A Thesis by SHANE HOLLAND

TITLE... The History, Design and Social Factors of,

Subterranean Metropolitan Transport with particular

reference to the London Underground,
the Paris Metro,
the New York Subway,
the Moscow Metro and
the Nürnberg /Munich U-bahns.

This thesis is submitted as candicy for
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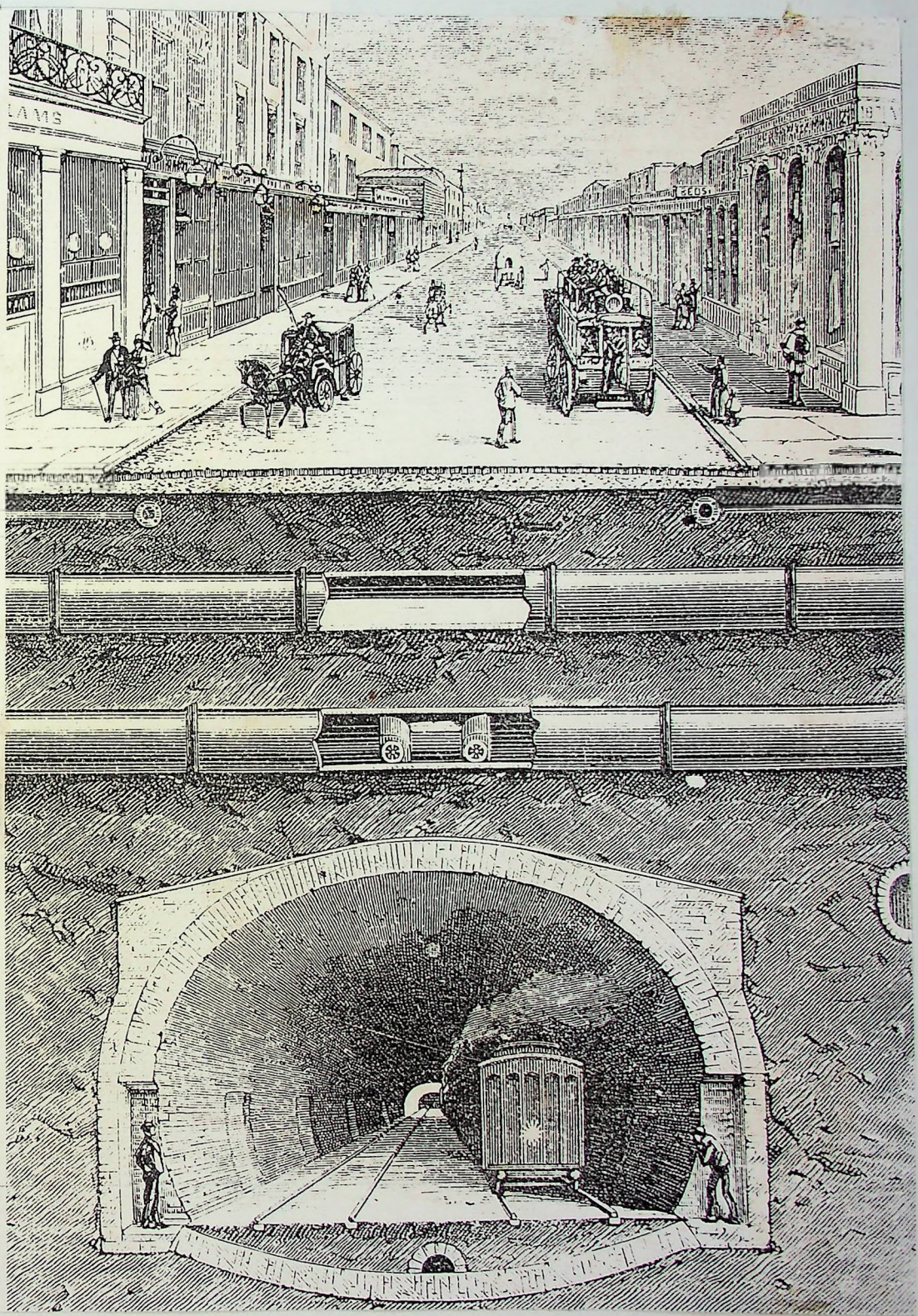

L I S T O F C O N T E N T S

* The history and Design of the Moscow Metro.
* The rolling stock and engineering details.

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* The controlled environment.

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* The benefits of underground transport
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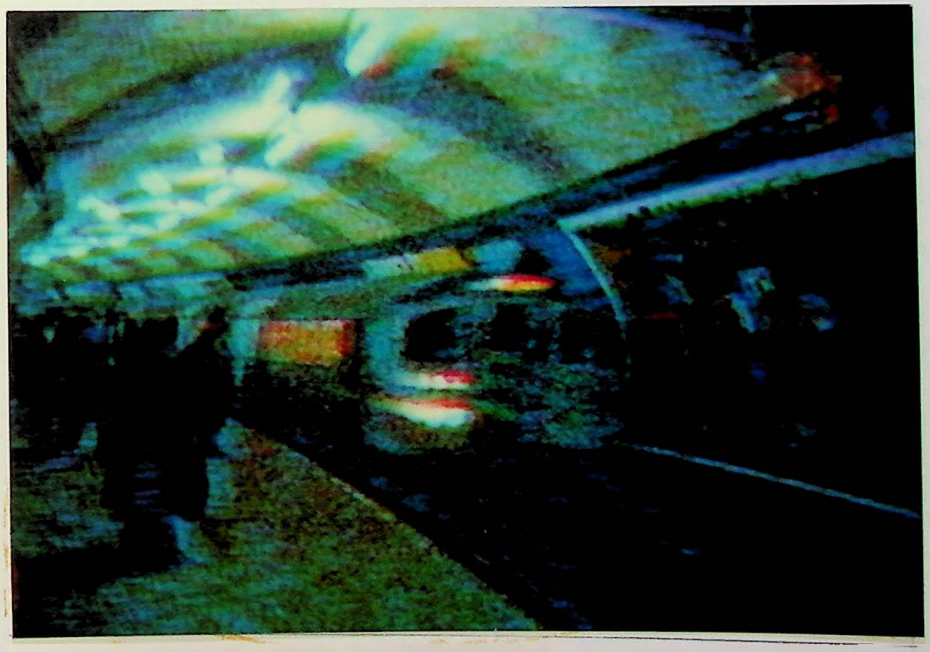
INTRODUCTION

Subterranean metropolitan transport has become and shall continue to be a major feature of urban life in the major cities around the world. The aim of this thesis is to investigate underground transport from three specific angles. The history and design of the particular systems being two angles which focus on the origins and sequence of events leadings to the formation of the present networks in the discussed cities.

The design development of stations, rolling stock, equipment and subsidiary areas such as signage, typography and corporate identity are discussed in relation to design policy and philosophy of the systems. The third area relates to the social factors of underground transport which can be seen as universal to all underground systems. An attempt is made to investigate the effect that the controlled designed environment has upon its passengers. The design and architecture of subways is possibly the best example of a man made and designed environment in which the natural elements are controlled. It is therefore an appropriate place to guage the effectiveness of modern design. The psychological effects and reactions to underground transport and design for this mode of transport are discussed. Graffiti is focused upon as an example of the manifestation of a reaction against both the official design and also the transport system itself.

The systems in London, Paris, New York, Moscow and Nurnberg/Munich are chosen for a particulr purpose. London being the first system in existence claims a larger proportion of attention due to the pioneering nature of its history. The Paris Metro and New York Subway which both followed shortly after the inception of the London Underground. Both systems approached design problems in varying ways and developed seperate characteristics in what have beome important and extensive networks in world terms. Moscow is included as an antithesis of the Western systems which provides an interesting contrast in philosphy and design in relation to undergorund transport it also merits mention being the busiest metro in the world.
Nurnberg/Munich are examples of recently developed systems from Germany which illusrate a techinical competence efficieny and an innovative approach to architectural design. The two U-Bahn systems are discussed together as they have some very similar traits. However Nurnberg being a prototype system for smaller 1 million inhabitant cities, can be concentrated upon more easily.

* Map of London Underground
LONDON REGIONAL TRANSPORT



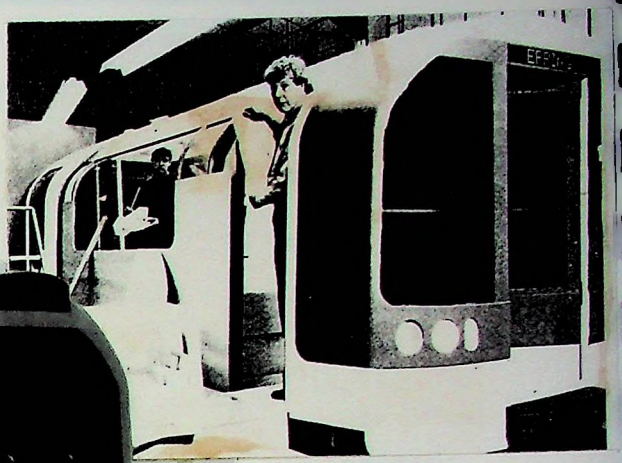
* TV picture of tube approaching
R.T.E.

The London Underground is particularly important to the development of underground transport due to the fact of it being the first system in existence. Much of the development work on the engineering of tunnelling, ventilation and rolling stock design involving signaling and electric traction equipment was pioneered in London.

The London Underground also proceeded to innovate after the inception of other systems, such as Paris, New York; and Berlin in the area of architecture, typography and graphic design work.

The London Underground presently carries more passengers than ever before, carrying 769 million passengers in the years 1986-87 which is above the previous total record of 720 million in 1948. Modernisation has reduced operation costs by the use of driver only trains and maximum automation without the driverless train option, which while being feasible has not been adopted so as to offer passengers the extra security of the minimal human contact of having a driver for reassurance of safety.

The underground carries 2.5 million people daily on 254 route miles - 105 miles of which is underground and serving 273 stations. Even though the London Underground is fifth in terms of numbers of passengers carried, it is the most extensive network in the world, closely followed by New York.



* David Carter Associates - Prototypes
DESIGN WEEK 5 Feb 88

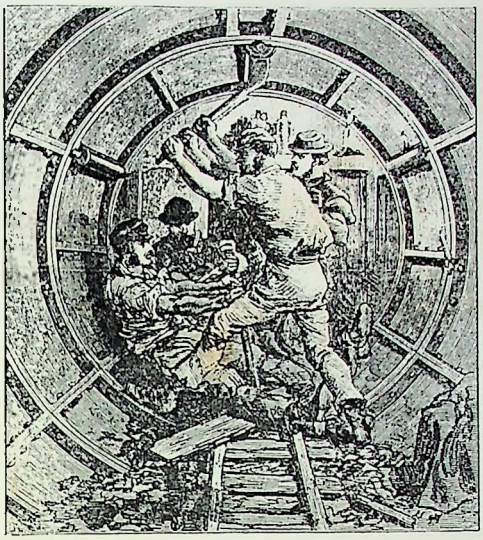
* Camden Town Tunnel
S. HOLLAND 86

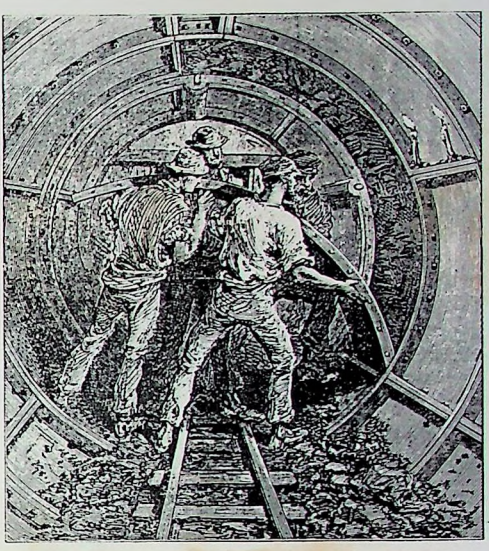
The underground's rolling stock consists of 3875 cars. Surface stock which operate on the Metropolitan, District and Circle lines are larger than the tube stock which is designed to operate through the 12ft diameter tunnels. The most recent rolling stock prototypes which are expected to run by 1990 have just been finalised as a £260 million tube train programme for which the design work has been carried out by David Carter Associates.

The new trains offer larger windows, continuous handrails and increased seating. The body will have an off-white body with grey window surrounds and red doors. The overall standard tube profile will be retained in keeping with previous designs.

The 1935 in London The Unique City, Danish architect Steen Eiler Rasmussen described the London Underground as "the eighth wonder of the world." (1) It is doubtful that many of the regular passengers on the tube would agree with him as the prospect of tube transport at rush hour can be daunting and often streessful. It can rarely be equated with a aesthetic experience on a par with "the eight wonder of the world." The London Underground however, must merit as a major feat of human application.

For us to understand how this system evolved we must look back to the mid 19th century to investigate it's origins.





* Greathead Shield
UNDERGROUND ILLUSTRATED HISTORY

Using a Greathead shield to excavate one of the station tunnels on the Great Northern & City Railway, about 1900. (14784)

THE HISTORY AND DESIGN OF THE LONDON UNDERGROUND

As a preliminary situation to the development of underground transport significant advances in tunnelling technology had to be made. French exile Marc Isambard Brunel, the famous engineer devised the tunnelling machine which was used to construct the Thames tunnel opened in 1843 after fifteen years of construction. Brunel's tunnel, even though a major achievement was not a commercial success. Tunnels remained out of vogue for about twenty years until James Henry Greathead, a twenty six year old South African engineer designed his own Greathead sheild which was more sophisticated, lighter and 7ft 6" in diameter. It operated under compressed air.

Greathead also designed in 1889 a prophetic machine which was never built . It worked on the principle of washing away the spoil with high pressure water. This principle was utilised to some extent in the 1971 Bentonite tunnelling machine which turned clay into a liquid when subjected to a chemically induced shock. this development was pointed to by two major landslides in 1950 in Knockshinnock in Ireland and Surte in Sweden . The Tower Subway was engineered by Greathead and Dalrymple Hay ,another prominent engineer who was involved in the Waterloo to City underground railway and consultant with London Transport until the 1930's.

Etching of the section view of the proposed Metropolitan railway's design.
Source.. London under London.

William Halerow succeeded Dalrymple Hay as the major tunnelling expert since the 1930's.

The Story of the Metropolitan Line 1843 starts with Charles Pearson.

In order to solve London's traffic problem whereby 250,000.00 people entered London each day and there were no traffic lights and subway streets for horses and pedestrians, as it was vetoed by the police as a lurking place for thieves.

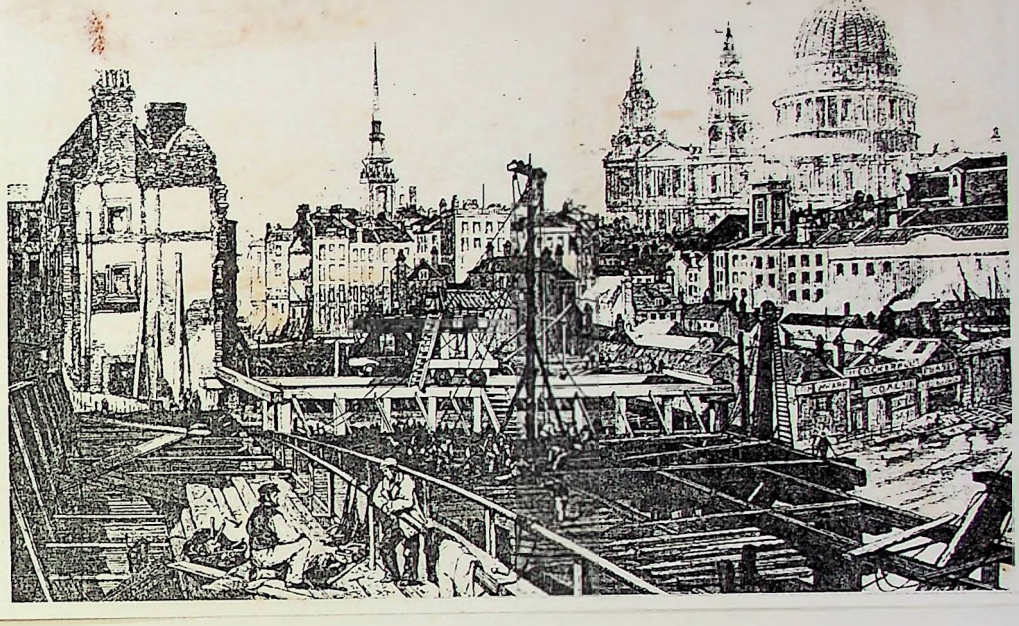
Pearson's vision was underground railways linking railway termini. He envisaged that the idea would get rid of slums in the inner city, those being replaced by proper suburban housing. There were various comments of ridicule of sending people like parcels in a pneumatic tube in a drain-like tunnel from one end of the metropolis to the other.

Punch suggested that he use coal cellars belonging to the public and have them at the disposal of the company.

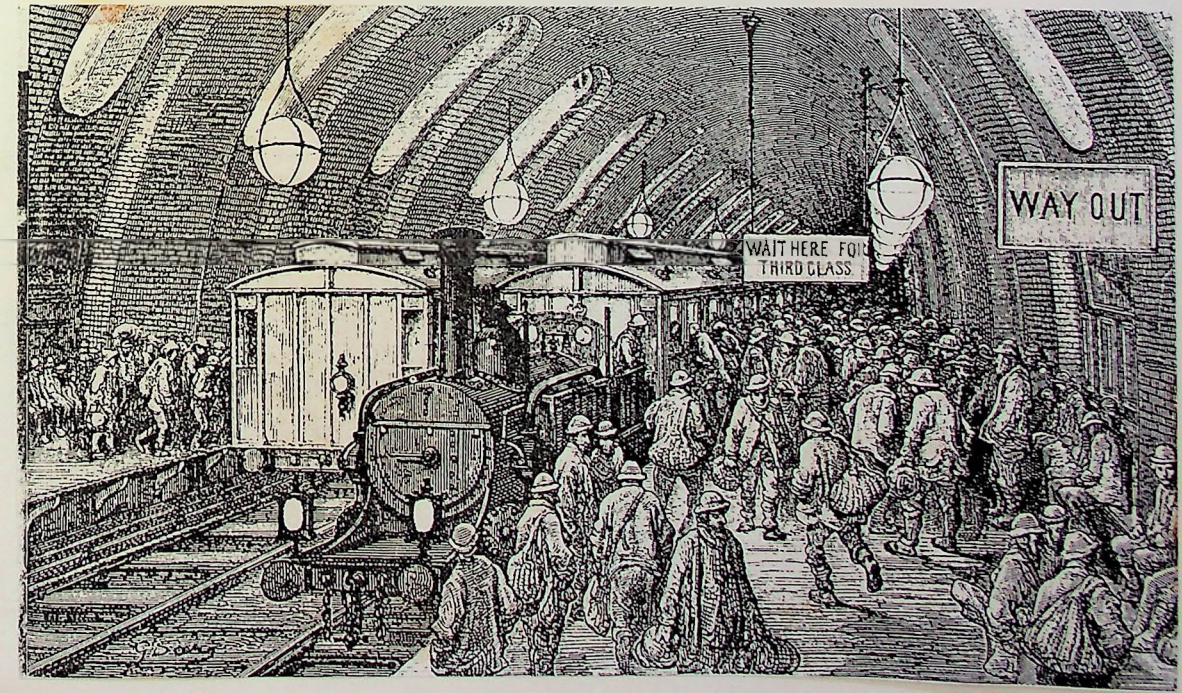
Pearson had the problem of finding a suitable engine as the standard steam engine would suffocate the users. An engine was built whereby the smoke and steam was diverted to a tank which on exiting a tunnel would let off steam.

After fourteen years Pearson raised £300,000.00 from the Great Western Railway and Great Northern and the City of

The cut and cover method of construction caused much havoc on the streets.



The early days of operation on the Metropolitan.



London Corporation. The first shaft was sunk in Euston Square in 1860.

The construction work was done by a cut and cover method which meant cutting a trench tunnel and building the tunnel structure in brick. Then the clay covers the tunnel and the roadway is re-surfaced.

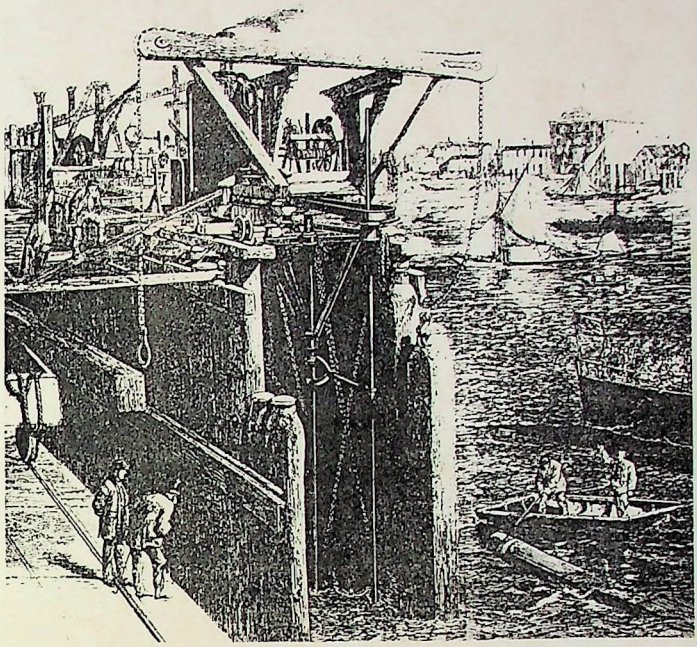
Building caused a large amount of disruption as well as compulsory purchasing and demolition of houses.

In the Fleet Valley in which thousands of poor people lived, 12000 of them were displaced from 1000 houses without a single vocal complaint - certainly a sign of the times!

The line was completed in January 1863, not without taking its human toll from various accidents and construction calamities such as burst watermains and sewers. Pearson never saw the opening, dying six months earlier after having received little in return for his efforts.

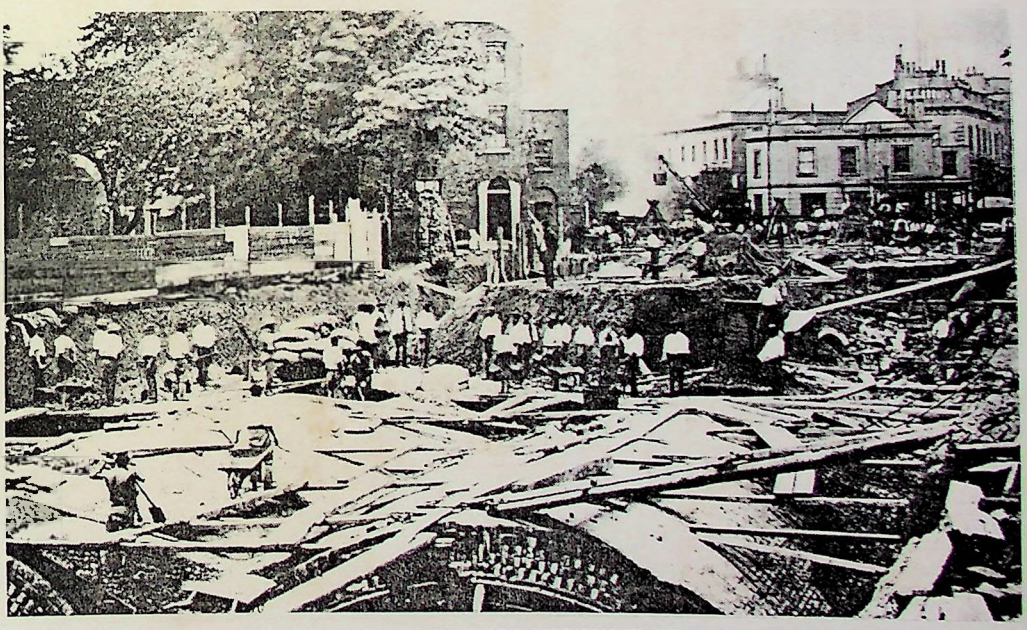
The Metropolitan's first day of operation was of crowded scenes. There were first, second and third class. First class cost six pence, whereas the early morning working man's two penny fares were availed of - cutting down long journeys to work "making working class fellows a much more pleasant bunch." (2)

With the success of the Metropolitan line there was a flood of many more or less zany ideas relating to the new method



Left:
Bazalgette intended the District Line to be incorporated into the Embankment from the outset. Delays to the line meant that the Embankment was built first, only to be torn up again a few years later when the District Line finally put in an appearance.

Below:
The twin tunnels of the District Line at South Kensington.

