, 24 January 1877, p. 5.

47. «The Conseil Municipal of Paris», *The Times*, 5 May 1877, p. 13; John H. White, Jr., «A perfect light is a luxury: Pintsch gas car lighting», *Technology and Culture*, 18 (1), 1977, p. 64-9.

48. *The London Journal*, 7 June 1862, p. 365; E.T. MacDermot and C.R. Clinker, *History of the Great Western Railway, Volume One 1833-1863*, London, Ian Allan, 1964, p. 446-447.

49. «Opening of the Metropolitan Railway», *Observer*, 11 January 1863, p. 6.

might be read with facility; but, in motion, the drafts through the apertures of the lamps, created so much flickering as to render such a feat exceedingly difficult»⁵⁰.

The Standard went further in noting that, even at the official opening, «not very long after starting the gaslights in the carriages went out, owing to some defects in the apparatus»⁵¹. Another *Observer* article offered a more dramatic version, reporting that, between Portland Road and Gower Street,

«a loud report was heard, which sounded like an explosion, or the letting off of a small cannon. The effect of this was to extinguish the gas in the compartment in which a reporter was riding. A little further on another report of a similar nature was heard, and this being followed afterwards by another, caused some excitement amongst the females and children»⁵².

C.L.E., in *London Society*, was more enthusiastic: «we plunge into the tunnel. Not into darkness, though – there is a good steady light from the gas-burner above, which enables you to read, should you be so inclined, as easily as you could by your moderator lamp at home»⁵³. Edward Walford echoed this view a decade later:

«The light thus afforded to the passengers is so bright as to utterly remove all sense of travelling underground, and entirely dissipate that nervousness which the semi-obscurity of ordinary oil-lighted railway carriages gives to the sensitive during their transit through the tunnels on other lines.»⁵⁴

But the *London Review* remained unconvinced:

«The authorities of the line evidently think that the introduction of gas is a boon. In this they are mistaken. When the reservoirs are first filled with gas, the illumination of the carriages is brilliant enough; but very soon, as the pressure diminishes, the flame becomes lower, and we have no hesitation in saying that, as a rule, the light is far below the proper standard. But even if the pressure were sustained – and, indeed, when the pressure is greatest – the flames are thrown into a state of vibration... and are most hurtful to delicate eyes. *Good* oil-lamps would be infinitely better.»⁵⁵

50. «Opening of the Metropolitan Railway to the Public», *Observer*, 11 January 1863, p. 5.

51. *Standard*, 10 January 1863, p. 4.

52. «The Metropolitan Railway», *Observer*, 12 January 1863, p. 1.

53. C.L.E. [Charles Locke Eastlake], in *London Society*, May 1863.

54. Edward Walford, «Underground London: its railways, subways and sewers», in *Old and New London: Volume 5*, London, Cassell, 1878, pp. 228-229.

55. «Underground perils», *The London Review*, 31 August 1867, p. 233.

Despite the introduction of the Pintsch system complaints continued, especially as passengers became accustomed to incandescent electric light in workplaces, shops and some domestic settings. A correspondent to the *Illustrated London News* asked: « Why are not the carriages on the Metropolitan Underground railway lit by electricity? » He noted that « bright incandescent lamps » had already been introduced on a train on the London-Brighton mainline⁵⁶. A South Kensington « Sufferer », writing to the *Observer* in August 1893, grumbled that there had been no change in the lighting of underground carriages for at least a decade. He attributed his difficulty in reading the newspaper to the design of the lamps, which copied those originally constructed for burning oil. They were closed at the bottom, to stop oil from dripping onto the passengers, but with gas this precaution was unnecessary, and the glasses could have ventilation holes drilled in them to give the burners more air. Without such holes, burners displayed « a bluish flame that practically gives no light at all »⁵⁷. He was reiterating a problem *The Times* had noted at the outset, when they observed that the Metropolitan had « contrived to get more of the heat and less of the light out of the gas than generally results from this mode of illumination. A little extra ventilation of the carriages will be absolutely necessary to correct this nuisance »⁵⁸.

Curiously, « A Sufferer » made no suggestion that electric lights should be installed in the carriages. In fact, the District Railway experimented with penny-in-the-slot electric reading lamps but, unsurprisingly, few passengers were prepared to pay extra for the luxury of a personal electric light⁵⁹. Adding a medical voice to the debate, *The Lancet* demanded an increase in the number of gas jets in each compartment: « Sufficient light is a primary necessity, and should therefore be provided at the cost of the railway companies.... Light is not to be doled out at an extra charge through an automatic penny slot. »⁶⁰ When the first (free) electric lights were installed in Metropolitan Railway carriages in 1900, Stone's system was employed, powering the lights by a dynamo on the train when it was in motion, and by batteries when it was stationary⁶¹.

56. *Illustrated London News*, 29 November 1884.

57. « Underground Railway Lights », *Observer*, 6 August 1893, p. 7.

58. « Metropolitan Subterranean Railway », *The Times*, 6 August 1862, p. 9.