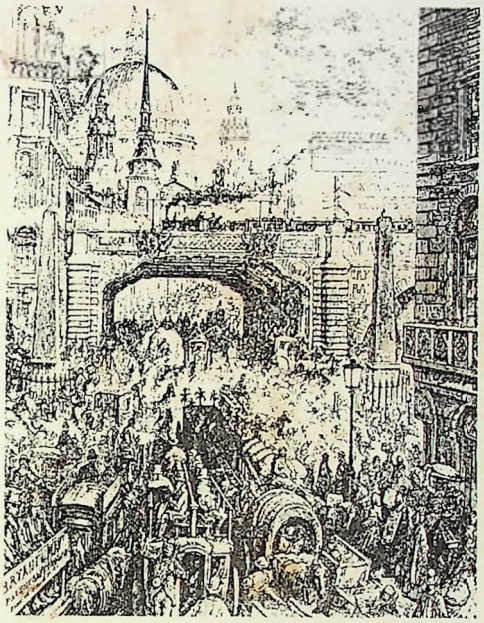


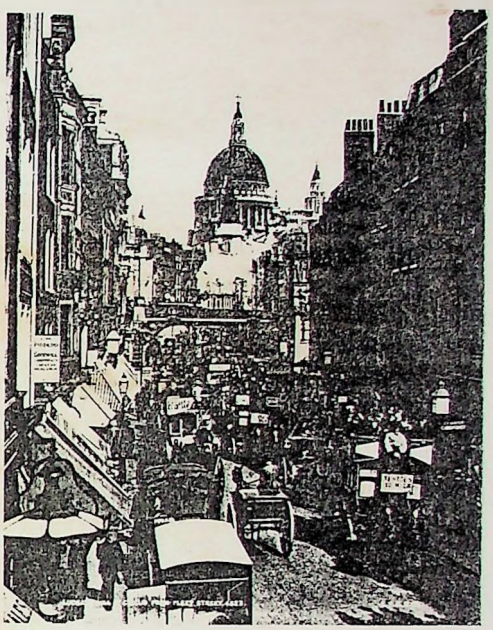
of transit. These included the building of an atmospheric railway powered by air pressure, another to drain the Regents canal and run a line along it powered by cables and windmills. Joseph Paxton's ten mile glass covered "Great Victorian Way" and the final proposal was to build a line alongside the Thames.

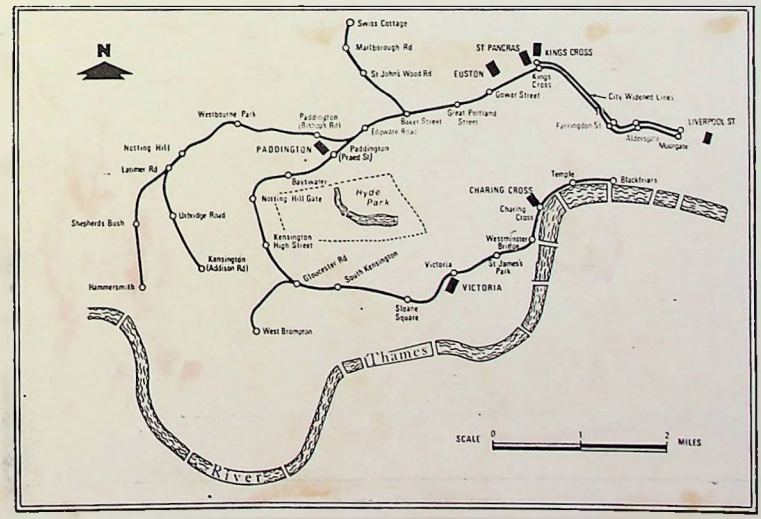
After Paxton's idea of using atmospheric pressure came to a cul de sac, even though the idea was used in the Dalkey Railway in Dublin, and in the London/Croydon Epson Railway. It consisted of using a pipe with a continuous valve made of leather and lubricated by beeswax. However, rats caused havoc by seeking shelter in the pipes. The idea was abandoned.

The District Line proposal was accepted by engineer of the Metropolitan Board of Works, Sir Joseph Bazalgette who had the power of decision over the fifty three other shelved proposals. The District line was to be built as an integral part of the proposed Thames Embankment. Building started on June 29, 1865 employing 2000 workmen, 200 horses and 58 engines, as they dug their way underground. The first section Westminister/South Kensington was ready by Christmas Eve 1868. However there were constant delays on the approach to the Embankment and Bazalgette could not wait any longer to build his Embankment without the District line, eventhough it had to be torn up a few years later to accommodate the line.

The building of the Underground was meant to alleviate London's endemic traffic problems, but these two views of Ludgate Hill (with the London, Chatham and Dover Railway in the background) – in an engraving by Doré of 1872 and a photograph taken twenty years later – show that nothing had changed.





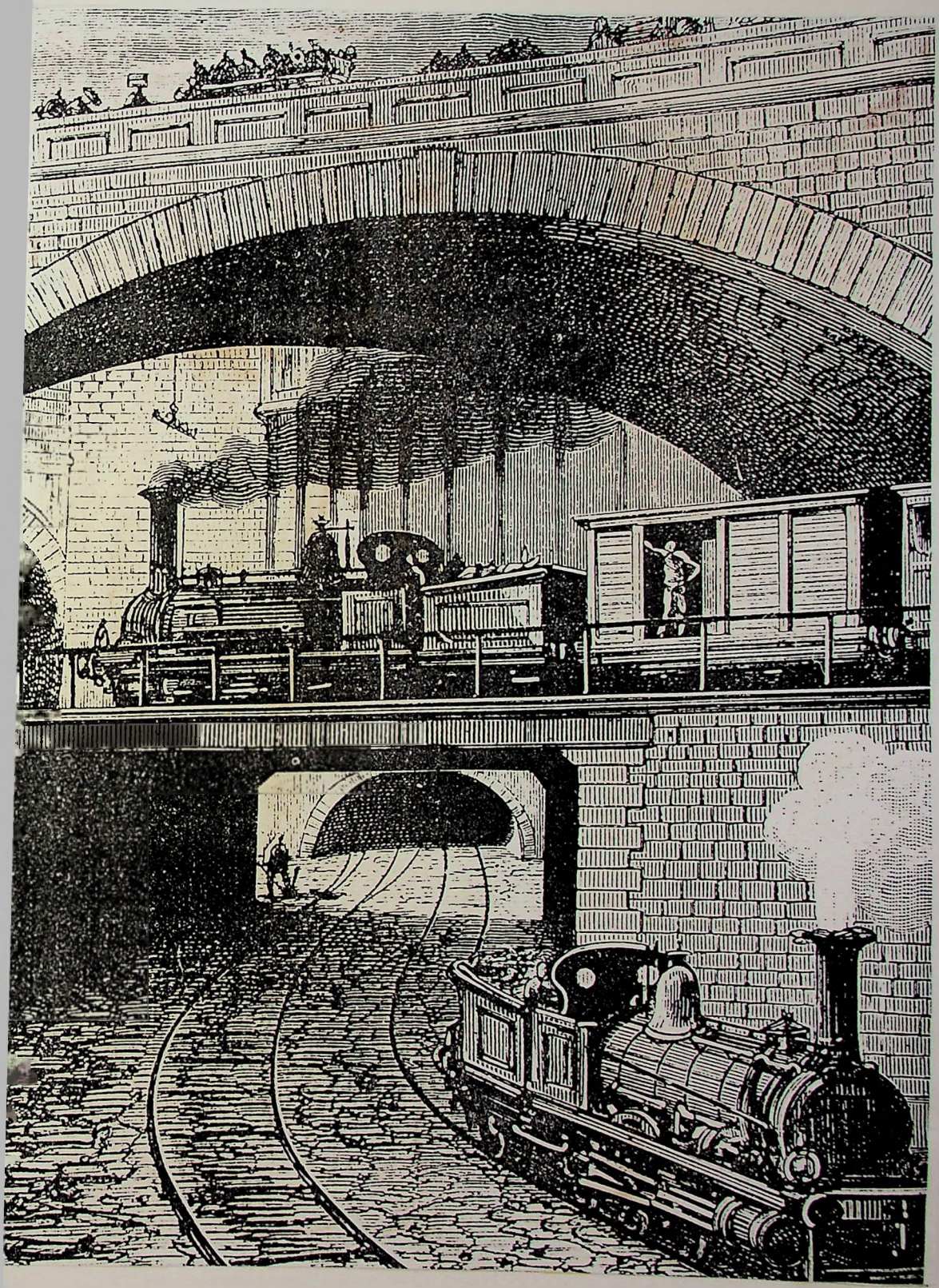


* Map of Metropolitan and District Railways 1870

The District and Metropolitan came to within a mile of each other but did not join for over thirteen years. This fact was testimony to the rivalry of the heads of the District line James Staats Forbes and Sir Edward Watkins, the Metropolitan chief, who shared mutual hatred for each other and their schemes.

Due to rival stations cropping up in similar locations and the demolitions required by two separate companies, public opinion and governmental pressure forced the lines to link, forcing Forbes and Watkins to sit side by side on the first train journey around the Circle line in spite of each other in 1884.

Ventilation was a problem which had been a relatively low priority issue with the first tunnelling engineers who had thought that the piston action of the trains would be enough to circulate the air. There were sporadic air holes leading up to street level. As there had been no satisfactory means of smokeless locomotion, tubes could not be properly ventilated and passengers would have to continue in their discomfort for a few more years. While steam locomotives continued and the problem was most acute. However even when electric traction was introduced, causing a reduction in pollution, the problem was still not alleviated. In the deep level tubes where there could be no air-holes, the exhaust fumes of engines, combined with the smell of concentrated humanity made journeys malodorous and suffocating.

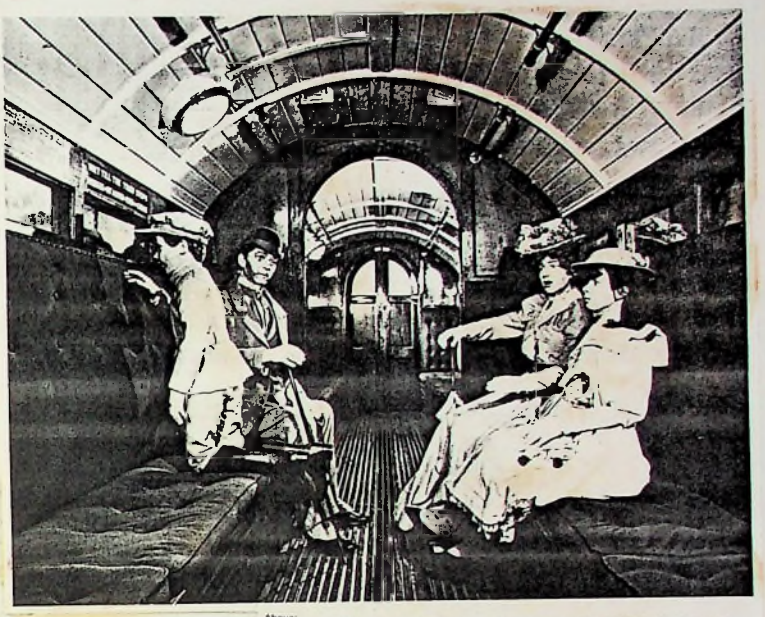


A spectator from an the English Illustrated Magazine talked of the grim nature of that form of transport commenting:

"By the time we reached Gower Street I was coughing and spluttering like a boy with his first cigar." (3)

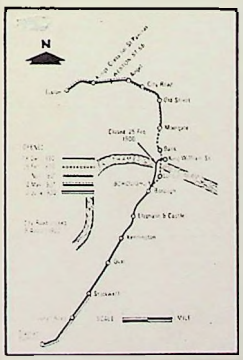
London County Council chemists were called in to investigate underground pollution and found that sulphur and nitrous oxides were a danger whereas carbon dioxide was not. The air in the tunnels was foul smelling due to excessive dryness - only about half the humidity of the street level air. Exhaust fans were first built in 1902 in Bond Street. It was not until the 1920's and 1930's that filtered and ozonised air was injected into the underground making it a relatively painless experience.

The Metropolitan and District lines up to now had been built by the cut and cover method. The first deep level tube was the City and South London line now known as the City branch of the Northern line. The engineer was Greathead. By this time electric traction was in wide use in the United States carrying 250 million people over 3500 miles. There were three projects: Dover to London, the Bessbrook to Newry Tramway in Ireland and the Volks Electric Railway on the seafront in Brighton. These systems gave the promoters second thoughts about cable haulage which was the system for tram haulage in San Fransisco, run off large steam engines and intricate gear changes.



Above:
The interior of the original City & South London car now on display in the London Transport Museum. The reason for the nickname 'padded cell' for this rolling stock is obvious. (B5/408)

* Photo of the "padded cells"



* The City and South London - Diagram

Electricity was adopted. The principle of electric tranction had been demonstrated by Werner Von Siemens in Berlin in 1879. The line was opened the November 4, 1890 being the first electrically operated deep level railway in the world.

The rolling stock was built by Beyer Peacock with Mather & Platt electrical equipment. The locomotives picked up 500 volts DC from the conductor rail laid between the running rails. The coaches were known as "Padded Cells" due to the high upholstery leading up to ventilation slots. Windows were omitted by the reasoning that there was nothing to see. Station names were called out by guards between carriages.

The next line to be built was by Dalrymple Hay's Waterloo in 1898 and city line, nicknamed "The Drain." This line was fitted with American built cars and Siemens motors. It has since never become part of the underground system belonging to British Rail.

The methods of tunnelling by sheild marked the way forward for underground railways in central London. The next twenty years saw a boom in this type of construction. A parliamentary committee recommmended that future tunnelling be of a standard guage of 11 1/2ft diameter and that compensation would not need to be paid for tunnelling beneath properties as had been imposed before.

These years saw the building of the Central line, 1900, which was the first dug by a tunnelling machine, the West End branch of the Northern line 1904 and the Bakerloo.

The Central London Railway went from Shepherds Bush to Bank via Oxford Circus. Construction began in 1896 under the direction of the engineers Greathead, Fowler and Benjamin Baker. Features of the line included the oddity of having eastbound and westbound platforms at different levels. There were also rising gradients at the approach of a platform to aid braking and downward gradients on the exit of the tunnel to aid acceleration. The trains were built by the American company G.E.C., which integrated the locomotive with the first carriage itself.

This line not only served commuters but also those going to the shopping and theatre districts. It was known as the twopenny tube and it attracted 15 million passengers by the end of 1900. Within a few months there were complaints of excessive vibrations affecting nearby properties which were affected by the hefty 44 ton locomotives of which 75% of the weight was unsprung. Later stock were redesigned reducing the weight to 31 tons with 35% unsprung weight, thus alleviating the problem.

There was also a safety development where the signaling current was separated from the main traction current into a low voltage control system as opposed to the whole traction current passing through the train.

The Great Northern and City Railway was built to alleviate problems with a bottleneck from Finsbury Park to Kings Cross and Moorgate. This was a 16ft diameter tube which accomodated standard suburban rolling stock. Services began in 1904. However, it was not a financial success and was subsequently taken over by the Metropolitan railway.

Around the turn of the century the history of the London Underground was dramatically changed by one influential, if not shady character, an American named Charles Tyson Yerkes. Yerkes who had been jailed in the United States at the age of twenty four for embezzlement, moved into the streetcar business in Chicago. He rapidly gained control of all of Chicago's streetcars through ruthless operations and had managed to extract $40 million dollars from the people of Chicago before being turned upon by the people after having claimed monopolistic rights for his streetcars. He fled to New York with his wealth. In 1900 he moved to London and bought the District line and after building the Lots Road powerstation or "Chelsea Monster" which was Europes largest generating station, he proceeded to electrify the District line in 1901. Yerkes soon acquired all lines except the Metropolitan line. O. S. Nock wrote of Yerkes:

"His interest in railways, as railways, was absolutely nil. He neither knew nor cared about the day-to-day methods of operation, safety consideration and such like. His sole and only concern was with the accounts." (4)

Yerkes died in 1905 and was succeeded by Henry Stanley, who later became Lord Ashfield. Stanley, an Englishman had

emigrated to America and rose through the ranks of the Yerkes organisation from messenger boy to general manager. It is ironic that the underground network of the British capital and that of the Empire had become mainly owned and run by an American based organisation.

THE ELECTRIFICATION OF THE METROPOLITAN AND DISTRICT LINES

In 1898 the Metropolitan and District lines shared the cost of an experiment in electric traction using a 500 volts DC supply and Siemens equipment.

Various proposals for electrification systems were entered, including that of a Hungarian company Ganz, which was recommended by the committee, consisting of a 3000 volt overhead wire system. However, the chief financier Yerkes vetoed the proposal in place of the lower voltage conductor rail system which was in wide use in the United States. Despite a legal arbitration case the Metropolitan had to accept the District's decision as it would have been highly inpracticle to have two incompatible systems in operation. The first electrified service occurred on January 1, 1905 on the Metropolitan line using the American Westinghouse electrical equipment on some stock and British Thomson Houston traction control on other trains for comparative purposes.

The District line had done the electrification construction work by 1901. However it was not until 1905 that the

service went into operation due to financial problems. The District stock known as A stock was fitted with British Thomson Houston traction equipment and Westinghouse braking equipment, illustrating the American connections of the District's management. The cars were wooden-bodied open saloons which were entered through hand operated doors.

In 1905 on the District line, second class accommodation was abolished, leaving only first and third class - a good reflection of the rigid class structures which were inseparable in British society at the time.

Of the various tube railways promoted in the 1890's succeeding the City and South London, only three more lines were developed in central London for the next sixty years. These lines were what are now the Bakerloo, Piccadilly and Northern lines which were completed in 1906/7.

THE BAKER STREET AND WATERLOO RAILWAY

The line was started in 1898. The line was initially financed by Whitaker Wright who was a financier who had made his fortune in the United States in mining. When his Globe Finance Corporation was liquidated after a scandal, Yerkes took the opportunity to take the line over in March 1901.

The Charing Cross/Euston and Hampstead Railway (CCE & HR) which had been sanctioned by Parliament in 1893 but had not proceeded until 1900 when Yerkes and his colleagues bought

* Piccadilly Circus Station about 1910

the rights for $100,000.00. This line formed the basis for what is now the Northern line.

The third line built by Yerkes was the Piccadilly line which was an amalgamation of two seperate railways. The first project being Brompton and Piccadilly Circus Railway Company and the second being The Great Northern and Strand Railway. The projects were brought together in 1901/1902 by the Yerkes group through it's Metropolitan/District Electric Traction Company (MDET) which was formed in order to organise the three lines and the building of the Lots Road electrical generating station, which was completed in 1905.

The Charing Cross Euston and Hampstead was the last of the Yerkes railways to be opened by Lloyd George. From Charing Cross to Golders Green and the branch from Camden Town to Highgate. It was advertised by the UERL as:

"The last link in the new chain of communication. Passengers can enter into possession of a complete system of underground railway transit which it is believed will not only help to solve the pressing problems of street congestion but will introduce wide ranging changes in the distribution of population, the location of shopping centres and the travel habits of people." (5)

The underground stations of the period had tiled walls with colour coded stripes to aid passenger identification. The station names appeared in large tiled lettering on the tunnel walls.

The rolling stock for UERL tubes had Spragem/Thompson Houston control equipment. A total of 108 all steel cars

* London Underground Railways Map 1908

'No Need To Ask A P'liceman' by John Hassall, a well-known early example of the Underground's pictorial poster advertising, issued in 1908. (21250)

were built by the American Car and Foundry Company at Berwick, Pennsylvania. They were shipped to Britain in knock-down form and assembled at Hafford Park, Manchester. One hundred and fifty more were built in Manchester. For the Piccadilly line an order for two hundred and sixteen cars was divided between Les Ateliers De Construction du Nord de la France and the Hungarian Railway Carriage and Machinery Works. It is curious that at a time when Britain was still asserting itself as an imperial power, much of the work was carried out by foreign contractors.

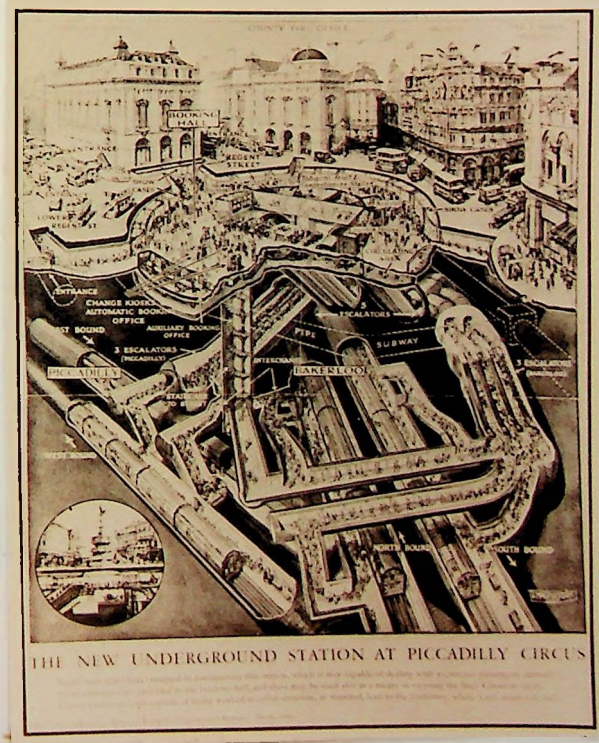
UNDERGROUND

In 1908 the general managers agreed to publicise their railways jointly under the title UNDERGROUND. UERL's joint publicity was co-ordinated by Frank Pick. Pick developed the policy of commissioning publicity posters from both known and unknown graphic artists. He was always insistent on the hightest standards of design.

Albert Stanley who later become Lord Ashley was instrumental in bringing together the various elements of London's public transport into a single unified body. Under his brash type of American style management he begin to swallow up his rivals. For the first time the Bakerloo, District, and Northern lines were linked at what is now Charing Cross station in 1914.

* Example of escalator hall by Charles Holden

Below:
A cutaway view of Piccadilly Circus station as reconstructed in 1925-28 with a new circular sub-surface booking hall and banks of escalators to replace the original lifts. *(H16296)*



THE NEW UNDERGROUND STATION AT PICCADILLY CIRCUS

* Cut-away view of the refurbished Piccadilly Circus Station of 1925-28

World War I lead to a 67% increase in passengers between 1914 and 1918 with more workers drawn to London by war industries and many soldiers making their way around London via underground. The war also led to women being recruited to jobs which were previously done by men only. London experienced its first air raids in 1915-1917 where deep level stations were used as air raid shelters for the first time.

After World War I the underground gradually extended into the suburbs with the backing of government guarantees for financing. There was acute overcrowding on the existing system and there was a shortage of rolling stock. New stock was introduced with new air operated doors in 1921. To cater for the overhaul of rolling stock, the central repair depot was built in Acton Town in 1922. The Camden Town junction was constructed, incorporating the most complex interchange of four lines in 1924.

Frank Pick was responsible for hiring Charles Holden to be the architect for the stations along the Northern line extension. Holden's work epitomised a certain house style which remained the hallmark of the underground's modernist persuasions.

The Piccadilly Circus station was reconstructed from 1925 to 1928 as a showpiece of Holden's work. The attractivce central circulation area set a precedent for metro planners throughout the world.

* The Experimental Streamlined 1935 Stock

* Interior of 1938 Rolling Stock

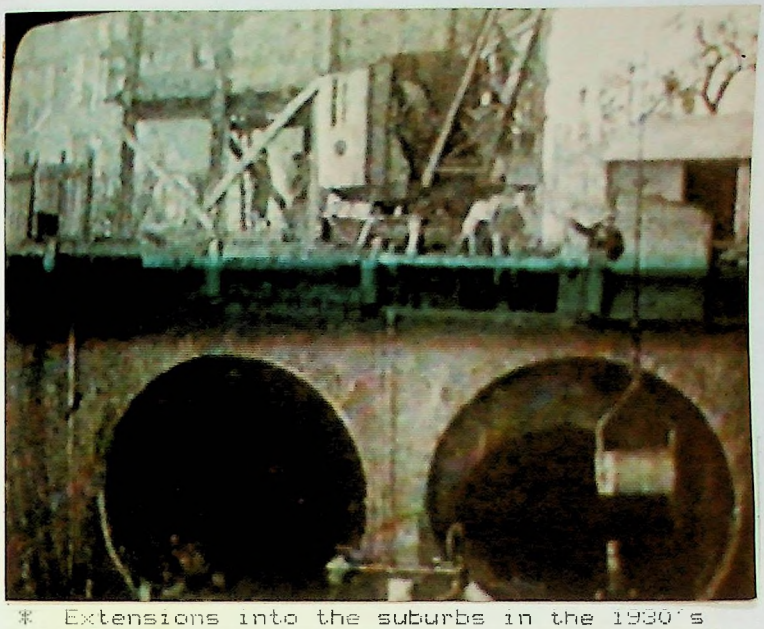
THE CREATION OF LONDON TRANSPORT

London Transport was created July 1, 1933 due to the chaotic state of bus services and rivalory between different independent companies promoted the co-ordination of London Transport under common management. London Transport was led by Lord Ashfield as chairman and Frank Pick as vice-chairman. It had a monopoly of bus, train, trolleybus and underground services within a 20-30 mile radius of Charing Cross. The underground network covered 227 route miles and carried 416 million passengers in it's first year.

After the introduction of London Transport there was a series of modernisation schemes. The Metropolitan line was no longer permitted the luxury of regarding itself as a mainline railway and services into the countryside were swiftly cut back.

There were new extensions on the Bakerloo, Northern and Central lines. There was new stock developed to cater for the extensions. Initially there was an experimental streamlined train which reflected the effect of American streamlining on design. However, the streamlined train was not seen to have any practical advantages for trains which travel at relatively low speeds and a more boxy but rounded look was adopted in the 1938 stock.

These trains incorporated new features such as putting the control gear under the floor instead of being situated



* Extensions into the suburbs in the 1930's

* Seat incorporating underground logo

* "The Archer", at East Finchley Station 1939 by Eric Aumonier

behind the cab thus increasing the pasenger capacity by 14%. The trains also incorporated the smooth exterior body line which prevented the common practice on older trains of jumping onto a moving train and forcing the manually operated sliding doors open. The trains were built by Metropolitan - Camell and Birmingham R.C.W. companies. The innovative engineering work was under the direction of W.S. Graff Baker. These trains marked the standard outline shape of London tube trains for over forty years.

The 1930's was a flourishing time for the underground, not only in terms of increased passenger numbers but also for the patronage to the graphic arts by Frank Pick and the development of a coporate/modernist image in architectural style as typified by the work of Charles Holden. Throughout Frank Pick's career with the underground he used his position to retain a high standard of design throughout the system. Pick was described by Nikolaus Pevsner in an outline of European architecture:

"British business was unwilling to accept design. Pick was the prototype 20th century patron. He used his position as an administrator." (6)

Pick himself stated that:

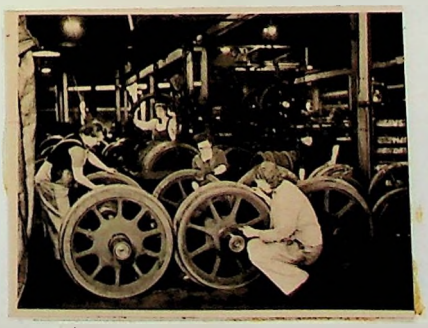
"Art is not a separate thing but an essential part of civilised life" (7)

and in the choice of graphic designs he maintained that ever poster was to be justified by it's functional virtue, i.e. stimulation of traffic. Pick who was remembered as a

* Litter basket in Piccadilly Station

* Charles Holden's Sudbury Town Station

* Plessy Factory in Central Line Tunnel 1942



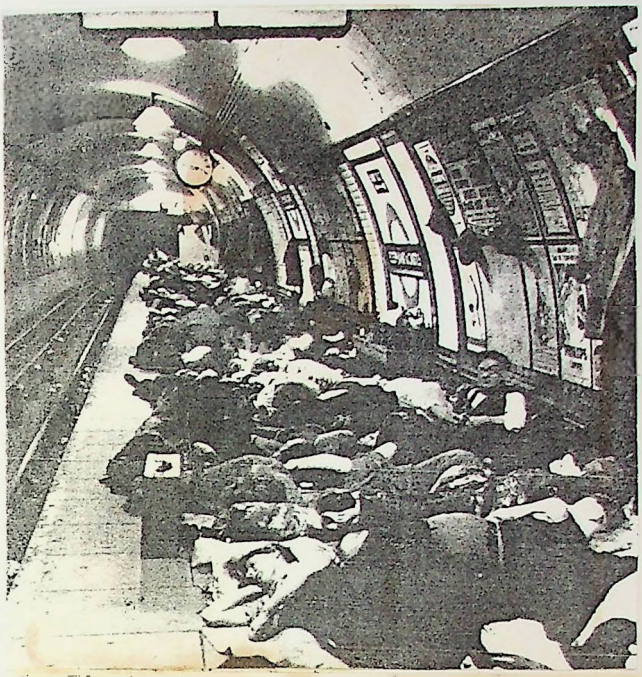
Women doing maintenance work at overhaul depot at Acton

rather austere figure was known to spend as much time on design of a signal box, canteen or garage as to the entrance hall of a busy station. His philosophy must have been that of progress through patience.

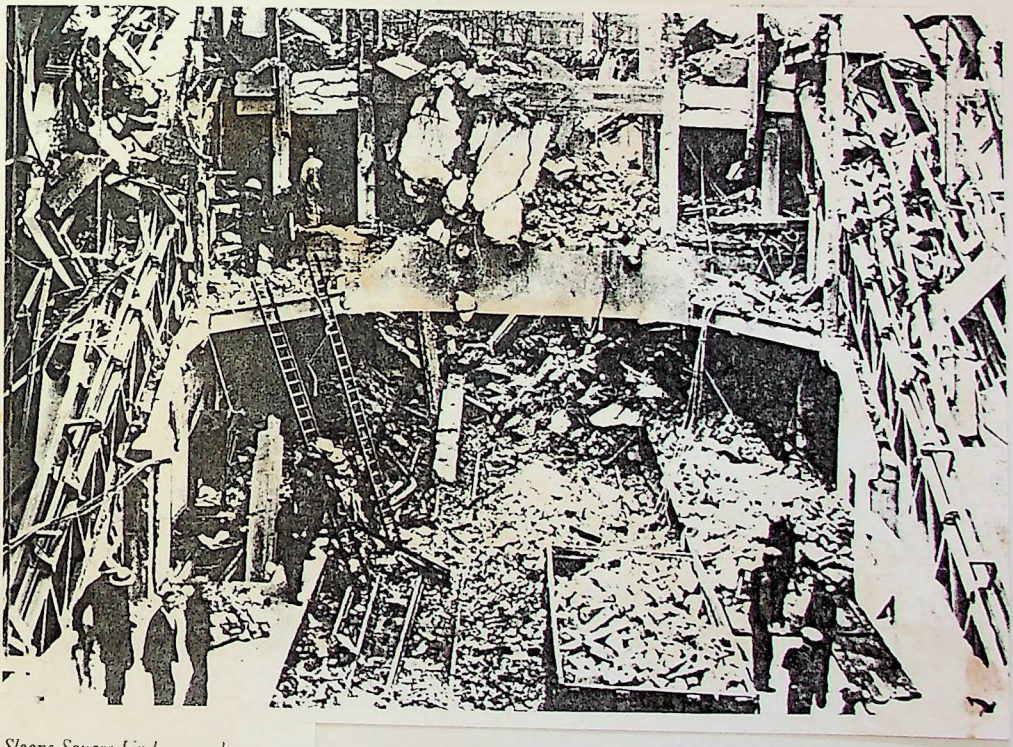
Holden's work was also influential in introducing modernist ideas to British design with his characteristic architectural features of the brick box with a concerete lid in stations such as Sudbury town. The style reflected an almost utopian toytown look which incorporated a clarity of corporate images which are now recognized as the best examples of modern commercial architecture in Britain between the wars.

WORLD WAR II

In 1937 London Transport was instructed by the government to form an Air Raid Precautions Committee. The most serious threat was seen as the possibility of flooding in tunnels under the Thames. Floodgates were installed in certain tunnels. Underground trains were fitted with anti-splinter netting and reduced lighting in open sections of track during the blackout. Luxuries such as Pullman carriages on the Metropolitan line were withdrawn. The Blitz began in London in September 1940 and carried on intermittantly until May 1941. During this time Londoners took refuge in the tubes for shelter in their thousands thus defying a government instruction that stations not be used for this purpose. However, after initial chaotic scenes, sheltering



* Elephant and Castle Station during the Blitz 1940



Sloane Square Underground station after a bombing raid on 12 November 1940.

facilities became properly organised, with the provision of bunkbeds, refreshments and admission tickets.

The underground system suffered some disruption and severe damage due to the bombing. In World War II ninteen underground cars were almost totally destroyed and 1050 were damaged in some way. There was an enormous backlog of maintenance and repair work by the end of the war. Some sections of new tunnels were converted into government shelters or as on the Central line, a Plessy aircraft component factory which employed 2000 workers was in operation, workers working day and night shifts.

POST WAR

Under the new Labour government resources were primarily channelled into reconstruction of housing. There was a priority with the Central line extension.

A major advance in the London rolling stock design took place in the 1950's with the introduction of aluminium alloy bodywork which saved energy due to reduced weight and avoided the need for painting for weather protection as it was corrosion resistant. The use of aluminium became the new standard for future London Transport rolling stock, thus giving them their distinctive look. Other improvements came with the Victoria line which was the first new tube line to be built under Central London since the 1900's. It was intended to relieve pressure on the overground traffic and

* Victoria Line Diagram

* Fifties Rolling Stock Interior, Northern Line

* Victoria Line escalator hall
MISHA BLACK

provide a link between the four mainline termini. It was believed that the railway would not be financially self-supporting but would have substantial social benefits. Construction work started ini 1963. It was decided to build tunnels slightly bigger to reduce the air drag on trains.

The Victoria line differs from the other earlier tubes by its common sense attitude of placing seats, escalators and telephones with the notion of dynamic process, where the regulation could be controlled from a central control room.

In terms of financing, costs could be reduced with increased automation thus cutting back on operating staff required, and secondly the revenue lost from fraudulent travel and vandalism could be reduced if surveillance was improved and an automatic fare control system introduced.

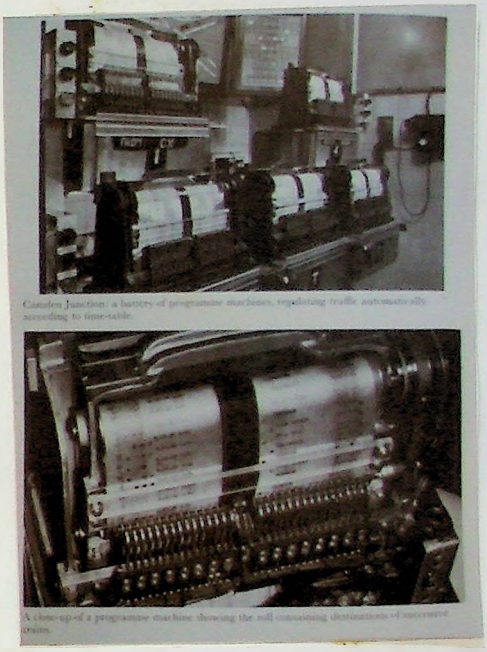
The tunnelling was quite a technological and engineering achievement requiring less than 1" tolerance needed in alligning the twenty three tunnel sections each with its own drum digger sheild cutting at the rate of 2" every minute. The flyover tunnelling was done at Euston, Finsbury Park, Highbury, Oxford Circus and Stockwell.

Misha Black and the Design Research Unit carried out the design of the 1967 stock, producing reduced drag bodied cars.

Below
A Kinnear Moodie rotary-drum digger shield being hauled through a station tunnel at Green Park after completing a Victoria Line running tunnel drive from Victoria, May 1965.

Above
One of the most visible signs of work on the Victoria Line was the Oxford Circus 'umbrella' bridge, erected in August 1963. It remained in position until April 1968 when construction of the new station booking hall below the road junction was completed.

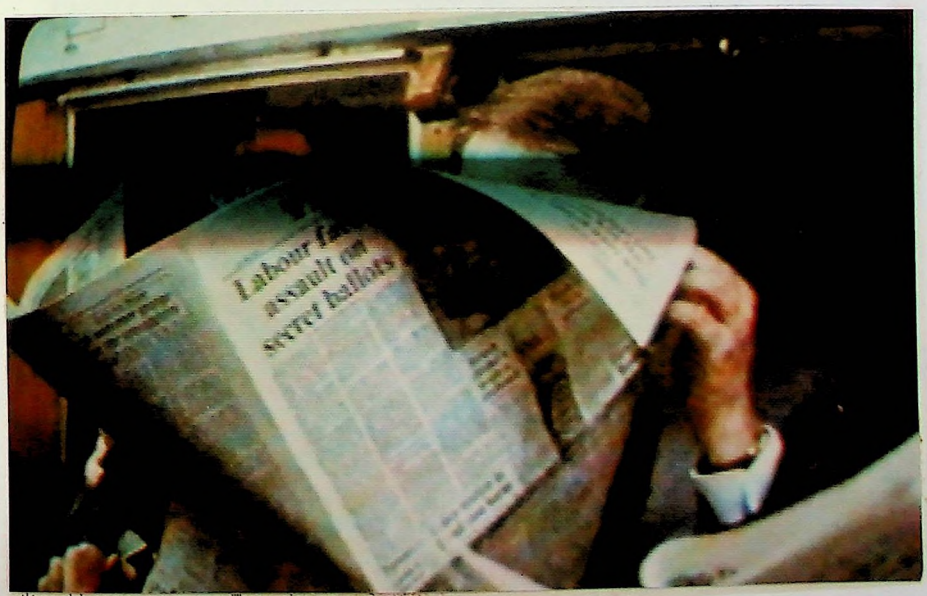
* 1967 Rolling Stock, designed by Misha Black and The Design Research Unit



Camden Junction: a battery of programme machines, regulating traffic automatically according to time-table

A close-up of a programme machine showing the roll containing destinations of successful trains

* Punch Tape Control System used on pre-Victoria Line automation



* Newspaper Reader

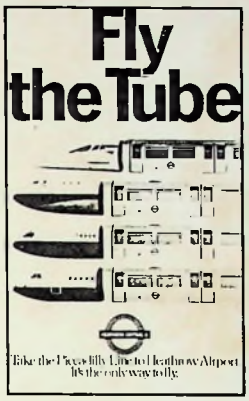
Seats were redesigned after ergonomic studies were made. Smaller and deeper seats with zig zag handrests designed so as to keep neighbours of newspaper readers content.

Automation instead of the previous punch tape control system meant that coded signals could be taken from the rails. These signals controlled both traction and braking. In the manual systems there were variations with accelerating and braking, whereas the new trains could enter a station at 35 miles per hour and come to a halt within 5ft of a given point. Headway between trains was set automatically. The cab was simplified down to relatively few controls made it a more comfortable and uncluttered cab.

Due to the increasingly deteriorating stations, London Transport announced a modernisation plan in 1979. This plan proposed the refurbishment of stations with a new incorporation of individual station identities.

In 1963 the British Transport Commission was abolished and London Transport became directly responsible to the Minister of Transport. From Janury 1, 1979 London Transport's control was transferred to the Greater London Council. Funding for new lines was funded 75% and 25% respectively between the govermnent and the Greater London Council. However this meant that London Transport became prone to changes in political control making longterm plans difficult to implement.

The single platform at Heathrow Terminal 4 station, opened by the Prince and Princess of Wales on 1 April 1986. Passenger information has recently been improved at many Underground stations with the installation of dot matrix train describers giving train arrival times. (24056-14)



62

* Terminal 4 Heathrow Extension

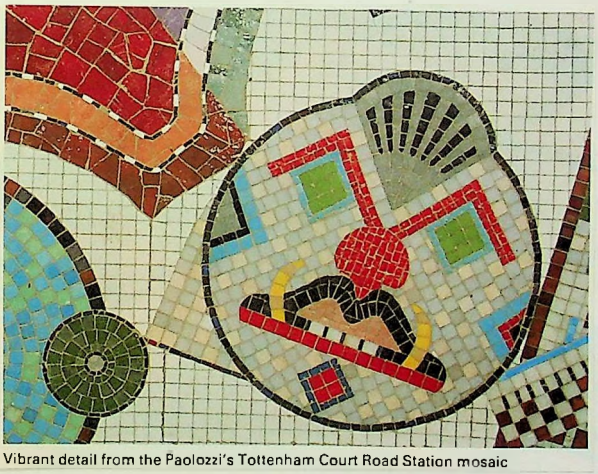
The Greater Lonodon Council subsidised fares from 1970 leading to a serious legal and political battle in the "Fares Fair" wrangle in 1981 which contributed to the abolution of the Greater London Council itself by the Conservative government.

In 1971 an extension was added to the Piccadilly line linking it up to Heathrow Airport (thus making it the first underground network to link up directly with an airport which by the 1960's had become the world's busiest). The extension was opened in 1977. There was a further extension to join up with Terminal 4 which was opened in 1986.

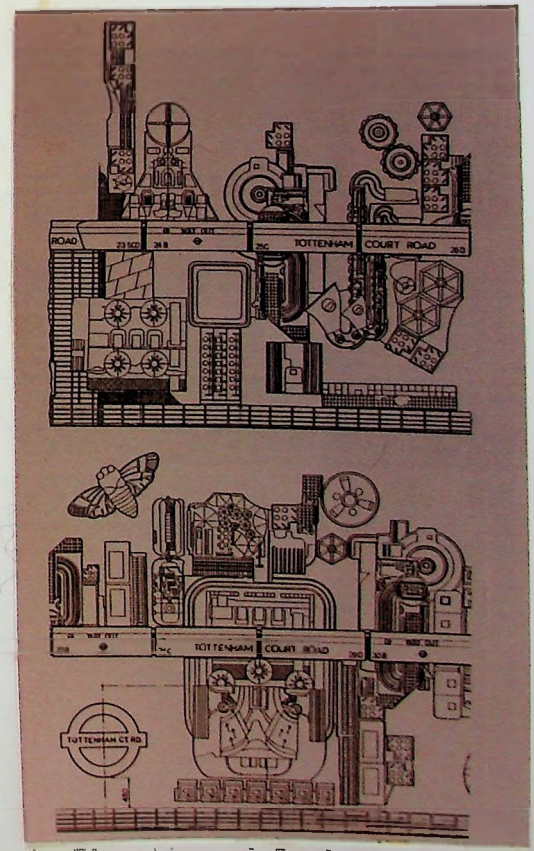
Another project started in 1971 which had been first proposed by the London Plan Working Party Report of 1949. This line which was to become the Jubilee line was proposed to ease pressure on the most heavily congested of the underground network, the Bakerloo line, between Baker Street and Oxford Circus. The line was 14 miles in all from Charing Cross to Stanmore. The line was opened in 1979 although it's name commerated the Queen's Jubilee in 1977.

After a series of new rolling stock deliveries in the 1970's and 1980's, all remaining pre-war 1938 stock was taken out of service except for a temporary relapse in 1986 when due to an unprecedented rise in passenger numbers, five of the 1938 red trains were re-used.

* Tottenham Court Road Station



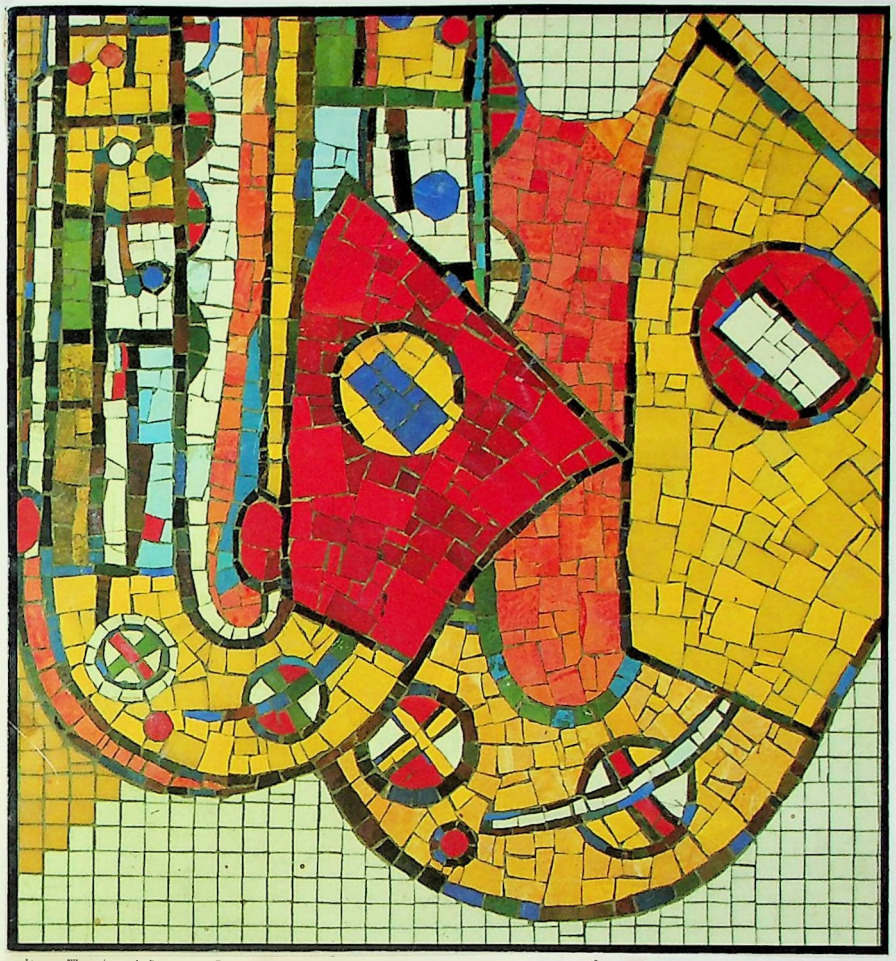
Vibrant detail from the Paolozzi's Tottenham Court Road Station mosaic



* Elevation of Paolozzi's mosaic

Due to a concentration of financial resources into rolling stock, stations and the general static environment received little attention and this prompted Design Magazine, November 1979 to highlight the deterioration of stations through confusing signs and poor lighting.

A new development was initiated in 1981 involving the systematic station improvement and modernisation scheme which was to cost $60 million. The scheme centered on the central area such as Bond Street, Embankment, Holborn, Piccadilly Circus, Tottenham Court Road, Waterloo, Baker Street and Leister Square. The design approach changed from that of the clinical and austere feel of the Victoria and Jubilee lines which were strictly modernist in approach. Surveys however showed that passengers preferred bright modern environments which increased a sense of security. In a gesture similar to that of Frank Pick's policy of commissioning artists and designers to enhance the travelling environment, London Transport commissioned the pop artist Eduardo Paolozzi to design a mosaic for Tottenham Court Road station, the new refurbishment designers favoured the idea of offering a more interesting environment to travel in by giving the stations an individual character by references to the activities overground. For example Paolozzi's mosaic included elements such as saxaphones, referring to the music shops that are synonymous with Tottenham Court Road. The line identity is colour coded



* Details of Paolozzi's mosaic

* Example of Stockholm Underground

along the wire duct which also carries the direction and station name graphics.

Leister Square's imagery in carried through graphic film spoke holes along the wall. London is by no means the innovater in this field, where specific station characters and it's relation to the overground location has been taken into account. Stockholm, Munich and certain stations in Paris reflect this in design.

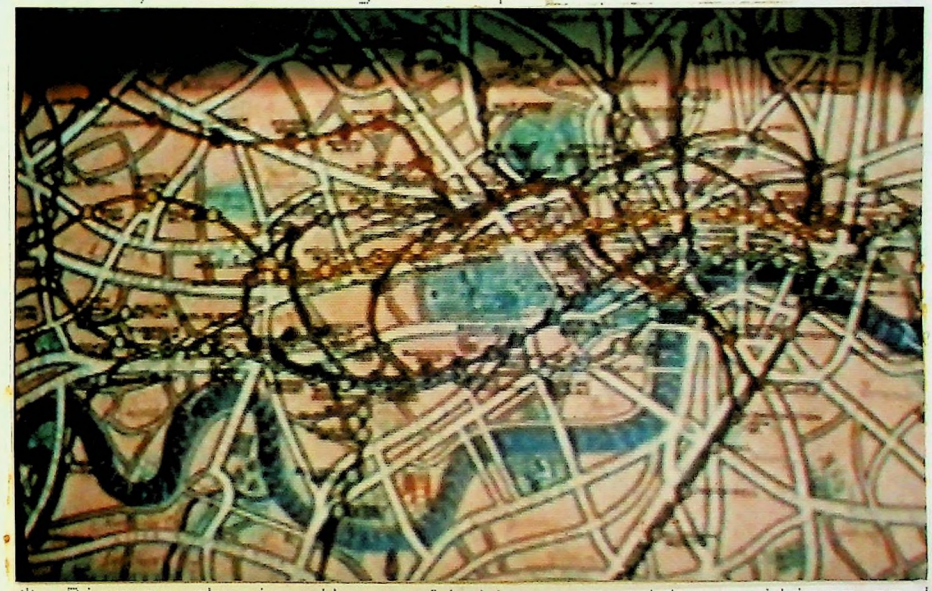
As is common on any municipal project, there can be criticisms between the professionals as to what should be done, such as the debates between Marcello Minole (interior designer) and Donald Hall (director of design and architecture at London Regional Transport) raised in Creative Review Magazine May 1986, where Marcello attacked the new designs saying that the primary duty of London Regional Transport should be to provide a good, clean and efficient service and not to entertain the passengers whereas Hall retorted "but travellers are enjoying our decorative tube stations."

The fact that other less frequently used stations are not given as much attention is regrettable and this being the nature of financial constraints is what is offered the public in a quest for a better designed environment, which can lead to a healthier social environment.