59. Mike Horne, *The District Line*, Harrow, Capital Transport, 2006, p. 28.

60. « Carriage lighting on the underground railways », *The Lancet*, 1 October 1892, p. 788.

61. Alan Jackson, *London's Metropolitan Railway*, op. cit., pp. 97-98.

Meanwhile, attempts were made to measure the intensity of light objectively. In 1892, Trotter found that illumination in the carriages of Metropolitan and District trains varied between 0.3 and 0.9 foot-candles, a level similar to that found on ordinary streets and on the platforms of Charing Cross and Cannon Street mainline stations, but less than the 1 candle-foot he deemed « comfortable »⁶².

Of course, it all depended on what one hoped to see while travelling: not only whether lighting was sufficient to read a typical railway novel or a newspaper, but also how easy was it to see other passengers, especially strangers. Carriages were divided into separate compartments with seats for up to six passengers facing one another, and no possibility to change compartments between stations. Nor was there any emergency communication cord to alert driver or guard between stations. You needed to be sure you would be safe when boarding the train, an anxiety exploited in fictional murder mysteries, such as « The Mysterious Death on the Underground Railway » and « An Underground Tragedy », in which murders were committed in otherwise empty compartments⁶³.

In more highbrow literature, George Gissing's Maurice Hilliard followed Eve Madeley, whom he had previously known only through a photograph, onto a train at Gower Street. Sitting opposite her in a third-class carriage, he had no difficulties in « compar[ing] her features with those represented in the photograph ». In the course of the journey he first identified her « half-smile telling of habitual sadness », then « a look of cold if not defiant reserve » and finally « a nervous restlessness »⁶⁴. In Henry James's *The Wings of the Dove*, after an absence of six months, Kate easily spotted Densher across a « choked compartment » as she entered a train at Sloane Square⁶⁵. It may be objected that these are both fictional accounts where recognition across a crowded compartment was critical to the development of the plot. Nevertheless, they indicate that this was a perfectly credible occurrence. Even if light was too poor for comfortable reading, it did not prevent recognition of fellow passengers.

62. A.P. Trotter, *Illumination, its distribution and measurement*, London, Macmillan, 1911, pp. 253-262; Chris Otter, *The Victorian Eye, op. cit.*, p. 170.

63. Baroness Orczy, « The mysterious death on the underground railway » (originally 1901), in *The Old Man in the Corner*, London, Hodder & Stoughton, 1908; C. Haddon Chambers, « An underground tragedy », *Belgravia: A London Magazine*, December 1886, pp. 205-218.

64. George Gissing, *Eve's Ransom*, London, Lawrence & Bullen, 1895, chapter 6.

65. Henry James, *The Wings of the Dove*, London, Constable, 1902, Book Second: I.

Beyond the Underground

It is easier to excavate discourses about the lighting of underground railways than the practices and behaviours which lighting, or its absence, generated. To reconstruct the practices of all kinds of passenger, including women, children, the elderly and the working classes would require a close reading of sources such as personal letters, coroners' reports and witness statements in criminal cases. Yet an initial examination of the latter – whether in Old Bailey Proceedings or newspaper reports of petty crimes tried in police courts – reveals few comments about the state of lighting underground, compared to numerous statements about the lack of ventilation causing breathing problems, overcrowding which provided rich pickings for pickpockets on station platforms and in crowded compartments, or the dangers of moving trains, slamming doors and slippery staircases which provoked accidents. A rare exception was a case at Snow Hill (Holborn) on the branch connecting the Metropolitan to the London, Chatham & Dover Railway, where a bookbinder, relieved of his gold watch, explained that « This was at the darkest part of a very dark station »⁶⁶.

In most respects, travelling by underground railway by night was little different from travelling by day. What differed was the interface between the railway journey and the outside world: the journey to and from the railway, and the ways in which the apparent safety of night-time public transport facilitated the growth of a night-time economy of retailing and leisure activities. Nicholas Daly speculates that theatregoers who flocked to see railway terrors such as Boucicault's *After Dark*, popular on West End stages in the late 1860s, would have travelled to the theatre by underground railway⁶⁷. Returning home late at night, they had more to worry about the dark streets between station and home than the gloominess of the journey, including assaults and muggings on still dark streets close to stations. Thomas Parker was mugged outside Temple Station, « rather later than 12 o'clock » on a « fine night, moonlight » but, according to a witness, « the electric light was out »; and James Tanton was attacked outside Gower Street Station at 9 o'clock one evening by an assailant who « stepped from a dark doorway »⁶⁸. The modernity of the Underground counted for little set against the perennial hazards of metropolitan night life.

66. *Old Bailey Proceedings Online* (www.oldbaileyonline.org version 7.2, 29 March 2015), February 1885, trial of Henry Allpress (t18850202-252).

67. Nicholas Daly, *Literature, Technology, and Modernity, 1860-2000*, Cambridge, Cambridge University Press, 2004, p. 20.

68. *Old Bailey Proceedings Online*, May 1881, trial of Patrick Harrogon (t18810502-460); *The Times*, 2 March 1864, p. 11.