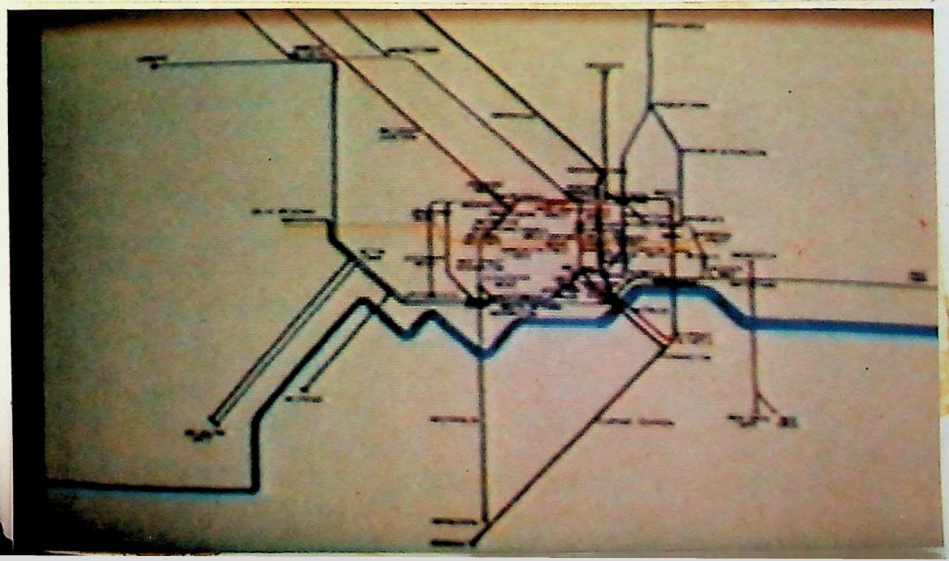
VISUAL COMMUNICATION

* Detail of Beck's map showing inter-change stations

* Early 1920's Underground Map



* Diagram showing the realistic geographic positions on the map



* The 1970's version of Beck's map which was later retracted in favour of the original

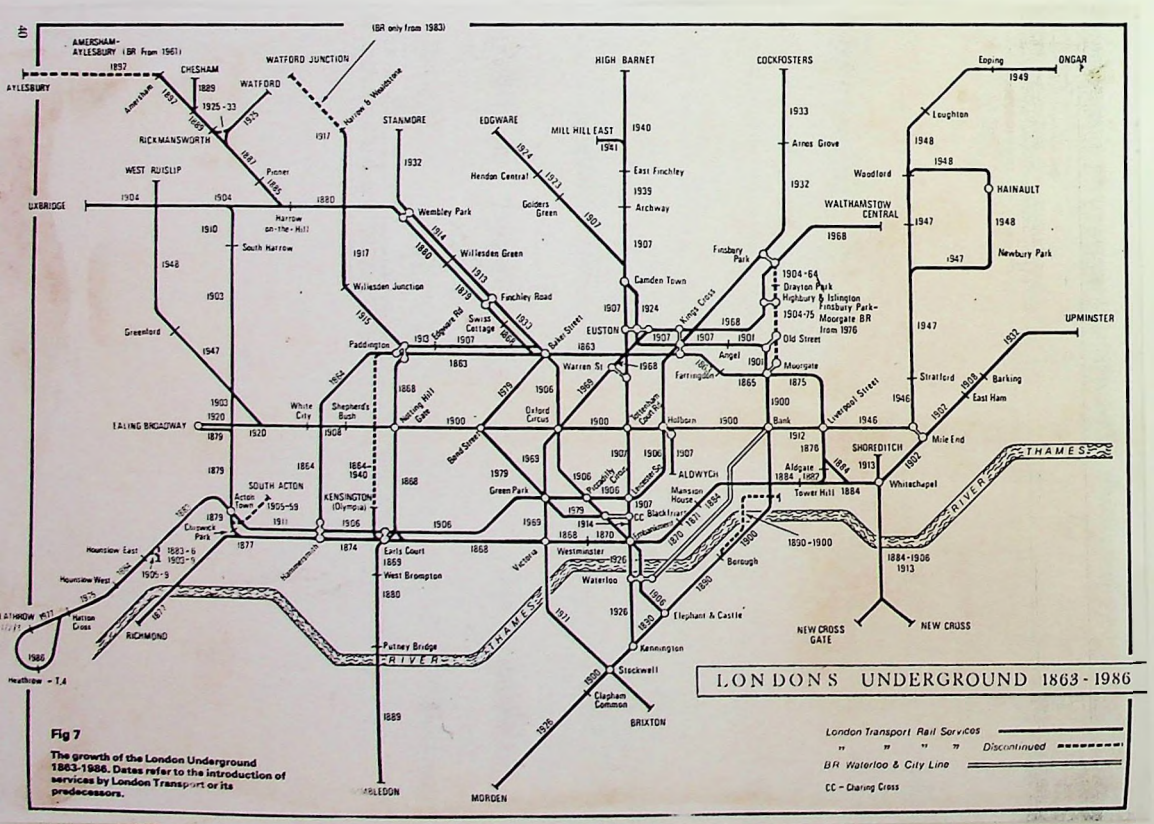
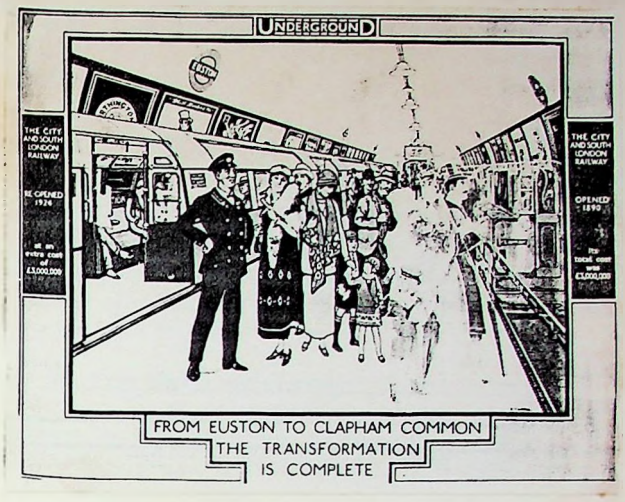
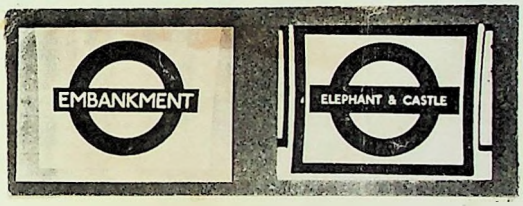


Fig 7

The growth of the London Underground 1863-1986. Dates refer to the introduction of services by London Transport or its predecessors.

* London's Underground 1863 to 1986 Map





Before: back-lit indicators at Victoria

After: New Johnston upper and lower case, front lit, aims for greater clarity and "friendliness"

The London underground has been a highly influential organisation in the historical development of graphic design. From the commissioning of Edward Johnson by Frank Pick in 1916 to design an alphabet which would embody clarity and simplicity in which signs could be written, to the influential underground which provided a medium for graphic illustrators to show their skills to the public.

The underground map designed by Harry Beck in 1931 shows Beck's ingenious diagramatical approach, based around electronic circuit diagrams. It became an instant success with passengers where clarity was more important than seeing the actual geographic locations of the stations. Beck set a precedent for the mapping of systems which has now been adopted in some form or other in all underground systems. It is renowned as a design classic!

The underground logo also proved to be a fine example of a corporate identity carried throughout the system from architecture to publicity of the organisation.

Recently there was a new introduction of signage using lower case letting which was found to be easier to read. However Johnson's San Serif typeface is stil being used.

An alternative attempt was proposed to guide the passengers via laser beams, colour coded to that of the line and deflected around corners by mirrors. This feature has not arrived yet but we'll see!

Pickered fenced stations

The Modern English man.

THE BRITISH NATIONALITY AND IT'S RELATIONSHIP WITH THE UNDERGROUND

There is usually a difficulty in coming to exact conclusions on the different nationalities of design, especially with more modern design. However, the London Underground has developed quite a British image. Even the no nonsense styling and heavily engineering basis of the British railway carriages. The early lines were easily compatible with the very British characters Sherlock Holmes and Watson. Off-white vitreous tiling and brown tweed capes seemed to fit. The overground stations kept in sync with the cricket club's pickered roof edgings, which are also a feature of older station roofs.

With the later station designs a more internationalist/modernist image came into being, with the in-house London Transport style propogated by Charles Holden and Frank Pick.

The early rolling stock with its varnished wooden interiors, upholstered seats and first and third class carriages exemplified British traditions of the time.

The 1930's was a flourishing time for the undergound with the tube being the envy of the world.

The curious element of the underground's history is that rather than it being an essentially British venture, many influences came from abroad - the underground was financed

Victoria line styling.

and managed by Americans, much of the early stock was built in the United States, France or Hungary. The German Siemens company developing the early electric traction equipment and a sizeable amount of the construction work was carried out by Irish navvies.

The styling of the later lines such as the Victoria and the Jubilee lines were inspired lessons in efficiency and modernisation, however ofen tended to alienate the passenger with a lack of humanity which is not an exclusively British problem, which shall be discussed in relation to social factors.

The new developments in the more user/friendly, recently refurbished stations can be seen as an improvement to the system. These improvements shall hopefully continue in the future of the London Underground.

PARIS

HISTORY AND DESIGN

INTRODUCTION

The Paris Metro was the world's second underground railway. It was opened in 1900 just in time for the World Exposotion in that year.

The first proposals for underground goods transit were made as early as 1845. Due to the problem common to all metropoles at the time, street conjestion possed a challange to the planners to find a solution involving rapid transit. The choice and organisation of a solution became the fuel of what became known as the great debate.

THE GREAT DEBATE

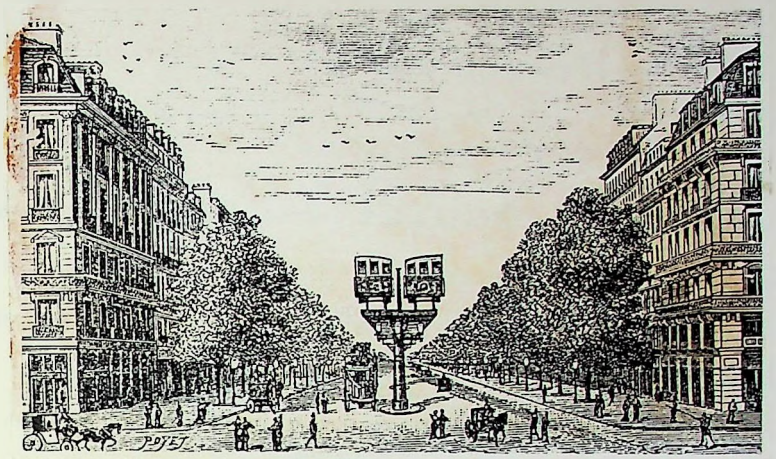
In 1871 city officials coined the expression 'Reseau Metropolitan' (Metropolitan network). The initial routing was proposed in an east west north south "grand croise" of Paris, the plan was drafted but remained dormant.

In 1875 a system linking the 5 main train stations to the centre of the city was proposed, however it was ruled out as the system was seen as not catering for the Parisians living within the city. This ended in an ongoing 20 year debate between the city and the Government who proposed the mainline scheme.

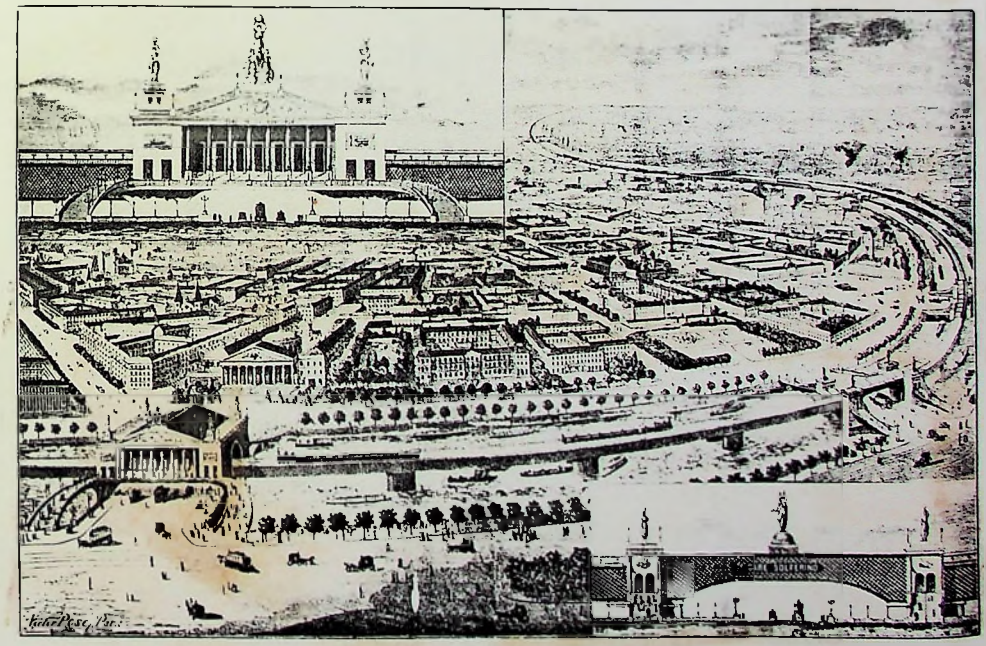
In 1876 the Municipal Council sent a delegation to London, which returned convinced of the possibility of developing a similar system to London. In 1883 a 6 line system was proposed.

The idea of the Metro stimulated much thought among engineers and designers and also debate. A National Assembly man Madierde Montjau insisted "The life of the boulevards will be gone. People will become animals not wanting life but to

Elevated railway proposed by Jean Chrétien in 1881.



63. Tellier scheme, 1885



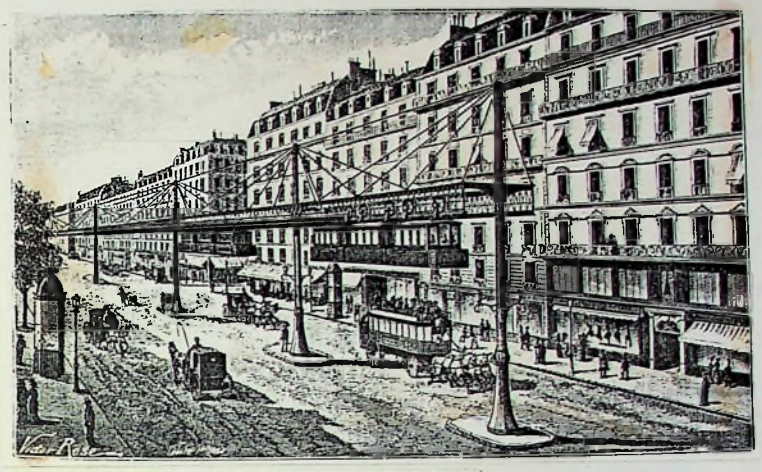
catch trains. There will be no more intelligent beings. The Metro is Anti national Anti municipal Anti patriotic and detrimental to the glory of Paris."[8]

Many others in opposition favoured an elevated system rather than a"sewer train." The Metro was opposed for being expensive disruptive dangerous to workers and causing damage to buildings from vibration. The most postulated argument rested on the perceptions of the nature of Parisians.

An interesting comment was made by a French engineer on visiting the London underground "To some Frenchmen the success of such a dismal form of transport relate to the dismal nature of London itself" and that "The Parisian who loves the day, the sun, gaiety and colour to alter his route unto darkness as a means of transport will be a pretaste of the tomb and he will refuse" [9]

The elevated systems accounted for the majority of proposals. Most solutions involved cast iron viaducts which would carry trains above the street level. The elevated proposals which came from Jean Cretien, Jules Garnier, Charles Tellier, A. Angely, Arsene Olivier and Louis Heuze varied considerably.

The proposals were backed up with the guarantee that they would be a possibility to employ designers and sculptors to decorate the cast iron sections especially at important junctions of boulevards. Charles Tellier proposed that trains should run along the middle of the Seine on an elevated structure which would not cause street or river navigational disturbance. It was feared that the railway would diturb the view towards the place de la Concorde from across the river, Tellier proposed an absolutely monumental station which would maintain architechtural harmony.



* Monorail by Angely in 1881

* Arsene Olivier's elevated railway

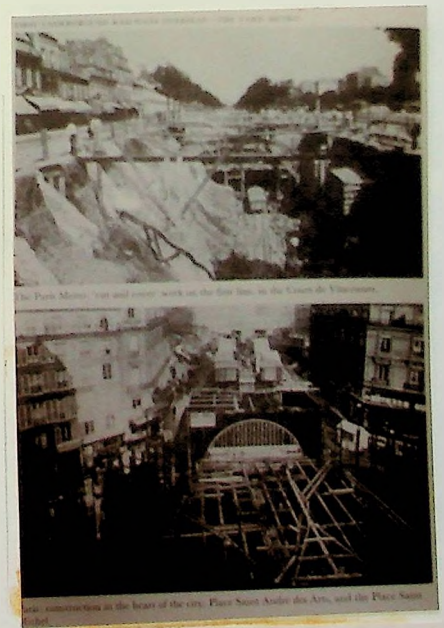
The engineer A. Angely's elevated monorail was to run along the boulevards in the middle of the road was another novel approach. The most spectacular system proposed was Arsene Olivier's thirty meter high viaduct which would clear most of the houses thus avoid the need for routing along streets. However the ideas sometimes tended to be based upon the designers hope of being imortalised by overkill ideas. Arsene Olivier insisted "The purpose of the Metropolitan is to complete Paris ... let us make it one of the last masterpieces of the century."[10]

The idea of a subterranean system also inspired some bizzare proposals such as that proposed by J. Mareschal in 1880 on which trains would be powered by gravity and be lifted up at each station. Another scheme proposed a system of tunnels to be used as passenger trains by day and as sewers at night, a system of ventilators would remove the smell each morning as it was thought. The civil engineer J.B. Berlier outlined his thoroughly developed proposal in 1887 in which metal tubes would carry electrically powered trains and the method of tunnelling would presumably permit construction without disrupting the surface. Berlier maintained that a tunnel abundantly ventilated and luxuriously illuminated would be willingly adopted by the workers of Paris provided that there was rapid transit.

After the long period of controversy over the various and after ingenious imaginative concepts for elevated railways the officials gave their most serious consideration to an underground systems. Berlier's system impressed the Muncipal council and he was granted the concession to build in 1892 however as he was unable to raise sufficient funds and the enterprise lapsed.

The main catalyst to the realisation of the Metro was the approach of the 1900 Exposition where the prestige of the French

* Berlier's underground railway proposal 1887



* Construction work underway.

capital was a stake and it was felt that Paris should epitomise a modern city reflecting the standards of French science and technology. So after years of debate between city and Government the minister of works Louis Barthon yielded power to the city of Paris to develop and control the Metro.

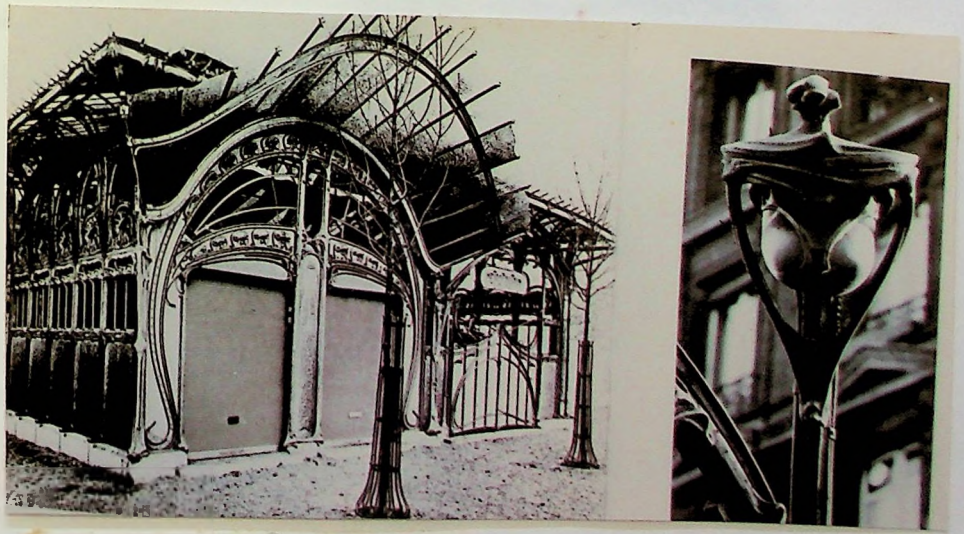
The city proposed that the standard track guage should be 1.30 meters as opposed to the mainline rail guage of 1.44 meters thus avoiding an encroachment into the system of the mainline railway. The work was to be carried out by the city however a concession was given to the Campagnie General de Traction for the right to operate the system for 25 years. The creation of the Metro was directed by engineer Flugence Bienvenue who spent most of his working life until his death in 1932 making it his vocation.

The Metros construction began in October 1898 because of the need to have the system in operation by 1900. The method of construction utilised differed from the original metal tunnel proposed by Berlier, the cut and cover method finally being chosen. The train lines were to be situated under the main boulevards with the top of the eliptical profiled tunnels being only a metre from the street surface. This differed with Londons deep level tubes. Construction work was carried out by over 2,000 workers who continued day and night. The first line ran along an east west axis from Porte de Vincennes to Porte Maillot. The "portes" or gates represented the exits of the city which were still in use as a defence measure until 1922. This was still seen as important for detering a Prussian offensive.

This line was opened on July 19, 1900 with limited publicity as officials were nervous as to whether the Parisians would adopt or reject to use the system. The metro proved to be a success

* Map of original lines

* Station entrance



* Hector Grimaud's station

and travellers were enthusiastic and it took precedence over all other forms of transport in the interior of the city in 1900.

The second line involved a northern semicircular link between Porte Dauphine to the Place de la Nation via Etoile it was built between 1901 and 1903 about 1/3 of the line was elevated on viaducts. Five lines were in operation by 1910 and a complementary network was added to with lines 7 and 8 being opened by 1914. The length of the Metro system expanded from 10km in 1900 to 80 in 1914 carrying over 400 million passengers in that year.

City officials had originally thought that it would relieve conjestion overground, however a 1910 report suggested that the availability of cheap rapid transit seemed to set off a demand for more transport encouraging the frequency of movement of people.

The development of the metro became an opportunity for the works of designers such as Hector Grimaud through his stations and Metro entrances which virtually established what known as the Art Nouveau "Metro style".

In 1886 Charles Garnier had written to the ministers of works "The Metro in the view of most Parisians should reject absolutely all industrial charachter to become completely a work of art. Paris must not transform itself into a factory it must remain a museum". [12] As the Metro itself represented a new form of transport it may have seemed appropriate that it embody innovative design . Grimaud's entrances made of cast iron incorporated a fan shaped glazed roof. Their organic formed stems provided the four structural elements which held up the glazed roof with a 3 sided border of cast rails lead to the entrance.

* Views of Grimaud's Abesses station entrance

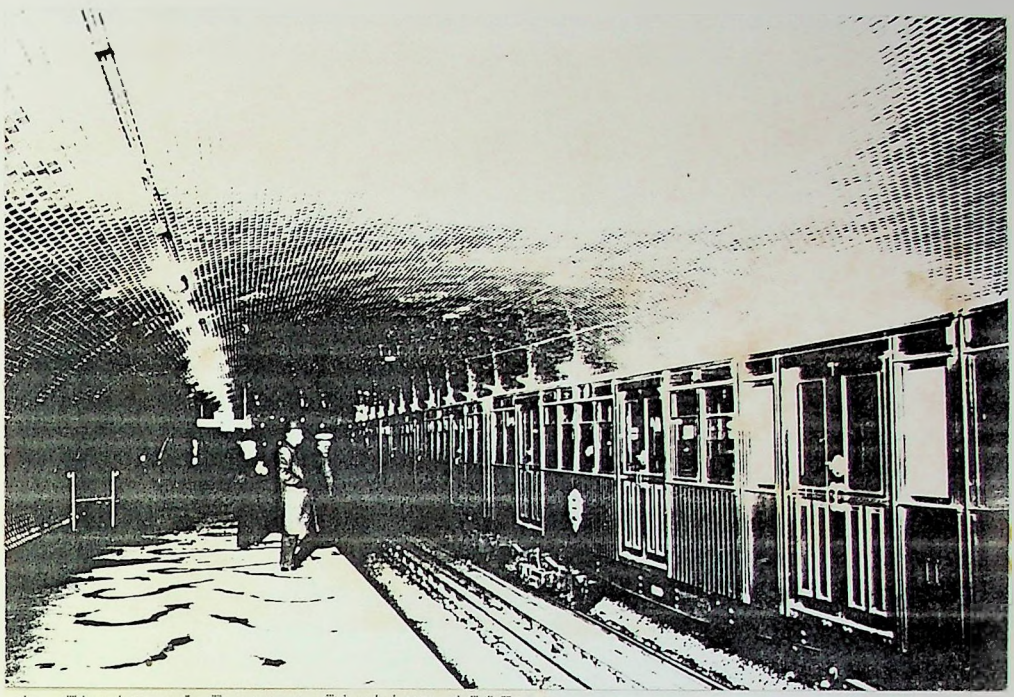
The graphic style featuring the word Metropolitain and the station name is gothic in influence. The entrances and stations were criticised as being too Germanic by being green in colour which seemed to represent Germany for some reason in the eyes of French nationalists. Grimaud wethered the critisims well, he quoted the influences on the architectural work as being Logic, harmony and feeling to arouse emotion which he felt was the factor which transposes art into the highest form of expression.

The style of Metro exits was changed to classical stone structures which were considered suitable for monumental sites such as at Place de la Republique.

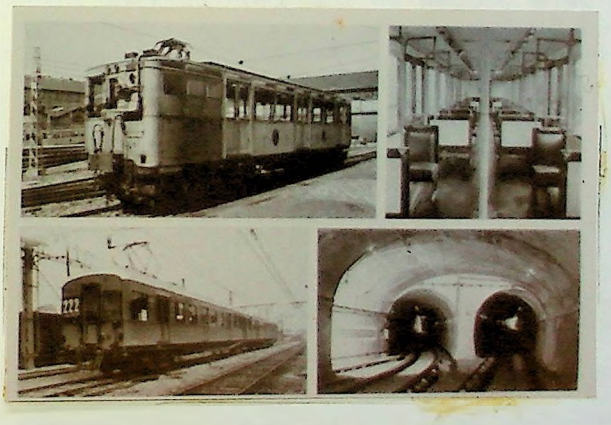
The original Metro stations consist of eliptical arcs spanning the 2 lines the walls are covered in off white vitreous tiling with station names tiled into the platform walls. The tunnels generally split seperately after the main station tunnel. The electric traction cars were wooden on the 1905 rolling stock. By virtue of the density of population within the city the Metro carried almost 4 times the number of passengers per kilometer than in London 1.5 times that of New York and twice that of Berlin in 1930.

In the 1930's Metro made a few modest penetrations into the suburbs, with the growth of the suburbs the first link between the Metro and suburban lines was made when the Sceaux line from the southern suburbs of Paris became a part of the Metro system in 1938.

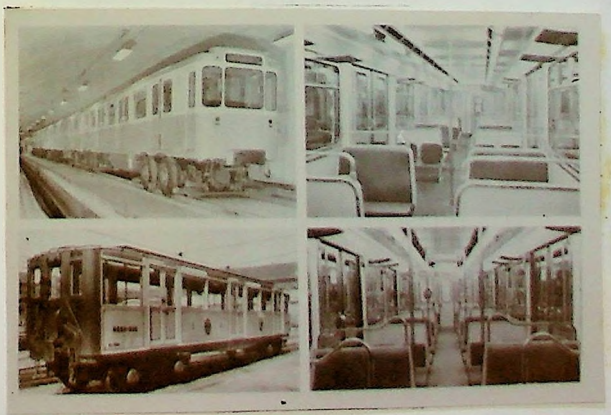
By 1937 the Metro had 150 km of track and it carried 761 million people in 1938 the greatest pressure for the system was to come with the German occupation during World War 2. Due to the shortage of petrol preventing frequent use of cars almost the entire burden of public transport relied upon the Metro.



* Photo of Bourse Station 1905

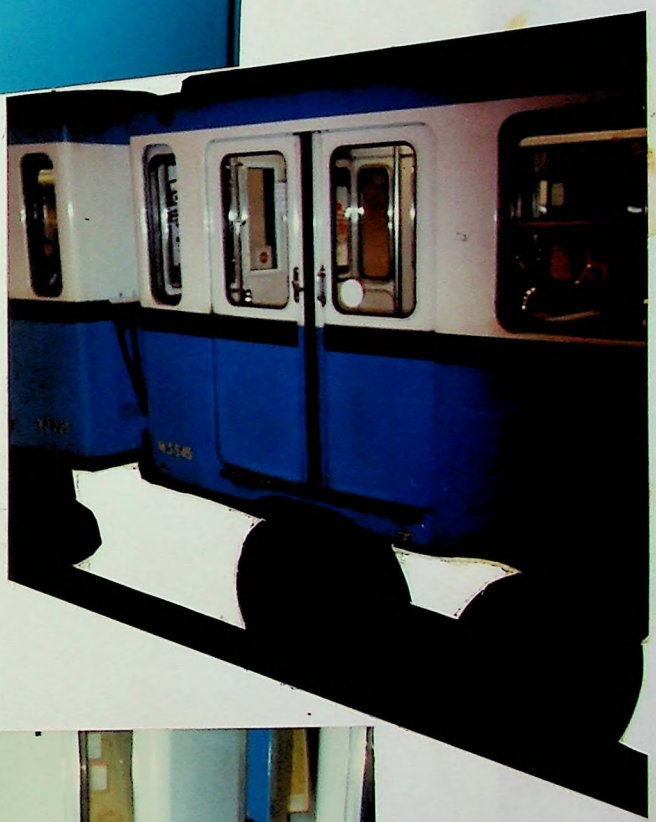


* Sceaux Line Stock plus interiors and Metro Tunnels

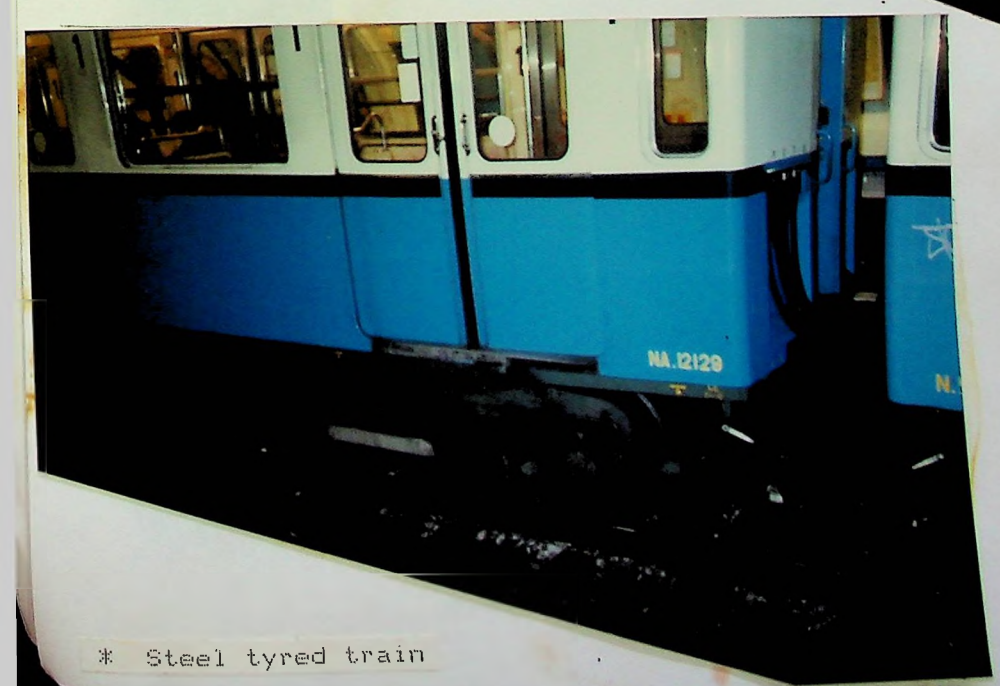


* The Metro 1970

* Top-door detail



* Rubber tyred train



* Steel tyred train

Travelling the Metro during the war meant almost intolerable crowds and antiquated and badly maintained facilities. The highest number of travellers was recorded in 1946 with a total of 1 billion 598 million making it the busiest system in the world. Around this period it was decided that surface and underground railways in the Paris region be unified and in 1948 the Regie Autonome des Transport Parisians (RATP).

Although government policy seemed to neglect public transport for a while in favour of private automobile transport facilities, it became apparent that private transport could not serve the Paris region adequately especially with the increasing Metropolitian spread in the suburbs. Though the 1960's the Metro became subject to a programme of modernisation involving the refurbishment of stations and the introduction in 1956 of rubber tyred trains which reduced noise and vibrations. Rubber tyres ran on concrete tracks with a wheel axially touching on the side conductor rail. This wheel also aided steering. This system was installed on lines 11 initially and subsequently on lines 1.4.and 6. during the 60's and 70's. The rubber tyred trains however never took over totally from the original steel tyres as the rubber caused excessive heat produced through friction.

For engaging junctions steel sections are lowered so as to engage guide rails. There is no essential difference between the 60's and 70's Metro's except for the steel and rubber tyres on different lines. The cars bodies are built in aluminimum panels with the front cab moulding being made from fiberglass. The colour scheme of process blue with a white band continuing along the windows gives a utilitarian look. The doors are opened by pushing down a shiny metal knobs which almost looks qutely

* 1960's Rolling stock, train over-all view, interior, cab detail

antique, air power opens and closes the doors after activating the knob, a last chance buzzer rings, a few seconds and passengers rush for their place the train then rushes off.

The interior has an overall beige color punctuated with dark chocolate coloured seats and stainless steel holding bars and window and door trims. There are spring loaded foldaway seats to be used for low to medium density traffic whereas during rush hour there is only space for standing. The stations are displayed above the door in graphic form, strip lighting gives the interior an overall yellow hue of colour different to the later trains.

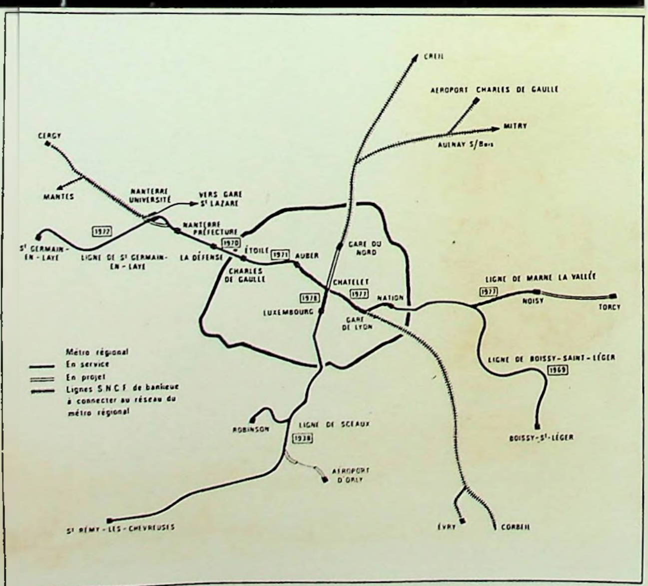
Advertisment panels and through carriage doors with the standard red ladder to faciliate the emergency exit are standard features. Other curious features which indicated the Frenchness of the enviorment are the signs placed on the window in yellow indicating that first priority of seating is for persons with injuries from the wars, second to elderly people and 3rd priority to handicapped people. These signs can tend to impress an uneasy manifestation of the French sense of nationalism. Another manifestation being the provision of 1st and 2nd class cars even though the 1st class only differ in the fact that they are less crowded than 2nd class rather than having superior accomodation.

The 60's rolling stock offers an aura of a machine age enviorment which is result of anefficiently engineered design solution however it lacks the panache of the modern R.E.R. trains.

The cab and the 60's Metro's gives an example of an unfriendly engineering based design where it may function adequately but is by no means a fully acceptable work station solution.

* 1970's Stock train

Map of R.E.R Network



74. Routing of the Réseau Express Régional (RER), showing connections with the suburban railroad lines. The RER lines are shown in black, and suburban railroads with hatched lines.

* Train entering station

* Metro ticket

The remarkably spacious deep-level Paris RER platforms at Gare de Lyon (left) and Châtelet-les-Halles (right).

* R.E.R. stations

Paris. The Regional Express Metro. This view of the station "Nation" gives a fine impression of the spaciousness and elegance of the new underground railway.

Paris. The Regional Express Metro: the control centre at Vincennes.

* R.E.R. station at Nation with control centre

One of the sucesses of the Metro over the London underground is the rapidity and frequency of its service and the provision of low fares.

Stations underwent extensionsin tunnel length in the 1960's to accomodate longer trains however planners decided that the Metro was not a sufficient infrastructral facility even though it could not be extended without saturating the system with more stops thus less rapidity. It was decided that trains from the suburbs would supplement the Metro as a new system called the Reseau Express Regional or (R.E.R.). The (R.E.R.) would also supplement the already strained commuter railroads and it was thought would open up new suburban areas for settlement. The R.E.R. tunnels were designed at a depth of 10-30 metres passing under Metro's and making connections with the Metro at key stations. The trains were designed with the same heigth of standard railroad stock and would reach speeds of up to 40 m ph.

The first R.E.R. line opened along the same east west axis as Metro line one extending from Boissy St. Leger to St. Germane en Laye the line was opened in sections from 1969 to its completion in 1972 as line A. Line B which travels in a north south route incorporation the 1938 Sceaux line to St. Remy lès Chevereuses on entering the city centre at Les Halles. There is now a very comprehensive 4 line R.E.R. service extending into the suburbs and matching London's move by extending as far as a Charles de Gaulle airport recently.

The station design in the R.E.R. tends to be more modern and spacious than the Metro's. This relates to the size of the trains which are powered from overhead wires with retractible poles such as are on most overground electric railways.

* Photos of standard modern R.E.R. trains

* Photos of double-decker R.E.R. trains

* Modern metro cars exterior/interior plus door detail

The R.E.R rolling stock, consists of the 1970's stock and the later 80's trains including double deckers which increases passanger capacity dramatically.

The standard modern R.E.R trains have a red , white and blue colour scheme with red bands punctuating in the white to indicate door entrances. The stainless steel and glass doors open at the press of a button. Their design overall is good in terms of styling, comfort and utility reflecting the increased quality of French modern trains, the ultimate example being the high speed TGV trains on the mainline network. The ultimate in design of the R.E.R trains can hardly be claimed at this stage not as long as the psychological considerations of the commuter are solved through the design.

The modern metro trains which were introduced around 1980 can be seen as a dramatic improvement on the older counterparts. The exterior, a white body with dark blue train looks more intergrated, the front of the train bulges out slightly to aid aerodynamics and to look like a gentler form. The graphic destination indicator is colour coded and easier to read.

The interior has a more tranquil and cool feel with dark seating windows which are easy to open and diffused lighting with anti glare grids. The seats are more comfortable than before. It is overall a more pleasant carriage to be in.

The Paris metro is a vital part of Paris the city and the lives of most Parisians. It is estimated that the average Parisian on retirement will have spent over 2 years of his life in the metro. The system has coped with the development of the city and suburbs by a consistent policy of development and modernisation. Now metro stations both new and old have changed with introduction of automated ticket machines, closed circut tv

* Escalator Paris Metro

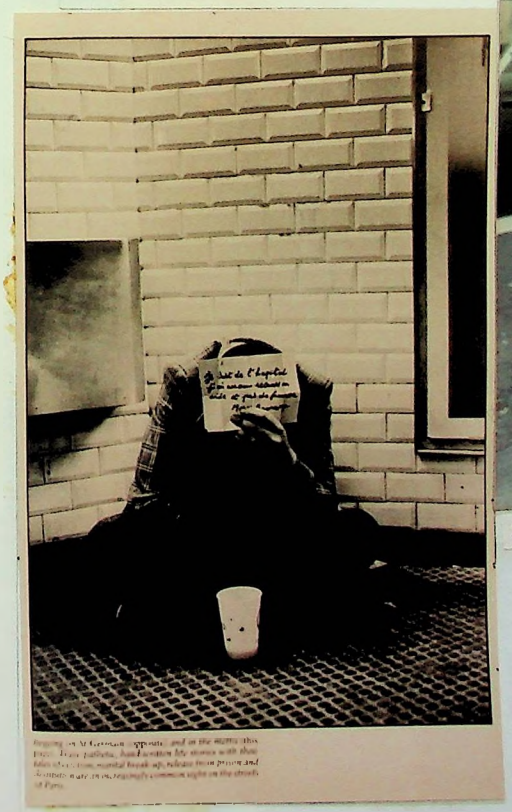
* Standard Outline of Metro stations

* Standard Metro Map

Cirque dans le métro (Photo RATP)

* Charles de Gaulle R.E.R. station, an example of the modern grid based design

* SITU Public Transport Information Machine Paris



for the drivers and a specific tv channel for public viewing in the stations called 'tube.'

The Metro stations retain a consistent format of the tiled eliptical tunnels. Many of the large stations have subsidary underground areas of circulation with ticket bureaus and shops. The access to the platforms are controlled by ticket turnstiles with pneumatic gates, some of which can be frustrating for the first time users with suitcases getting caught within its grasp.

The R.E.R stations architecturally are modern with squarely profiled stations and grid pattern features. They are well lit and include some shops and other services but tend to have little character. This however is the dilema in Architecture whether to design for clinical efficiency or design individual stations with their own character as financial consideration usually deter individual character approach in design.

The metro provides an underground common denominator for the city serving as a platform for buskers of many persuasions a refuge for those down on their luck away from the cold of the street. For most the metro is a theatre of people and a palace of anonymity.

The metro serves 346 stations and contains 168km of track mostly underground.

* Metropolitan Transit Authority
NEW YORK CITY SUBWAY MAP

THE NEW YORK SUBWAY.

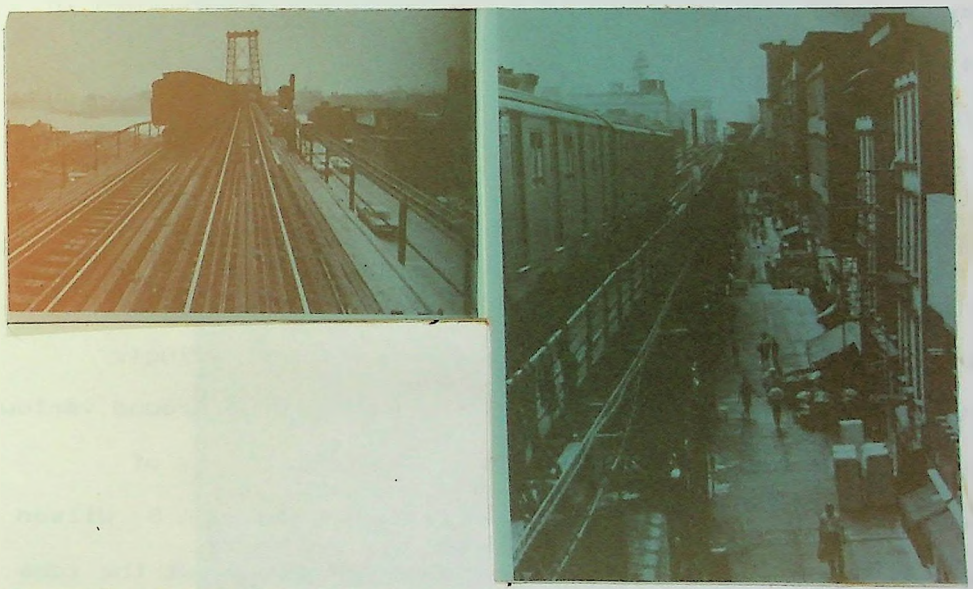
Introduction

The New York Subway is possibly the most eccentric, grimest, dangerous an intriguing system in the world. It contains the longest length of underground lines at 137 miles then its total route length lies close behind that of London with 254 miles. The New York Subway however has the most extensive system in terms of stations at 358 and operational hours due to the fact that it operates around the clock it also has the larger fleet of cars numbering 6,674. It carries the third largest number of passengers after Moscow and Tokyo. The subway was opened in 1904 after much background bickering between the cities influential personalities.

History and Design of the New York Subway

In the New York of the 1860's the rapidly expanding city was becoming more conjested especially with the restrictive peninsular shape of Manhattan, transport was increasingly difficult. With the advent of of the London underground various entrepreneurs and inventors looked at the possibility of relieving the problem. A Michigan railroad man Hugh B. Wilson raised $5 million to build a subway under Broadway but the idea was turned down by Reuben E. Fenton the then Govenor who was also being cannvased by one of New York's most influential tramway owners "Boss" Tweed.

However in 1867 the state authorised the building of an experimental elevated railway track which was proposed by the inventor Charles T. Harvey. In 1868 a crowd gathered to watch Harvey operate his locomotive which perched 30 feet above Grenwich Street moved along by a motor winching a cable into the



* Photo of the elevated railways in the early 1960's

car thus moving it along. The machine reached a peak of 10 miles an hour to everyone's astonishment. Despite various objections from the Senator Tweed the elevated went ahead.

In the meantime unbeknown to the City Authorities a strange subway was being bored under Manhattan by a genious inventor by the name of Alfred Ely Beach who was the publisher of Scientific American.

In 1867 he built an experimental pneumatic at the American Institute Fair which was made of plywood and a 10 passengar car was blown using a large fan from one end to another. Beach was aware of the corrupt city officialssuch as State Senator Tweed who had ditched Willson's original idea. He therefore furtively applied for permission to build what he termed as pneumatic mail tube which would run under Broadway. Tweed failed to see the implications of the plan and gave Beach the charter. Gangs of labourers worked in complete secrecy building the tube 8ft in diameter at a length of 312 feet. The work was carried out in 58 nights. Then on February 26, 1870 the New York Herald carried the headline "Fashionable reception held in the bowels of the earth."[15] The subways reception hall was highly decorated with wall fresco's a fountain hung paintings and a grand piano. People flocked to see their new subway. Boss Tweed was furious. Beach's plans to extend the line passed the lawmakers but was vetoed by the Govenor Hoffmann who was an associate of Tweed,after Hoffman was thrown out of office in 1871, Beach's bill was approved but by now the city was in the grip of a depression and Beach could no longer raise the necessary capital to finance the project. The idea was abandoned and it was not until the turn of the century that New York was to have a subway.

In the meantime the elevated or EL became the accepted means of rapid transit. The 3rd and 6th avenue elevated were the first to begin operating in 1878, the 4 car trains ran from 5.30a.m. to midnight at a fare of 10 cents.

The EL had drawbacks, the sky trains frightened horses on the street,often soot, and cinders and burning coals dropped on infuriated pedestrians. For people living on the 2nd or 3rd floor of tenements oil often squirted in the windows. Property values also declined along the EL routes. The elevated railways in 1886 were carrying 1 million passengers daily and were stretched to the limit.

Despite the fact that most of the political bosses in the city had vested interests in the privately owned elevateds, various people such as the Mayor, the Chamber of Commerce agitated for the setting up of a subway belonging to the city. In 1891 the state passed the rapid transit act which entailed the setting up of a committee to draft a plan for the construction of a subway system. The city anonounced that it would accept bids for the construction of the subway. Contactors however were reluctant to enter for fear of lawsuits from the influential elevated's owners. It was not until 1900 that a New York contractor John B. Mc Donald agreed to build equip and operate the subway for 50 years for $35 million. Mc Donald did not have enough cash to swing the deal despite his ability and political connections. A certain August Belmont II came to his aid as head of a rich banking firm. Finally the finance was secured and ground was broken on March 24th 1900 in front of the city hall.

Work progressed at a frantic rate day and night with a work force of 12,000 consisting mainly of Italians, Irish and Polish

laborourers. The work was almost exclusively done by hand in what is the rocky constitution of the Manhattan Peninsula. The subway construction was planned to be carried out as a massive operation to be carried out in a relatively short period of time. The dislocation of traffic was not as extreme as construction of European systems due firstly to the grid pattern nature of the streets along which the subway could be built. The method of construction was a variation on the cut and cover method where two trenches would be sunk, then the sides would be excavated towards the centre of the road. Rubble was hauled up using electric winches and the rubble was dumped on Govenors Island which had been dwindling in size from the seas erosion.

The first leg of the subway went into operation on October 27th 1904 when the Mayor George B. Mc Clellan yielding a silver control handle opened the subway from City Hall to Grand Central Station a distance of 9.1 miles. The electrically driven train reached a top speed of 45 m.p.h. travelling the distance in the celebrily train in twenty six minutes.

The line was an immediete success later that opening day a "World" reporter wrote "Men fought and plummeted one another in their mad desire to reach the subway ticket office so to ride on the trains. Women were dragged out in hysterics or in a swooning condition. Grey-haired men pleaded for mercy, boys were knocked down and only escaped by a miracle from being trampled underfoot." [11]

During the confusion at Times square station a passenger had his $500 diamond stickpin stolen representing the city's first subway crime. The system carried 300,000 people per day in the 1st year of operation. This line was run as the Interborough Rapid Transit Company or (I.R.T.). The subway began to sprout

in various directions it was extended to Brooklyn by a tunnel under the east river and into the Bronx under the Harlem river. The Hudson and Manhattan railroad was operating a subway interstate service to New Jersey it is more known as (PATH) run by the Port Authority presently. By 1913 city contracts were signed with I.R.T. and the newly formed Brooklyn Rapid Transit Company (BRT) to increase track length from 296 miles to 620.

However a crash in Malbore Sreet in 1918 killing 102 people had a financially devastating affect on the BRT and it wassuperceeded by the Brooklyn Manhattan Transit Corporation (BMT).

The third of New York's subway systems was opened in 1932 called the Independent System which ironically was the only system which was not independent from the city as it had been privately owned but no bidders came forward so it was carried out by the city and became known as the (IND).

In that year the IRT declared bankrupsy and the city finally acquired the two remaining systems in 1940 to become a single unified subway system.

The various corporate nature of the system up to 1940 led to a diverse range of station architecture and curious inconsistencies which remain today. The subway tracks at St. Nicholas Avenue or 191st Street are 180 ft below street level whereas at Smith/ninth street in Brooklyn the tracks are elevated 90 feet above the street. The rapidity of planning and construction of the subway led to almost ad - hoc design in places such as moving metal plates in the platform to fill in a considerable gap between the train and platform. There are also labrynthian passages and stairways with wall recesses and bumps for long forgotten purposes. There are also five "ghost

Keith Haring executing a heart-headed figure. Haring's images have infiltrated popular culture more than any other street artist's. In 1979, shortly after arriving in New York from Kutztown, Pennsylvania, he began organizing art exhibitions at Club 57, a new-wave hangout in the East Village. In 1980 he began doing his notorious subway drawings on the black paper the transit authority glues to placards when an advertiser's paid time runs out. While his drawings share the one-shot spontaneity of graffiti scrawls, Haring has managed to veil politically controversial themes—such as nuclear destruction, outer-space conquest, homosexuality—with a pseudo-naiveté that allows his works deceptively to appear to be as simple and thus endearing as a child's.

* Platform with Keith Haring executing one of his drawings

stations" which were abandoned after construction due to financial considerations.

The interiors of the stations are covered in wall tiles with varying designs and patterns aiding identification of the stations especially for the large percentage of non English speaking people using the system. The station names are tiled into the walls sometimes incorporating mosaics of landmarks close to the stations. More recent resurfacing of walls using white glazed brick can not be seen to be an improvement on previous attempts. The New York subway stations are supported by steel columns riveted together in a non ceremonious fashion like railway bridge structures. Concrete columns also proliferate. Flooring is also raw concrete which disguises dirt successfully. Seating is frugal in design with 90 degree back rests with slight ribbing built in between seats along the wooden bench to deter undesirables from crashing out longitudinally. Advertisments are inserted on panels along the platform walls. This provides the opportunity for street artist, Keith Haring, to execute his chalk drawings on advertisments panels which are covered over with black paper after their paid time is up

New York subway stations tend to be brutal and forbidding in design however there have been refurbishments done in downtown stations such as Wall Street where a more user friendly modern environment along the lines of the European systems exists.

This however seems to be a token gesture to what is basically a fairly unkept range of stations. The inadequacy of the facilities is heightened during the summertime when the heat and humidity become amplified in the subways due to inadequate air conditioning. It may be as close as one can get to the

* Edward Hooper's painting "Approaching the City"

George Tooker **The Subway.** 1950. egg tempera on composition board, 18" × 36". © Whitney Museum of American Art, New York.

* The Subway by George Tooker, illustration of the anxieties of travelling in the subway, note the turnstiles.

early days of underground transport in the 1900's in London or Paris.

It is hardly a pleasurable experience and one can feel tension in the air as people become more irate more easily.

The noise, dirt and confusing information transmissions can be very interesting but almost nightmarish for those uninitiated to the New York way of life. Train information is related over loudspeakers which may be drowned out by the noise of trains passing other platforms or two different loudspeakers may be competing with each other at the same time. The system of entrance turnstiles can be equally forbidding, most stations have fairly standard turnstiles which take $1 tokens after this there are thre compartment one way turnstiles from the ground to the roof which are brutally functional and could remind the passenger of what it looks like to be run over by a combine harvester travelling sideways. The stations have personal security gathering areas which are situated near the ticket office away from the platform. Oncoming trains are indicated via a texlight L.E.D display and buzzer. The philosophy of these areas is the principle of safety in numbers for people with the common interest of being safe rather than venture down to the platforms. The N.Y subway certainly has a reputation of being dangerous, this is undoubtedly true to a certain extent, however, the trains and stations are extensively patrolled by transit police and the vigilante group known as the'guardian angels'

Much of the image of violence is perpetrated by the un-user friendly environment which by design increases anxiety among passengers and makes the subway a more reasonable place for criminals to think of carrying out gratuitous violence. (This shall be discussed later in

The boys in blue

* Transit Police on duty

Les Levine subway poster, 1982, cosponsored by the Lower Manhattan Cultural Council and the Public Art Fund, with support from the National Endowment for the Arts

* The "We are not afraid" 1982 poster

social factors)

The Rolling Stock

The New York rolling stock accounts for nearly 20% of all of the worlds subway cars numbering at close to 7,000. Most of the cars have a stainless steel exterior which was introduced in 60's, the 50's and 60's stock still accounts for about 70% of the trains still running. These trains have an almost industrial look with exterior rivets showing on the exterior bodywork. The exterior of these boxy trains with curved roof are punctuated by square windows and small side windows displaying the trains destination. There are three sets of air powered automatic doors. Ventilation is through grids on the roof. The cars are joined end to end and extension criss-cross barriers seal the gap, however, there have often been accidents of people riding between trains and falling. These trains are quite noisy due to the lack of proper sound proofing and the steel wheels. The 3rd rail provides direct current traction to the train wheras the signalling is transmitted via a.c. voltage. The interiors house fibreglass seats with stainless steel bars for arm rests. Standing passengers grab ont spring loaded hinged stainless steel handles hung from a roof rail. Flourescent strip lighting illuminates the carriages. Advertisments extend along a side panel over the windows and on larger square panels on the walls. The ads. vary from Kool super lights cigarettes to six week computer courses. An interesting anthesis of advertising was commissioned by the Lower Manhattan Cultural Council which sponsored the "we are not afraid" poster in 1982 aimed to counter the idea that advertising's role is to inspire anxiety in the reader and to make them buy a product so as to want to feel better i.e. do your clothes smell? Buy new Radion. The poster

* Voice of the ghetto
AMERICAN PICTURES

thus said we are not afraid of advertising, even though it could also be read as a vigilante poster in a different context. [14] Signage in the trains is in English and Spanish. The standard N.Y subway map is also displayed in the cars. One inconsistency in the system is that there are no maps on the platforms so as to find out where your are going you might have to get on the wrong train. The New Rolling Stock of the 1970's was a marked improvement on the older models. They retain the stainless steel exterior. The information display on the trains has improved from the work of Massimo Vignelli who proposed a helvetica typeface for destination names and line identification. The interior features bright orange fibreglass seating and air conditioning. There is also considerably less noise.

Whatever may be said about the New York subway it must be one of the most interesting systems in the world mainly due to the interaction of characters and the diversity of people who travel on it. It can not be called a common denominator for the city as many of the more well off people do not use it. It is certainly a barometer of what neighbourhood your are passing through from the racial constitutions of the passengers. It is certainly a testament to the structure of American society that the further uptown you go from Central Park the less white people are present. The subway is a theatre of of the people of the city from the part-time preacher prophisising the end of the world, and no better place to prophesise the end of the world than the subway, its image makes the possiblitiy seem more feasible. The subway like the city above it is a jungle where time means money and there is no time for losers. The subway is as much a part of the speed and chaos of New York as the image of the scintillating colours of a passing graffitied train. No

* Graffiti involving social comment

* Full car sprayings by Lee, also style wars

mention of the N.Y. subway can be complete without mentioning its graffiti which is unique in its content and extensiveness.

New York Subway Graffiti

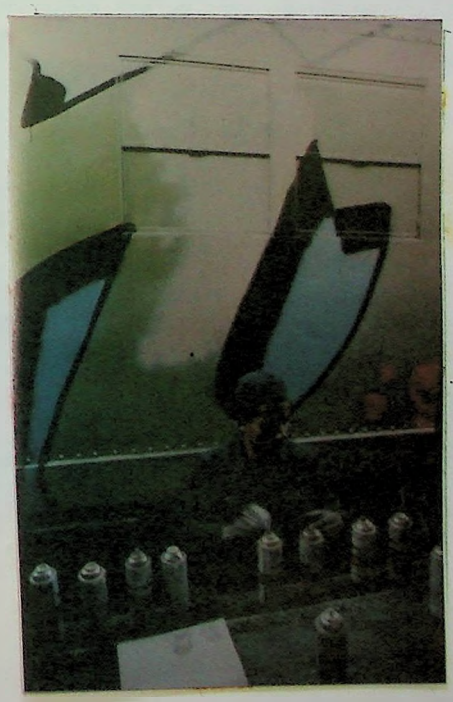
The practice of graffiti writing has become a cult activity which has infected the whole of the N.Y. subway system. The word graffiti comes from the Italian word graffiare which means to scratch. Graffiti in N.Y. became popular through the activities of Taki 183 who started "Taging" around the city.

Tags were the writer's code name which would be written in stylised script on the subway trains and other public places. The use of a tag avoided the use of the writer's real name which could be identifed by the police. In 1971 the New York times carried out a sympathetic interview with Taki 183 thus making him almost a folk hero among the youths of the city especially those from the ghettos. What was originally a relatively minor activity became a major craze. Graffiti may be seen as a reaction of people to their environment and the uniformity of modern urban design and architecture. The idea of presenting spaces of blank stainless steel and clinical interiors to the users of a system may have seemed to be another form of colonisation of peoples lives. Like many of the environments which surround the inhabitants of cities especially the young and deprived who are often unable to control their lives and environment. Graffiti was a subculture and a means of escapism.

The graffiti craze brought with it a range of terminology. The term "getting up" means getting your name or Tag up on a train.

'The king of a line' would be a person, who gets up most often, Stan 153 is reputed to have done over 10,000 pieces. The

* Photos of graffiti writers in action



older trains are called 'coalminers' as they are harder to clean whereas the newer stock are called Ding Dongs or Rocket Trains.

There is a fairly well adhered to code of etiquette among writers. "Racking up" is a tradition that all materials used in writing be stolen, ski parkas and baggy legged trousers are suitable fashions which can accomodate the unpurchased goods. In winter 1977 in the Bronx a warehouse was relieved of its 2,000 cans of red devil paints. The graffitists moral code also frowns upon "biting" (stealing someone elses style) or "slashing" (going over someone elses piece).

In 1973 the first whole 2 car paintings were appearing, styles became more elaborate with Tags being blocked in bright colours and outlined in others. The discovery of using wide nozzles on the spray cans became a sensation and what was known as the 'style wars' ensued which was an impetus to become the "king of style".

Most of the writers tend to be under the age of 16 when they start which is below the legal age of responsiblity. Graffiti writers often take their lives in their hands 'to get up'. The kids usually arrive at the train lay up yard with bags of spray cans, cut a hole in the fence and watchout for guards, then standing between trains the spraying is done mostly in the dark. This activity can be quite dangerous as the 3rd rail can not be stepped on however the writers often see the police as being a greater threat then the 3rd rail. Designs are usually sketched out beforehand with the appropriate colours being procured beforehand.

The graffiti phenomenon infuriated the metropolitan transit authority and city officals alike as it was spending $10 m per year by the late 70's to try and eradicate the 'problem". In

* The beautification of the city

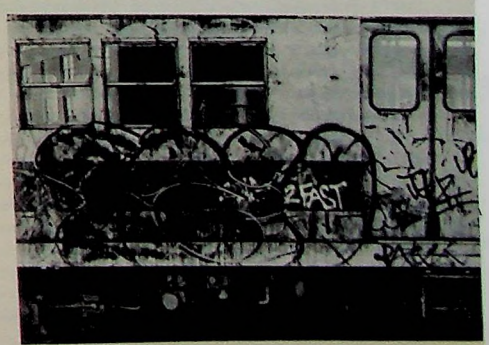
Spring 1972 city councillor Sanford Garelik said "Graffiti" pollutes the eye and mind and may be one of the worst forms of pollution we have to combat"[14] she then called for an all out war on graffiti under the auspices of the Environment Protection Agency which would scrub walls and cars. The New York Times called for a ban on the sale of spray cans to minors, this was echoed by the 'general welfare committee' which proposed to make it illegal to carry an unsealed spray can in public. Mayor Lindsay of N.Y.C stated that graffiti writing is related to mental health problems and called writers "insecure cowards looking for recognition".[15]

The Sanson Chemical corp. produced arcylic polymer hydron as a base for resisting the adhesion of graffiti known as (DWR) or Dirty Word Removers which was coated on a library in Queens however the experiment proved to be too expensive . In 1974 there had been 1,562 arrests with over 400 of the offenders sentenced to a day of cleaning trains. Support for griffitists came from Richard Goldstein in New York magazine in March '75 saying "the kids who write graffiti are the most assertive and healthiest in their neighbourhoods." He declared graffiti to be the first genuine teenage cult since the 50's. Many graffiti artists felt that they are beautifying the city and doing a public service. In a lot of cases they were not drawing on clean surfaces of the deteriorating subway fleet.

The graffiti situation continued to frustrate the authorities and Mayor Lindsay gave up his hopes of running for Presidency as a democrat being broken by the problem of graffiti and his inability to curb the situation despite heavy expenditure . Fingers kept been pointed, Chief Judge Ronald Matthews of the Bronx family courts answering to criticism of the courts lack of

* Cartoon character door

"Graffiti-wash machine" at the Coney Island train yard. Ted Pearlman



A typical "scrubbed" car, photographed just after a trip through the graffiti-wash machine. Ted Pearlman

* The Graffiti Washing Machine and a scrubbed car

convicitions said "graffiti is an expression of social maladjustment but the courts can not care all of societys ills [15]"The MTA blamed the courts the MTA transit foremen blamed the police for not keeping the kids out of the yards, the MTA graffiti squad blamed the New York Departement of social services for not rehabilitating known offenders and a city university professor blamed the New York Times for glorifying the writer Taki 183 in an interview in 1971.

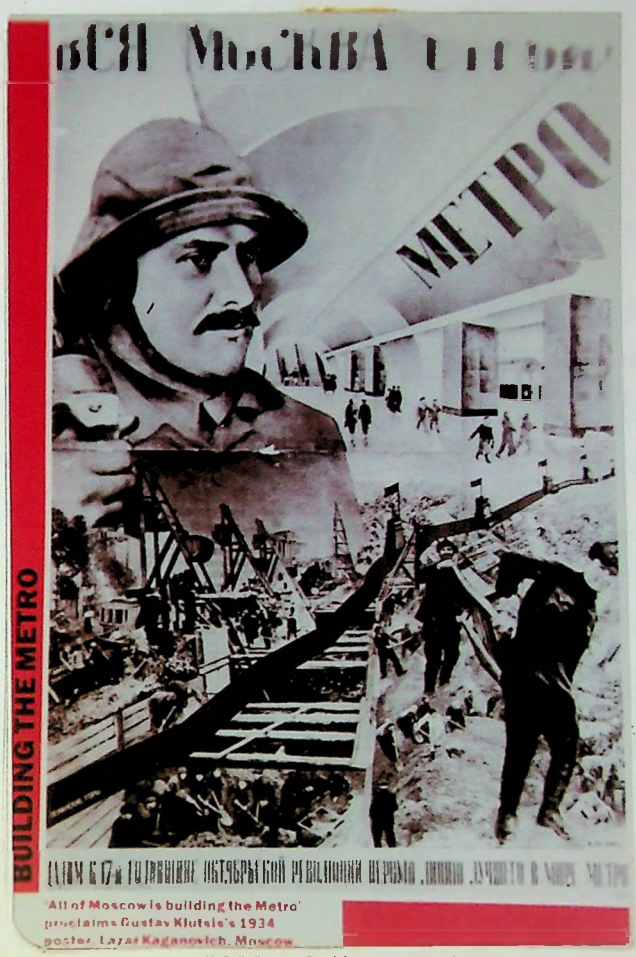
After all of the MTA's expenditure its contoller David Yunich in 1975 announced that he was going to cut back graffiti cleaning as it was sociological problem which defied solution. In 1976 MTA chemists developed a tough polyeurythane based paint which would remain intact after been scrubbed with powerful solvents however the graffitists defied this by spraying a quick drying epoxy base which would be covered by the graffiti and then they would coat the piece in shellac varnish thus securing relative immortality of their work. The work of graffiti artists such as Lee have led to acceptance in the art world circles and can now be seen as a part youth culture. Graffiti artists also gain relative immunity from the various gangs by wearing their particular graffiti jackets which identify them as such. This allows the writers the mobility to move through neighbourhoods which would be out of bounds for gang members. To many graffiti writers this is a way of life. Graffiti is a practice which is likely to continue for quite some time to come until all of society's ills are cured.

THE MOSCOW METRO

Introduction

The Moscow metropolitien is the most heavily used system in the world carrying 7 million passengers daily. There is 200km of track and 132 stations. The Moscow metro is regarded as the most palatially handsome system in the world, the most remarkable thing about the metro is its cost of 5 copeks to travel anywhere in the system which is the equivalent of 5p. The Soviet Union has always given priority to the concept of public urban transportation rather than privately owned automobile transit. The metro in Russia was thus planned as the palace of the workers.

* Kievskaya station



* Poster proclaiming "All of Moscow is building the Metro"

THE HISTORY AND DESIGN OF THE MOSCOW METRO

If the Moscow City council had its way Moscow would have had a metro at the same time as Paris however the idea had been ruled out by the Russian imperial archaelogical society and the archbishop of Moscow as they feared it would endanger the foundations of old buildings. In 1902 the Americian banking firm of Werner & Co offered to construct an underground railway but the proposal was rejected, a curious prospect in present day terms. After the Czarist downfall in 1917 the Soviet government was formed, after a period of adjustment and severe hardship following World War 1. In 1931 the central committee of the Communist party decided to tackle the construction of the metro. The Metrostroi Building Trust was set up which was provided with construction equipment developed from its mining sector. Construction of the first line was launched in 1931.

The central committee called on workers from various parts of the country who had been invovled in other massive construction projects such as the Dnieper Hydro Electric power station to the Turkestan Siberian Railway to join in the work. Workers from factories in Moscow along with 13,000 Young Communists League volunteers became involved.

The plans for the entire system was worked out at once for a 68 mile system which radiated from the trainlines in the city centre to main line connections for Leningrad, Archangel, Gorki, Kursk, Astrakan, Kiev, Warsaw and Riga.
A circular belt route 2.5 miles in diameter was to connect all lines.

The construction work continued at a swift pace with most of the earth being removed in wheelbarrows. The first 7.5 mile

* Sokol station

section employed 30,000 workers. Russian engineers consulted with western experts as the Metroski personell had no previous experience of building undergrounds. Deep tunnelling like the London tubes was favoured due to the Russian winter. Problems arose early due to quicksand below the ground. Compressed air sections had to be built. To avoid cave' ins of the tunnel the ground had to be frozen, however the concrete tunnel sections could not set against the frozen ground so it had to be insulated from the frozen clay and then heated until set. In the quicksanded areas chemicals were inserted to set and seal the tubes. This proved to be an expensive method. The first line of 7.5 miles had 3.5 miles of deep level tube and the next 4 miles being cut and cover sections, 25 ft wide by 12ft high. The roofs of the stations could be as much as 82 ft high which seems to be similar to the concept of building a tower of Babel underground.

The first line linking the Sakoliniki station with the Park Kultury Stations began regular service in May 1935. The construction work had been executed in 3 years which was a record in relation to the length of track laid. The motors and escalators were produced in factories in Moscow and Leningrad wheras materials came from distant parts of the Soviet Union. The Kusnetsk steel mills in Siberia produced the rails, cement came from the Volga, the various marbles and granites used in the palatial stations came from the Urals, Crimea and the Soviet far East.

The second line was approved in 1935. It consisted of the Gorkovstaya section leading out from Sverdlov Square to and Pokrovsky settlements and from downtown Moscow to the Izmailovo Park. This line went into operation in 1938.

* Paveletskaya and Avdozavodskaya stations

* Mayakovskaya station 1938

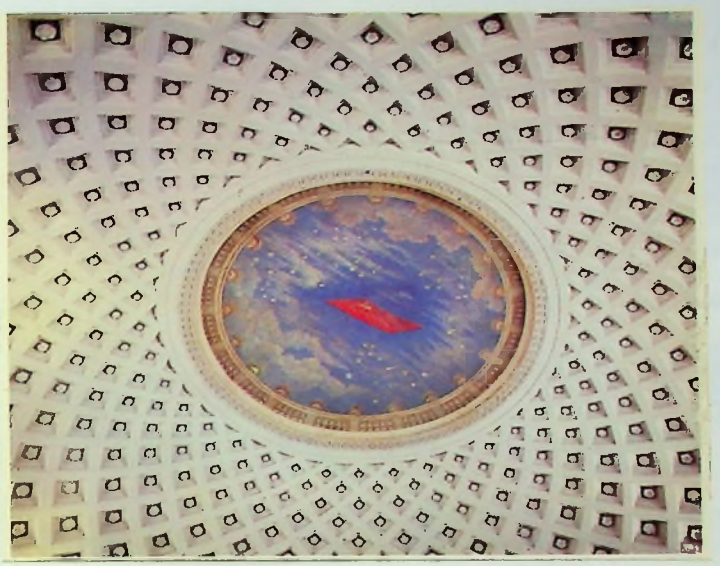
The construction of the metro continued uninterupted though retarded throughout World War 11 which as the metro guide sugests "the confidence of imminent victory of the Soviet people even as the Nazi hordes were approaching the capital . Construction the 2nd and 3rd lines was carried out."[17]

The landmark in metro history was the completion of the Koltsevaya or circle line which linked all of the then existing lines and was completed in 1954. Since 1954 the metro has seen the development of 4 more lines and extensions to existing lines stretching the system further into the far flung suburbs and industrial zones. The metro system is constantly expanding in size and it plans to have 200 miles or 320 km of line after the year 2,000 from its present 212 km of track presently in operation.

The Moscow metro is considered to be the most beautiful underground system in the world. Each station was originally designed by leading Soviet architects such as A. Shchusev, V.Gelfreikh and I.Fomin whose job it was to create an environment which changed the experience of underground travel from that of mundanity to a journey of discovery through marbled halls and arches.

The metro played an interesting part in the opportunity for post revolutionary Russia to formulate its beliefs in the architective and design in the metro. As opposed to surface architecture the underground is a totally unified and enclosed environment which does not have to compete with previous styles and forms of architective.

As opposed to other subway systems which were built along the commercial basis of making profit the Moscow metro is to a certain extent a temple to the promotion of socialist



* A strange iconographic exercise, ceiling at Taganskaya station

* Baroque influence in design

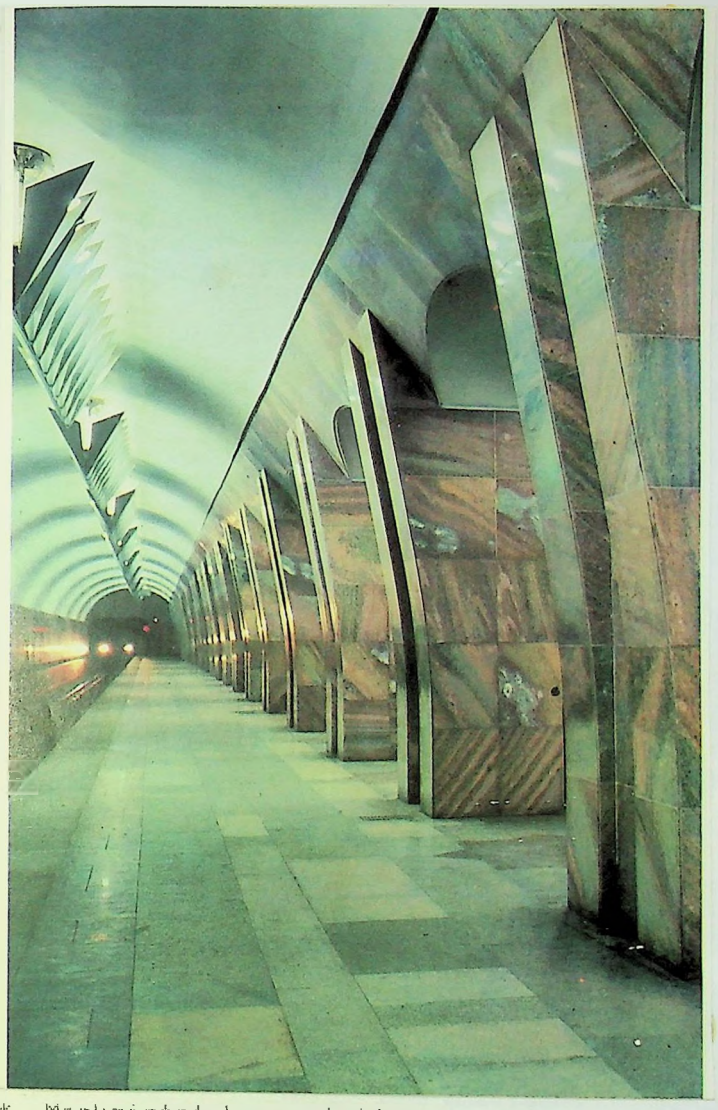
philosophies along the following lives. Firstly the concept of cheap, rapid urban transit for the masses can be seen as a social service which is a fruit of the labour of the revolution. This is enshrined in the artistic efforts in metro stations which display the iconography of the Soviet ideal. The affordability of such transit within a palacial environment is a gesture of democracy which may equate to the ideals of architects like Le Corbusier in his designing of tower blocks and new towns in which everyone world be seen as equal minus the palace scenario.

The original planners definitely did not overlook the political implications of building an efficient and luxurious metro thus inspiring and assuring its users into the belief that if the system can build this, the country is in good hands. It is no co-incidence that much of the overall master minding of the initial metro concept was organised by Joseph Stalin who's pet interest in Baroque archictecture may have been induced by the prospect of his immortality. Curiously much of the direct Stalin iconography has been removed from the metro. However the Stalin style pervades.

The metro in a burst of inspirational originality was officially named the Lenin Moscow metro for its golden jubilee in 1985.

Apart from the political connotion of the metro we may look at the design and aesthetics of the stations.

The quality of materials is consistently high with the main flooring and columnar work being of various coloured marbles. The platform walls are mainly tiled in an off white colour. Many of the less central stations adhere to an almost standard rectilinear design format with the long platforms punctuated by square marbled columns. These stations tend to be more modern



* Marksistskaya station

* Exterior of Medvedkovo station

in appearance, than the central stations. Innovative lighting arrangements along with different treatments of shape and pattern on columns, floors and roofs serve to create interesting minimalist envirnments. The purity of these areas is conserved due to the absence of advertisments and excessive signage. All of the stations are kept exceptionally clean, this is a reflection of the respect which the users have for their environment or perhaps the wrath of the stares of fellow passengers for being a litter bug. There is no smoking on platforms either.

Platform seating arrangements are sparse but present, however with the interval between trains being approximately one minute there is hardly a need for seating for the healthy

The overground parts of the metro stations adhere to a more angular modernist image. The corporate symbol of the metro is a large M which is lit as a neon strip at night. The red M can be seen at descending stairway entrances situated on a standard upright pole which looks like a ceremonious industrial crosier. The M is also situated on all metro station buildings at street level thus giving them a common identity.

The downtown stations are the most impressive in terms of their over the top baroque styling it is truly a serious a serious time-warp to have 17th century looking stations to a 20th century form of transport however it certainly defers boredom for those for uninitiated into the routine. The komsomolskaya station and its victory hall was built in 1952 its architecture seems to rely on imagery from the Romanov days which flaunted opulence in its buildings.

* Komsomolskaya station (Victory Hall)

* Prague Muzeum station

* Suburban modernist sta

* Overground station with standard rolling stock

The stations contain many sculptures, mosaics and stained glass panels. The sheer number of art pieces show the priority given to monumental artwork which indicates a common national strife towards socialist goals. There is a prevailing use of the dynamic diagonal incorporated in the monumental pieces of workers striving forward with guns or banners at an angle.

The Rolling Stock and Engineering Details

The Moscow metro has been used as the prototype for all other Soviet metro's in Lenningrad, Kharkov, Tbilisi, Baku, Kiev, Tashkeno, Yerevan, Gorky, Novosibirsk and Minsk. The rolling stock used in these cities is standard 1524mm guage which is also used extensively in other eastern european systems such as Prague, which I have travelled on. The colour scheme and design of the Moscow rollong stock is friendly looking with mildly curved corners in a blue and green split colour scheme. The trains outer panels are ribbed on the side. The automatically operated doors lead to a cosy interior containing 44 soft seats with the rush hour capacity being up to 270 passengers per car. The cars are lit with halo shaped flourescent tubes. Interior fittings are usually in aluminium or stainless steel. The original stock had unupholstered seats with mahogany veneered panels on the interior of the trains. The trains usually have eight cars thus giving a capacity of 2000

* Ismailov Park with rolling stock

passengers. The 3,280 horsepowered trains can reach speeds of up to 100kmph and traction is taken from the 750 volts transmitted via the third rail system which is standard to most other underground systems. Ventilation is procured from the bulging inlets on the roof. The interiors of the trains have long holding bars instead of the customary individual handles as on the London and New York trains. This feature is being adopted in the new range of London Transport trains being presently prototyped. The names of approaching stations are called out by the operater on an intercom.

Conclusion

The Moscow metro has become an essential part of Moscow life, for the seven million Moscovites and visitors who use it daily. Incidently Moscow plays host to up to nine million visitors at any one time who are invariably impressed by the system. From the rapid service with 48 trains running per hour during the rush hour to the minimal five copek fare which is thrown into a large slot upon entry avoiding the purchase of tickets and the eyesore of security design such as turnstiles and barriers, so prevailent in other western systems. The Moscow metro can be seen as a showpiece of underground rapid transit. The system runs between 6am and one in the morning all year round providing the winter months of the celebratedly fierce Russian winter which was the downfall of many invaders from Napoleon to Hitler.

* Map of Nurnberg U-Bahn with timetable

* Map of Munich's S and U-Bahn systems

THE NURNBERG/MUNICH U-BHAN

Introduction

The Nurnberg-Munich 'undergrund bahn' or underground railway known as the u-bahns are prototypes for the German solution to the problems of urban rapid transit. Both cities shall be discussed in conjunction with each other as they have quite common traits and are similar in engineering and rollong stock design. Both cities are chosen as examples of a recently evolved system of transit which differ to the previous early systems of London , Paris, New York. The Nurnberg and Munich u-bahns were started in the late sixties in Munich's case an impetus was the completion of sections of the u-bahn to cater for the 1972 Olympics in the city as it was seen as a factor in a city's eligability for hosting the games.

As the seventies were a time in the blossoming of the German post war economic (miracle) resurgance the cities along with the need for these systems to avoid congestion on the streets from automobiles there was an element of the respective cities displaying technical achievement and modern prestige.

The building of undergrounds is not a new phenomenon in Germany. The Berlin u-bahn was opened in 1902. The German company Siemens as previously mentioned was influential in the development of electrical traction equipment at the turn of the century for the London underground.

Presently Munich/Nurnberg posess highly modern and efficient u-bahn systems offering a high level of automation in design and operation. The overall clean cut look of the designed enviroment may have excited the Italian futurists or early modernists if they were transposed into the present day to see their predictions realised. The respective u-bahns are designed

* Hauptbahnhof in Nurnberg, a modernist European image

* U-Bahn station, East Berlin

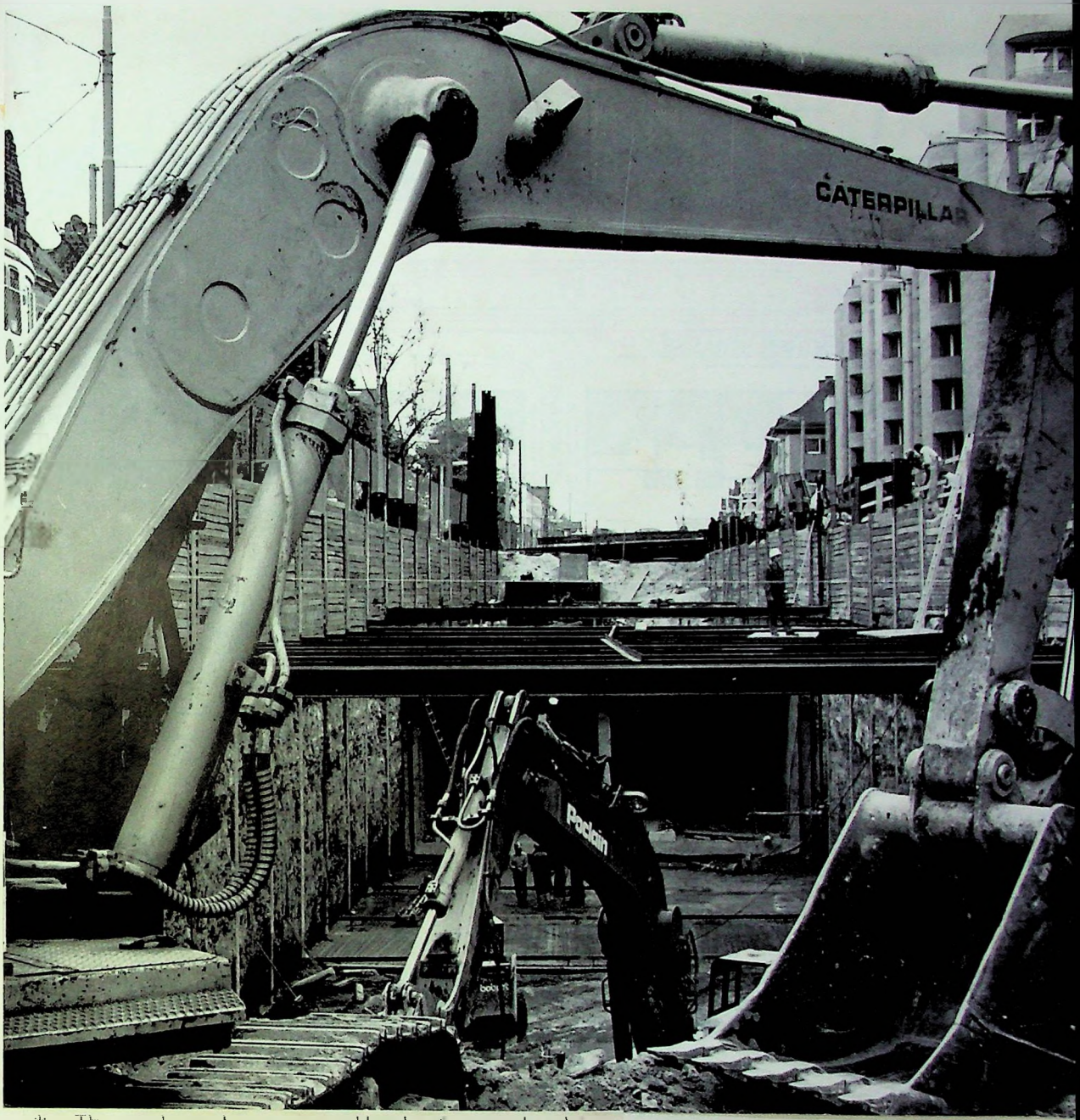
along largely modernist lines in a logical fashion with some splashes of exuberance in the surface treatments of station walls.

The Munich u-bahn is the most extensive of the two, containing 54KM of track on eight lines. The transport system is well integrated between the u-bahns and s-bahns which is the "Stadt-bahn" or fast overground railway which stretches outward as far as the satelite towns and outlying suburbs of Munich. Buses and streetcars also complement the city's transportation system which is very extensive, punctual and efficient. From personal experience of the system, one can nearly time ones movements precisely to the punctuality of the u-bahn.

As going to work early in the morming I would usually arrive at the top of the stairs to the platform and hear the train arriving exactly to the timetable by which time I would be on the platform by the time it stopped. The s-bahn like the R.E.R. in Paris also travels underground upon approaching the city centre area. Interchanges can be made between u and s bahns, at the more important stations. This is also the case with the Nurmberg system.

Munich Background History.

The impetus for the Munich u-bahn came from the traffic conjestion problem which was clogging up the streets of the historic city. It was seen to be impracticle to widen streets with the numerous monuments in the city centre. Even though the history of the development of the Munich underground went back to 1910 it was only in 1966 that construction work commenced on both the underground sections of the 380KM long s-bahn and the 16KM of u-bahn for the Olympics in 1972.



* The cut and cover method of constuction

Olympic Centre-bound train on the Munich Underground

The cut and cover construction method was used on most sections thus leading to the rectangularly profiled stations and tunnels however tunneling machines were used for certain sections.

The first section to be opened was from Marienplatz in the centre of the city to the Olympic Zentrum with the U3 - U6 line.

The finance for this expensive project was borne by the city however the real benefits can be seen today through the pedestrianisation of what were previosly choc a bloc with traffic such as Karlsplatz which was once the most conjested square in Europe and now a pedestrian area.

The U-bahn provides a vital service in German terms of transport for workers efficiently to their places of work via the co-ordinated network of bus , train and U bahn connections. The U bahn gives an impression of europeán way of doing things within a more complicated backround of planning to inte.grate with old buildings ,irregular street patterns as opposed to the American cities.

The U-bahn is certainly an expression of the 20th century city with its underground shopping areas, phones, toilets, escalators and elevators designed for handicapped persons.

The Nurnberg/Munich systems base the payment of fares mainly on trust where coin ticket machines offer different zonal tickets which must be validified on orange coloured pillars which stamp a date on the ticket Inspection of tickets is carried out by plain clothes "controlers" (usually middle aged women) who are in turn backed up by "schwarz sherrifs" who are the U-bahn armed police who are based in image on the New York transport police wearing all black uniforms. This force are highly trained in how not to have a sense of humour and on one occasion shot a 10

* Example of circulation area with various services

* Standard ticket machines

* U-bahn ticket

year old kid dead for running away without paying his fare, however this is not a regular daily part of their duties. The trust system of payment however proves to be a more cost effective method collection of fares with the acceptable rate of 4% of fraudulent trips being made. This also avoids the intimidating presence of turnstiles and other barrier equipment synonymous with other systems.

The stations on the Munich system are brightly lit with a consistency of design format with particular wall surface colours or finishes of tile or moulded concrete which give each station an individual look. The stations trains are written on colour co-ordinated bands indicating the line.

The standard station format includes 2 platforms for trains of opposing directions. Stairways are usually at the end of the platform or else descend in between the 2 tracks as with escalators which are in common use in the busier stations. Lifts designed for the handicapped people descend onto the platform.

Materials used to clad surfaces vary from concrete in artistically formed castingsto aluminium or mainly vitreous based tiling. Each station tends to have a particular colour scheme. Seating along with dust bins and information displays with maps are located in the middle of the split platforms. The seating is brightly coloured fibreglass with individually spaced seats which help one identfiy exactly where to sit without violating other peoples space zones (will be discussed later). The edge of the platform has serrated relief tiles so as to indicate the edge of the platform for blind people. This in a standard feature on most railway platforms presently.

* Seating, bins, lightbox and information displays

* Information display over platform

* The modern environment

* The hi-tech old ladies

* Hauptbahnhof Nürnberg

The train information is displayed in lighted boxes, containing an analogue clock and an [illegible] symbol in particular destination flicks onto the board as with the information displays in airports 5 minutes before the train is due to arrive. The average spacing between trains being approximately 15 minutes. The platform number and the position of the train car is given in symbolic form indicating how many cars there are on the train and where it will stop on the platform. Nothing is left to chance.

The impression of U-bahn transport is that the design reflects total logic and control of the environment. This is a uniquely German characteristic. There is a difficulty in critising the design from a logical point of view however we must ask if designing supposedly perfect environment rubs off positively upon organic and imperfect passengers.

However German people to a certain extent seem to take rather naturally to the application and use of technology and urbanisation, this however is not the case with all of its travellers.

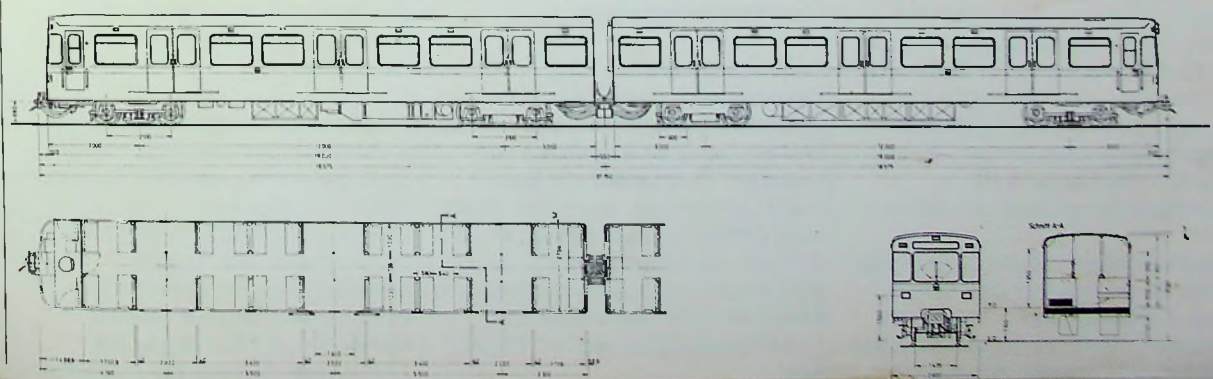
The Munich/Nürnberg U-bahns are almost immaculately clean and free from vandalism or graffiti this may be seen as the respect and apreciation for the environment that its users have and the deterrent force of the schwartz sherrifs.

However there seems to be one exception to this situation. 'Slave' is one individual who's stylised signature appears in numerous buses and U-bahn cars around Munich and must be a thorn in the side of the Referat der Landeshauptstadt München. The main train station (Hauptbahnhof) and Marienplatz are the two major junction points for the system the Hauptbahnhof always being one of the most important center of communications in any

* U-Bahn symbol outside station entrance

* Berlin Rolling stock - varies slightly

U-Bahn-Wagen Nürnberg DT 1



* Nürnberg Rolling stock

German city situated inland where most passengers arrive for their first time in the city.

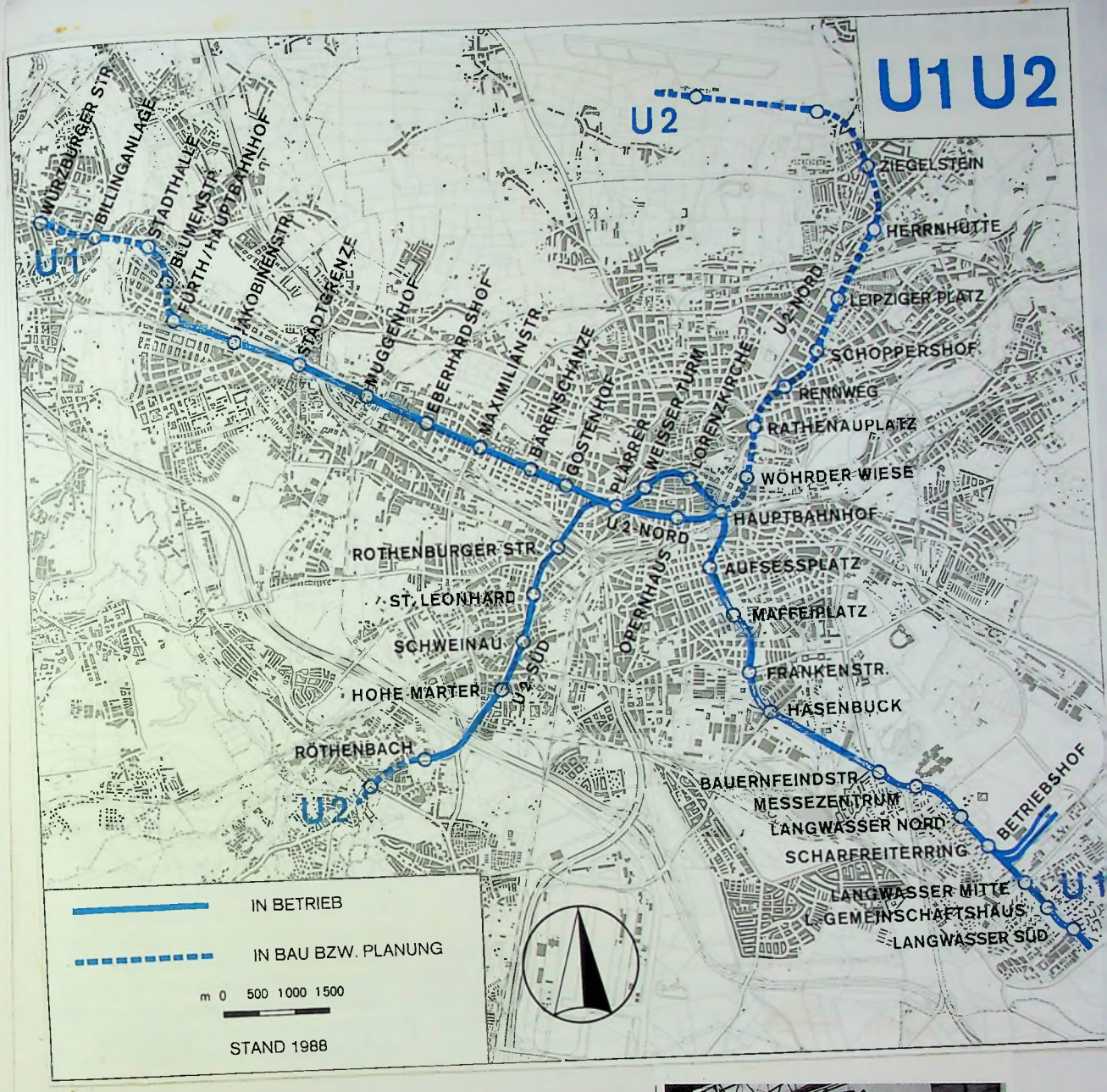
At Marienplatz there are four levels of platforms crisscrossing each other providing connections between U and S bahns. Signage for these stations and circulation areas is quite clear and symbols for services such as lifts and phones are utilised which which avoids a language barrier in a city which is host to many foreigners. The corporate identity for the U-bahn is a simple white U on a blue backround with an S on a green circle for the S-bahn. These symbols are illuminated outside the station entrances at night providing clear identification from a long range. These symbols are common throughout Germany as is much of the equipment and rolling stock utilised.

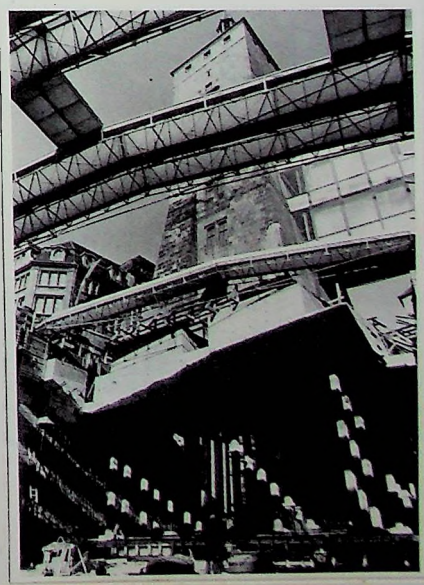
The rolling stock in Munich and Nürnberg is almost identical. The Munich cars are blue with a white band along the windowline this being the colour scheme of the Bayern state. The body is made of aluminum the chassis is made by the M.A.N. company with the electrical traction gear made by Siemens other companies have also been involved in their construction such as AEG TELEFUNKEN. The seating capacity is 48 however about 40 of extra space is designed for standing. The standard train contains two carraiges back to back so that it can be driven in either direction without being turned around. The doors are opened by pulling a lever back, they close automatically under the supervision of the driver who stands outside the door of his cab and warns people to stand back please saying "tur ig pleiben bitte" as he presses the button to close the doors. An interesting comparison of the manners of the train drivers in Munich and Berlin is that they only say turig pleiben (stand back) in West Berlin, they must be allowed this concession being

a city on a political knifedge east of the westworld. The driver also announces the approaching stations on the intercom.

The train interior is comfortable but somewhat sterile even with the token false wood panels which are not inspiring. The seats are laid out in pairs with people facing each other in a standard train format. Lighting is provided by a strip florescent panel along both corners of the roof. Advertisments are placed below this. Maps of the system are placed on the roof. The Munich map is designed exactly as Harry Beck designed the London map in the 1930's. There is never a shortage of information on the trains or station platforms thus letting the passanger know exactly what is going on (in German).

Munich presently has 54km of U-bahn line. The system was considered to be complete in 1987. The system carries 1.3 million people to their destination every weekday and 500 million per year this represents a high level of utilisation for a population of 2.3 million for the greater Munich area. The affect of the system can be seen in the easy going pedestrian areas of the centre of the city which would not exist without the system which has become a part of normal rapid mobility with Munich's citizens.





* Stilts under the foundations of Weissen Tower

Nürnberg History and Design

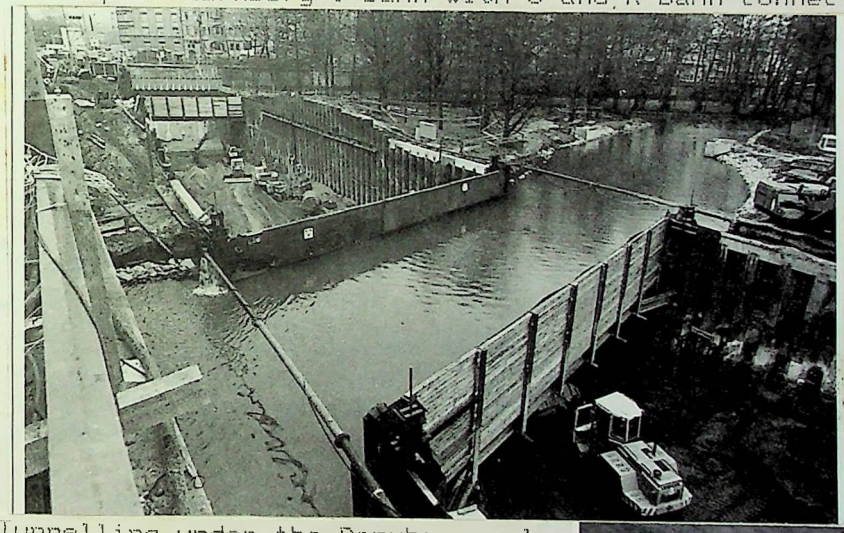
The Nürnberg U-bahn system does not differ significantly technically from the Munich system. The Nürnberg U-bahn is still under construction and is a very good example of the present state of the art in German station architecture and underground design.

In November 1965 the city of Nürnberg gave the go ahead for the proposed construction of a 42 kilometer U-bahn. Construction work started in 1967 in Langwasser Süd in the southeast of the city and the U1 line was constructed in a SE - NW direction passing through the city centre and heading towards Stadtgrenze. This 14km stretch was completed in 1979 an extension to the city of Fürth which is a part of the Nürnberg conurbation was completed in 1985. The U1 line cost 658 million dm. or approximately £220 m sterling for the 15.5 km stretch of line of which 10 km was underground. The second line U2 (pronounced ooh zwei not you two) has been built from the Hauptbahnhof to Rothenbach a distance of 4.2 km at a cost of 285 dm upon its completion in 1986. This is the U2 sud stretch. The northern section is planned from the Hauptbahnhof reaching the airport by the 1995, this section was started in 1987.

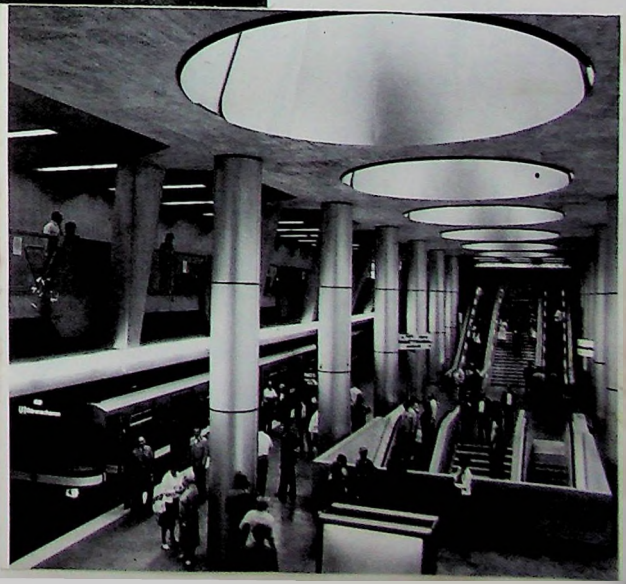
The completion of the system will be made with the U2 planned from Wetzendorf in the north-east via the city centre to Zabo Tiergarten a distance of 12.4 km with 18 stations. This would complete a 40 year period finishing in the year 2007 containing 55 stations.

The construction of the U-bahn is never a straight forward activity, first of all there is the problem of diverting traffic to allow for the usual cut and cover method of construction.

* Map of Nürnberg U-bahn with S and R bahn connections



Tunnelling under the Danube canal



* Plärrer station with naturally lighted platforms

Some of the more exceptional feats of engineering involved the tunneling under the Donau canal (Danube) or the avoidance of water mains and other obstacles. The stations in the Nürnberg U-bahn often utilise interesting concepts in architecture such as the use of skylights to let in natural daylight into Plärrer station. Opernhaus is a well coordinated example of a sympathetic merger in architecture between new and old by incorporating sandstone arches into the station thus complementing the magnificient old city architecture of the opera house.

The Lorenzkirche station features a handsome rosette casting in the concrete wall. The overall imagery of the now central old city stations present a modern utilitarian theme along the same vein as Munich with various arrangements of tiling effects and lighting. Certain underground areas give a science fiction aura with glitzy stainless steel glass and flourescent lighting merging to give an intuitive directional effect leading the passenger to the platform.

The peripheral overground architecture especially in the central stations is also impressive. The canopy over the U-bahn entrance at the Hauptbahnhof which was just completed in 1988 is a fine example a utilitarian structure which presents a creative approach in engineering which is not nessesarily decorative but defines its function exactly in the design.

The Eberhardshof station with its ridged corrugated cast concrete roof is an interesting design solution to the longitndinal nature of overground station platforms. The proliferation of concrete structures throughout the U-bahn allows diverse possibilities in the creation of interesting shapes and forms. The treatment of some of the suburban stations, however,

* Various views of Opernhaus station (Opera House)


OPERNHAUS
OPERNHAUS
SCHAUSPIELH.
GERM. NAT.
MUSEUM
VERKEHRS-
MUSEUM

* Lorenzkirche station

Sicherheit für die Lorenzkirche

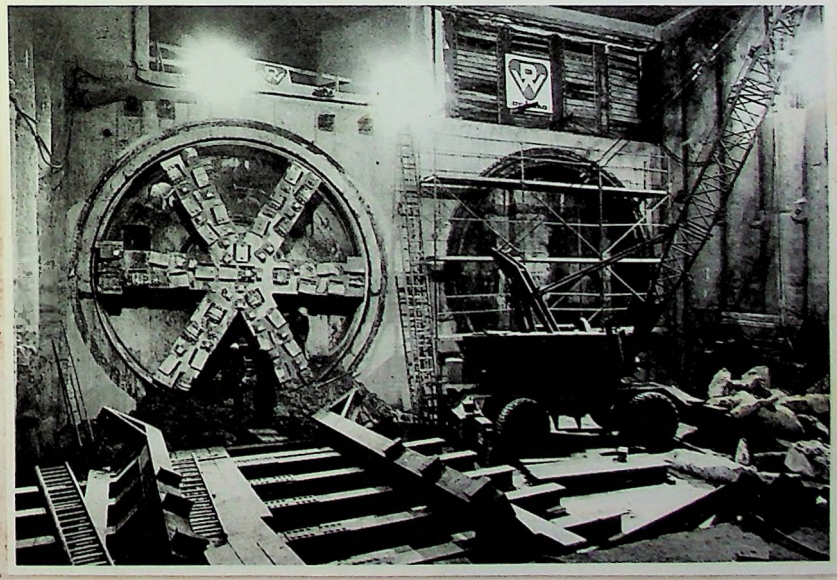
* Eberhardshof overground station

Canopy at entrance to the Hauptbahnhof

* Stadtgrenze station

* Nurnberg Rolling stock interior

exterior



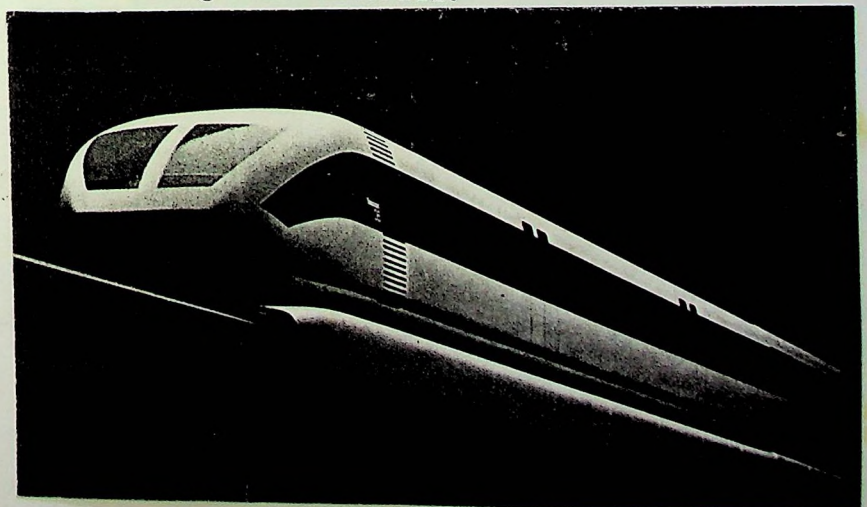
lacks imagination and attention to detail or human scale such as Stadtgrenze station which looks as if the way its design came about was a direct relation of how easy it was for the architect to make a model of the station using creased card. This, however, is often the nature of modernist architecture which it is granted that the construction work can be executed relatively cheaply and efficiently.

The Nürnberg rolling stock is identical to the Munich cars except for the red and white colour scheme which relate to Nürnberg city colours of the crest. The 2 car standard trains are 37 m long usually there are 4 cars in use during the busier hours of the day which can cater for up to 1000 people. They usually travel at a top speed of 80 kmph which may be reached after 40 seconds from a halt. The aluminium bodied trains weigh 140 tonnes. The 1440 kw motors take 110 volts from a 3rd rail situated on the far side of the track to the platform. The trains have an expected life span of 1 million kilometers of travel. The air operated doors are designed to move back in the case of late passengers getting stuck in closing doors. The Nürnberg was running 46 four car trains in 1982.

The construction of U-bahns in a highly costly activity however the benefits to a city can be considerable and by putting rapid transit in a city the temporary disruption during construction can be overridden in priority by the future usefulness of the system for the citizens. Germany has as a nation always been overtly consious of its image as a country at the forefront of technology and first world development in terms of infrastructure and design. The ethics of technology and achievement, display of wealth and work go hand in hand with idea

* Nurnberg station platform

Thyssen magnetic monorail.



of U-bahn transport. An exicting future prospect in the development of rapid transit lies in the new German magnetic monorail trains which are being developed by Thyssen at the moment.

The potential for this system of trains gliding over a track without the usual bumps and vibrations sounds particulary promising the only problen seems to be the implementation of changing tracks along existing routes be they over or underground. They certainly have the right imagery for the entry to the 21st century.

* U-bahn corridor Berlin

SOCIAL FACTORS

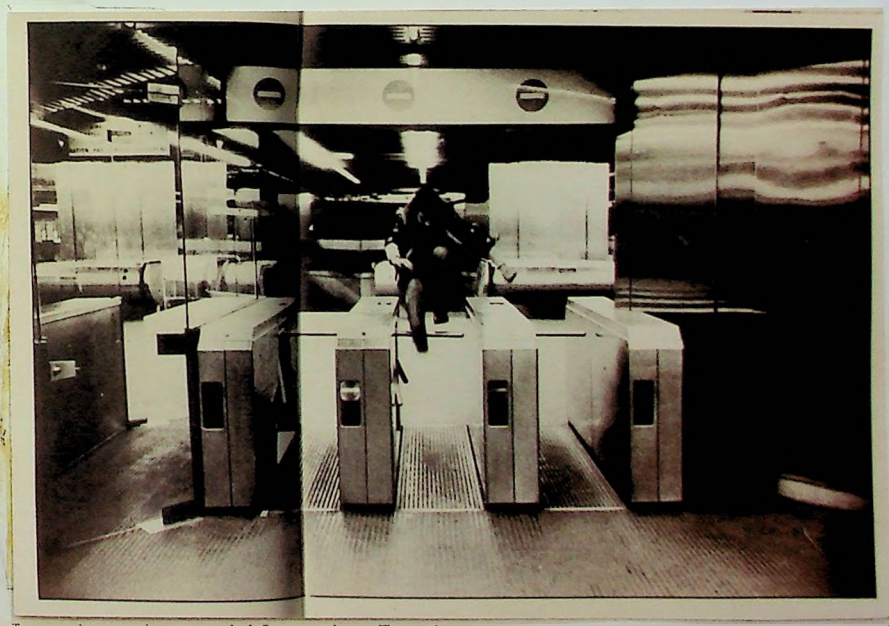
The Controlled Environment

One of the first things to retard the concept of underground travel was the idea of going down into the bowels of the earth hence the expression "sewer train" and the like.

However as we have noted in the history section it became quite a success almost immediately after implementation in all of the city's discussed due to the fact that people viewed the logic of getting to their destination faster being more useful than the discomfort and claustrophobia which early underground travel induced.

People seem to have accepted this mode of transport however it does not mean that it does not affect peoples subconscious, fears and conditioning. The ability of various people to accept controled environments may differ. Obviously sufferers from claustrophobia do not enjoy the prospect of travelling underground. Urban dwellers are by nature suited more to underground transport than rural dwellers whose environment differs. Urban dwellers would be used to designed environments such as office blocks, streets, cinemas which would be relatively controled with footpaths, signs, entrances and exits. The underground experience is a more extreme version of the modern urban experience as space is planned functionally. There is usually a particular reason for that particular space such as circulation halls, interchange tunnels and stairs. These areas make sense if they are used for the purpose for which they were designed however inconsistencies crop up in the controled environment when they are used differently such as trying to exit

* New York subway scene 1960's, tension at rush hour



* Jumping turnstiles in Paris, an inconsistency of design

through one way turnstiles or walking up downwardly moving escalators.

An important contributing factor to the efficiency of subway systems is the incorporation of intuitively operational design thus allowing fluency of action and movement of passengers without having to read manuals in order to use the machinery within the system from ticket machines to press button doors.

If design fails to relate to the humans using it it will lead to alienation and therefore lack of respect for that environment. Graffiti can be seen as a reaction to badly designed controlled environments even though this is not the total conclusion to graffiti which can have other influencing factors such as the craze syndrome. The common denomimator of much of underground transport lies in the fact of people being in a place that they don't particularly want to be but are there simply because they want to be somewhere else as fast as possible. The idea of being in an environment where everything is manmade and designed is often not appealing, from the control of ventilation lighting, space, surfaces and equipment. The prospect of any of these variables failing is also a recipie for anxiety. The film "Brazil" exemplified the alienation of automatic urban transportation in which the character,upon attempting to exit the shuttle for his apartment block is crushed between the automatic doors and carried off to the next stop. [16]

There is no doubt that the design of subway systems must take the pragmatic functional problems of the creation of an efficient envirionment seriously. There however often seems to be a blatant overlooking of the physchological affect of the solutions which are used. If we look at the simple design of covering a surface so that it will be cleanable, durable and

* Amsterdam underground, an urban experience

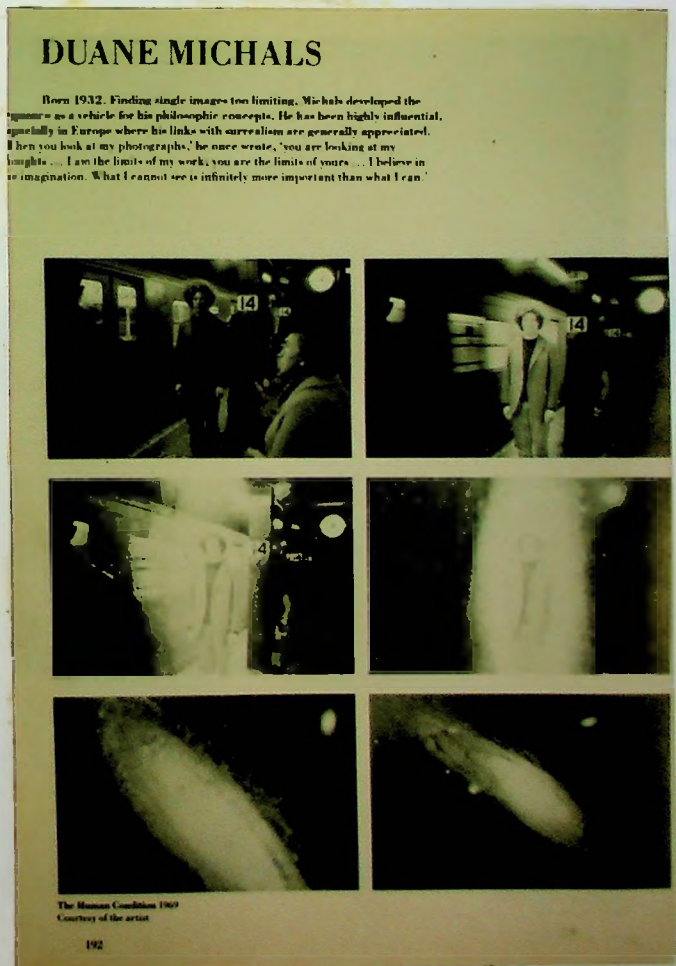
* Paris Metro, anonymous passengers

suitable for construction techniques then the normal solution is square tiles, stainless steel plastic or paint. When one then looks at the overall picture of a corridor completely covered in shiny white tiles its clinical image and logical aura of perfection may lead the user to feel insecure in its prescence as it may bear no reference to the human nature of being moody and imperfect. The design dilema comes with the production of a solution which assures a common demoninator between the millions of people who may use the system.

It is hardly expected that for a modern system that each passenger would have their own armchair and set of curtains installed in a tube train to keep them happy. The ultimate therfore in design terms is to appeal to both functional and aesthetic requirements of the user to a level that in as advanced as possible without offending other passengers. This may appear to the a stifling brief to consider in an advanced abstract level which may end up at a concept of cellestial lightning fast trains which offer the commuter brothel services en route and drop the person at the door of his house. The actual reality of mass underground transit in many of the worlds metropoli can be a traumatic enough experience for its passengers, especially at rush hour. In an ergonomic study by LUNDBERG in 1976 levels of catecholamine (stress indicator) in the urine were measured from selected passengers before and after both empty and crowded train journeys.[19]

The crowded controled environment such as the underground train causes unease and discomfort not only due to the physical situation of heat, air and seating or standing facilities but also in the least quantifiable but often most disquieting senario of underground transport.

* Paris Metro, negotiating turnstiles



DUANE MICHALS

Born 1932. Finding single images too limiting, Michals developed the "sequence" as a vehicle for his philosophic concepts. He has been highly influential, especially in Europe where his links with surrealism are generally appreciated. "When you look at my photographs," he once wrote, "you are looking at my thoughts .... I am the limits of my work; you are the limits of yours .... I believe in the imagination. What I cannot see is infinitely more important than what I can."

The Human Condition 1969
Courtesy of the artist

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* Duane Michals, surreal art from the subway

Much of the anxiety can be caused by the infiltration of peoples personal space.

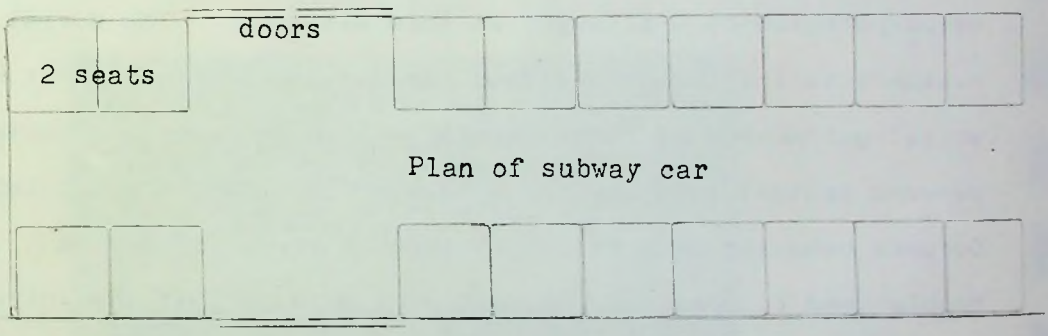
Peoples personal space is the area of invisible boundaries surrounding a persons body into which intruders may not enter. By reducing ceiling height a persons spatial needs are increased radially. There are 3 definable zones, intimate, personal and social and public.

INTIMATE	0	-	45cm
PERSONAL	45cm	-	120cm
SOCIAL	120cm	-	350cm

The intimate zone may only be acceptably entered by persons intimately involved with the person. The personal zone is usually reserved for well known friends as physical violence may be perpetrated by a stranger at this distance. The social distance is the the normal zone for dealing with people at casual social gatherings or formal business. A stranger who violates a persons spatial zone may cause tension, discomfort and flight. Defence behavior is typified by lack of verbal responces. People tend to freeze up or lean away or block off the intruder.

Mehrabian and Diamond 1971 showed that relaxation decreased as chairs were located to increase intimacy. Peoples personal zones vary due to personality, sex, culture, status difference and familiarity. People with personality abnormalities need more space as do introverted people whereas the opposite is of extroverted people. Females have smaller personal space zones than males. Germans require larger personal space areas as compared with English, Americans and French. If we relate the personality traits to the cultural trails this may suggest German people are abnormal and introverted this may be unfair however it

Of course there are exceptions to the rules of eye contact



Plan of subway car

Diagram for Fried & De Fazio stydy.

no mans land.

may explain the German policy of "Lebensraum" which Hitler so expertly expanded upon in W.W.2.

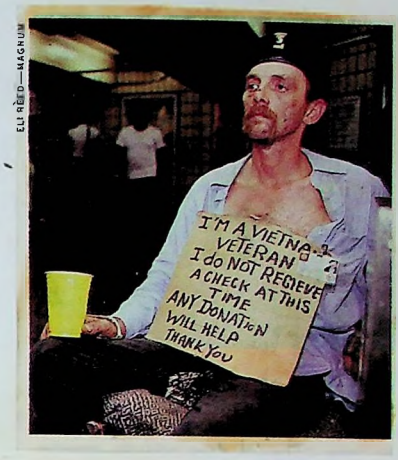
Other ergonomic studies by "Sommer in 1969" observed that people in a very crowded situation ie:. crowded trains seemed to control their potential discomfort from the overcrowding by staring at the floor or into space, thus relating to those close by as if they were non-persons.

This is certainly a scenario of human reactions on underground trains throughout the world. From experience of the London underground in particular one notices the lack of verbal contact between strangers and its atmosphere even quells the conversation even between acquaintances.

The greatest socially adhered to rule of underground travel is the avoidance of eye contact with other passengers. This seems to be the greatest fear of most travellers. In conversation with a friend of mine on the London underground he stated "I've read that ad before but I'm going to read it again." The plight of looking for an unoccupied visual space is often the prevailing occupation of passengers on their journey, this activity is often further frustrated by the reflections of the windows against the dark tunnels mirroring peoples faces and Eyes.

Further interesting human reactions lie in the layout of seating arrangements. The FRIED & DE FAZIO ergonomics study in 1974 looked at the layout of the New York subway cars, and in particular the double seats situated between the end of the car and the first set of doors.They noticed that if one person was seated in that seat that even under medium density of people present in the car (15 - 40 people) that the seat was regarded as sacrocanct and often people would prefer to stand than take the

Down and out, a concept
of underground charachters.



* Vietnam vetern in subway

seat however the territorial rights broke after a density of 40 people present. The territorial rights to seats are often marked by bags or coats however fellow passengers will rarely suggest verbally that the bag be removed.

The implications of social factors on the design of underground trains can interfere to reduce a systems efficiency no matter how well the physical environment is designed. For the problem of personal space zones armrests help in the avoidance of physical contact where space must be maximised.

The idea of the awareness of ones personal safety is also of high priority in the minds of subway travellers. The existence of large areas of walkways, tunnels and other public areas related to subway travel can give travellers the fear of violence in what may be seen as a no mans land between work and home. Similarly the popular image of the word underground often invokes the image of criminals such as Fagin[21] or generally other unsavory characters in the publics imagination. The preference in design so as to increase the sense of security among passengers lies in well kept brightly lit stations with close circuit t.v. cameras on platforms. The decaying image of the New·York subway certainly does not boost a feeling of personal security . Various non design measures seem to have been opted for in that systems such as the transport police however vigilantes such as the 'guardian angels' roam the subways as if they wanted to be good guy cartoon heroes. The 'guardian angels' also set up in London recently and its leader was beaten up in the first week of its existence even though the London undergorund is not reputedly violent, thus one can conclude that due to their presence and image they possibly provoke violence rather than prevent it.

* Subway surfing in Rio Janerio

The Bernard Gets incident a few years ago provoked much reaction after Gets who was travelling in the New York subway opened fire on three 16 year old black youths who had asked him for $5. A large debate arose as to whether citizens had the right to take their self defence through to the use of guns. The incident sparked reaction from both black civil liberties groups and pro - vigilante groups who gained much support with the white citizens who on occasion were seen with" Go get 'em Gets" tee-shirts.

The pressures of urban rapid transit have manifested themselves, in the bizzare craze of'urban surfing'in Rio de Janeiro where on the overground sections of the cities subway the heat and crowding inside the trains during the summer cause teenagers to go onto the roof of the train. The more adventurous participants stand on the train which can be travelling at up to 60 m.p.h. and surf while trying to avoid oncoming overhead cables and tunnels. The craze which requires split second timing for the avoidance of oncoming abstacles has killed over 150 so far, most of the surfers are young gang members. The theme of subways and violence have been echoed in music films and media. The CURE's subway song succinctly relates an experience which follows.

"Midnight in the subway
She's on her way home
She tries hard not to run
But she knows she's not alone
Echoes of footsteps follow her behind
But she dare not turn around
Turn around, turn around.

This is followed by a shrieking sound in a tunnel.[22]

S U M M A R Y

The Social Implications of Underground Transport for the City.

What ways they benefit.

It is a solution towards the easing of traffic conjestion mainly by automobiles. This is a more efficient use of energy as opposed to cars. There is an element of democracy and common experience of people who use the system. The use of underground tracks can open up conjested areas to pedestrianisation and defer the need for overground tracks which may be unsightly in certain areas. The city may also be able to develop its own expression of modernity through the medium of architecture, engineering and art and design. The concept of rapid transit also can open up new satelite residential areas outside the city with the prospect of quick access to the city. In many newtown developments apartment buildings are situated in close proximity to rapid transit stations. Depending on the efficiency of the system the speedy shuttling of workers to their places of work increases commercial activity. Underground transport also offers mobility for disadvantaged sections of the community who are not able to avail of the benefits of car ownership in suburbia.

The Drawbacks of Underground Transport.

The construction of underground is an extremely expensive activity, over £4 million per kilometer. It also causes much disruption when construction is done by the cut and cover method.

The use of underground transport subjects the passengers to a detachment from the natural elements which are substituted by a more sterile and controlled envoirment. This in turn may lead

to a change in the subconscious of the passengers making them more passive and acceptant of urban features.

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* TV picture of tube approaching
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* Map of Metropolitan and District Railways 1870

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* Piccadilly Circus Station about 1910
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* Example of escalator hall by Charles Holden
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* Cut-away view of the refurbished Piccadilly Circus Station of 1925-28
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* The Experimental Streamlined 1935 Stock
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* Women doing maintenance work at overhaul depot at Acton
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* Plessy Factory in Central Line Tunnel 1942
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* Fifties Rolling Stock Interior Northern Line
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* 1967 Rolling Stock, designed by Misha Black and The Design Research Unit
FROM MISHA BLACK, DESIGN COUNCIL

* Victoria Line escalator hall
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* Umbrella Bridge used at Oxford Circus 1968

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* Newspaper Reader
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* Travel card

* Punch Tape Control System used on pre-Victoria Line automation
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* Terminal 4 Heathrow Extension

* Jubilee Line

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* Details of Paolozzi's mosaic
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* Elevation of Paolozzi's mosaic
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* Example of Stockholm Underground
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* Early 1920's Underground Map
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* The Modern English man on an escalator in the 1920's
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PHOTO WILLIAM KLEIN

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* Standard Outline of Metro stations
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* Charles de Gaulle R.E.R. station, an example of the modern grid based design

* SITU Public Transport Information Machine Paris

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* Keith Haring drawings

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* Transit Police on duty
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* The cut and cover method of constuction

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9. Quoted in Jules Garnier
Avant project d'un chemin de fer arien.
SOURCE - Paris a century of change.
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10. Arsene Olivier, 1887
Quoted in Arsene Olivier de Landreville
Les grands projects de Paris
SOURCE - Paris a century change.

11. Comments by a "World" reporter October 1904
SOURCE - The Epic of New York city.
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12. Charles Garnier president of
Societe des Amis de Monuments Parisiens
SOURCE - Paris Century of change.
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13. City Councilor Sandford Garelik
Quoted in "Getting up"

14. We are not afraid poster 1982
SOURCE - Street Art.

15. Mayor Lindsay of N.Y.C.
Quoted in "Getting up".

16. Cheif Judge Ronald Matthews
Quoted in "Getting up".

17. There is still an overt bitterness in the Soviet Union where 20 million of its inhabitants were killed in what was known as the great patriotic war in W.W.2.
SOURCE - Moscow metro photoguide.
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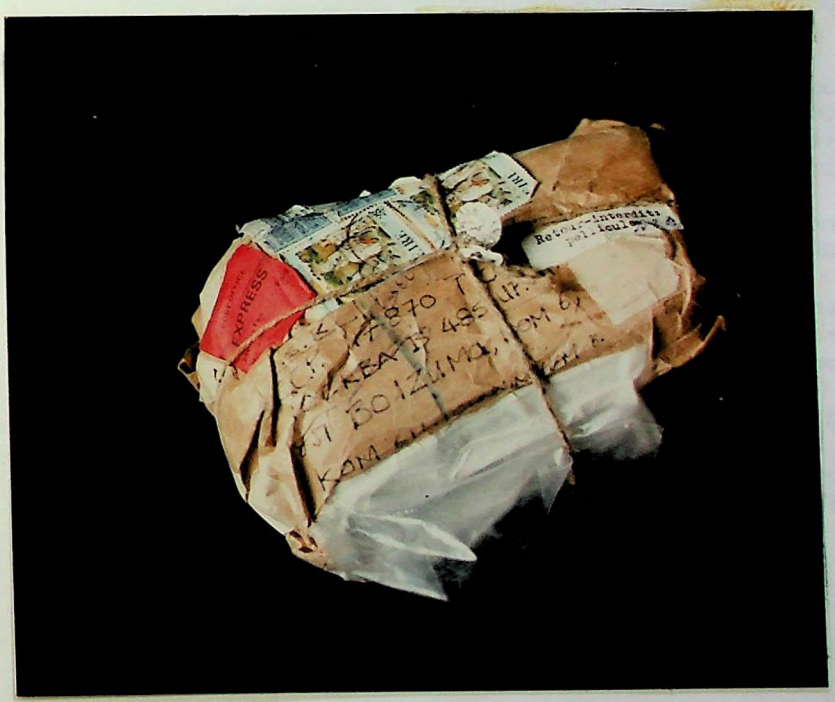
18. "Brazil" a film sarchastically based on the concept of George Orwell's book 1984
Direction - Monty Python crew - Robert de Niro
Bob Hoskins 1984.

19. Lundburg study
SOURCE - Applied Ergonomics 1988

20. "Lebensraum" Hitlers policy of Germanys wish for living room. Which manifested itself in the expansion of the 3rd Reich.

21. Fagin the character in the Dickens novel 'Oliver'

22. Subway song from the CURE's 1st LP. Three imaginary boys. 1979.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