

Paleotechnic Paradise: Coketown

1: THE BEGINNINGS OF COKETOWN

Up to the nineteenth century, there had been a rough balance of activities within the city. Though work and trade were always important, religion and art and play claimed their full share of the townsman's energies. But the tendency to concentrate on economic activities, and to regard as waste the time or effort spent on other functions, at least outside the home, had been growing steadily since the sixteenth century. If capitalism tended to expand the province of the marketplace and turn every part of the city into a negotiable commodity, the change from organized urban handicraft to large scale factory production transformed the industrial towns into dark hives, busily puffing, clanking, screeching, smoking for twelve and fourteen hours a day, sometimes going around the clock. The slavish routine of the mines, whose labor was an intentional punishment for criminals, became the normal environment of the new industrial worker. None of these towns heeded the old saw, 'All work and no play makes Jack a dull boy.' Coketown specialized in producing dull boys.

As witness to the immense productivity of the machine the slag heaps and rubbish heaps reached mountainous proportions, while the human beings whose labor made these achievements possible were crippled and killed almost as fast as they would have been on a battlefield. The new industrial city had many lessons to teach; but for the urbanist its chief lesson was in what to avoid. By reaction against industrialism's misdemeanors, the artists and reformers of the nineteenth century finally arrived at a better conception of human needs and urban possibilities. In the end the disease stimulated the antibodies needed to overcome it.

The generating agents of the new city were the mine, the factory, and the railroad. But their success in displacing every traditional concept of

the city was due to the fact that the solidarity of the upper classes was visibly breaking up: the Court was becoming supernumerary, and even capitalist speculation turned from trade to industrial exploitation to achieve the greatest possibilities of financial aggrandizement. In every quarter, the older principles of aristocratic education and rural culture were replaced by a single-minded devotion to industrial power and pecuniary success, sometimes disguised as democracy.

The baroque dream of power and luxury had at least human outlets, human goals: the tangible pleasures of the hunt, the dinner table, the bed were always temptingly in view. The new conception of human destiny, as the utilitarians projected it, had little place for even sensual delights: it rested on a doctrine of productive exertion, consumptive avarice, and physiological denial; and it took the form of a wholesale disparagement of the joys of life, similar to that necessitated by war, during a siege. The new masters of society scornfully turned their backs on the past and all the accumulations of history and addressed themselves to creating a future, which, on their own theory of progress, would be just as contemptible once it, too, was past—and would be just as ruthlessly scrapped.

Between 1820 and 1900 the destruction and disorder within great cities is like that of a battlefield, proportionate to the very extent of their equipment and the strength of the forces employed. In the new provinces of city building, one must now keep one's eyes on the bankers, industrialists, and the mechanical inventors. They were responsible for most of what was good and almost all that was bad. In their own image, they created a new type of city: that which Dickens, in 'Hard Times,' called Coketown. In a greater or lesser degree, every city in the Western World was stamped with the archetypal characteristics of Coketown. Industrialism, the main creative force of the nineteenth century, produced the most degraded urban environment the world had yet seen; for even the quarters of the ruling classes were befouled and overcrowded.

The political base of this new type of urban aggregation rested on three main pillars: the abolition of the guilds and the creation of a state of permanent insecurity for the working classes: the establishment of the competitive open market for labor and for the sale of goods: the maintenance of foreign dependencies as source of raw materials, necessary to new industries, and as a ready market to absorb the surplus of mechanized industry. Its economic foundations were the exploitation of the coal mine, the vastly increased production of iron, and the use of a steady, reliable—if highly inefficient—source of mechanical power: the steam engine.

Actually, these technical advances depended socially upon the invention of new forms of corporate organization and administration. The joint stock company, the limited liability investment, the delegation of admin-

istrative authority under divided ownerships, and control of the process by budget and audit were all matters of co-operative political technique whose success was not due to the genius of any particular individual or group of individuals. This holds true, too, of the mechanical organization of factories, which greatly augmented the efficiency of production. But the basis of this system, in the ideology of the period, was thought to be the atomic individual: to guard his property, to protect his rights, to ensure his freedom of choice and freedom of enterprise, was the whole duty of government.

This myth of the untrammelled individual was in fact the democratization of the baroque conception of the despotic Prince: now every enterprising man sought to be a despot in his own right: emotional despots like the romantic poets: practical despots like the business men. Adam Smith in 'The Wealth of Nations' still had a comprehensive theory of political society: he had a correct conception of the economic basis of the city and valid insight into the non-profit-making economic functions. But his interest gave way, in practice, to the aggressive desire to increase the wealth of individuals: that was the be-all and the end-all of the new Malthusian struggle for existence.

Perhaps the most gigantic fact in the whole urban transition was the displacement of population that occurred over the whole planet. For this movement and resettlement was accompanied by another fact of colossal import: the astounding rise in the rate of population increase. This increase affected industrially backward countries like Russia, with a predominantly rural population and a high rate of births and deaths, quite as much as it affected progressive countries that were predominantly mechanized and de-ruralized. The general increase in numbers was accompanied by a drawing of the surplus into cities, and an immense enlargement of the area of the bigger centers. Urbanization increased in almost direct proportion to industrialization: in England and New England it finally came about that over eighty per cent of the entire population was living in centers with more than twenty-five hundred population.

Into the newly opened lands of the planet, originally peopled by military camps, trading posts, religious missions, small agricultural settlements, there came an inundation of immigrants from countries suffering from political oppression and economic poverty. This movement of people, this colonization of territory, had two forms: land pioneering and industry pioneering. The first filled the sparsely occupied regions of America, Africa, Australia, of Siberia and, later, Manchuria: the second brought the overplus into the new industrial villages and towns. In most cases, these types came in successive waves.

The extensive land migration in turn helped to bring to the European system of agriculture the resources of hitherto untapped parts of the world:

particularly a whole series of new energy crops, maize and potato—and that pungent agent of relaxation and social ceremony, the tobacco plant. Moreover the colonization of tropical and subtropical lands added a further energy crop now supplied to Europe for the first time on a grand scale—cane-sugar.

This enormous increase in the food supply was what made possible the increase of population. And the external colonization in new rural territories thus helped to create that surplus of men and women and children which went toward the internal colonization of the new industrial towns and commercial emporia. Villages expanded into towns; towns became metropolises. The number of urban centers multiplied; the number of cities with populations above five hundred thousand increased, too. Extraordinary changes of scale took place in the masses of buildings and the areas they covered: vast structures were erected almost overnight. Men built in haste, and had hardly time to repent of their mistakes before they tore down their original structures and built again, just as heedlessly. The newcomers, babies or immigrants, could not wait for new quarters: they crowded into whatever was offered. It was a period of vast urban improvisation: makeshift hastily piled upon makeshift.

Mark that the rapid growth of cities was no mere New World phenomenon. Indeed, the rate of city growth was swifter in Germany after 1870, when the paleotechnic revolution was in full swing there, than in new countries like the United States: this despite the fact that the United States was then steadily receiving immigrants. Though the nineteenth century was the first to rival the early Middle Ages in large scale land colonization and settlement, the premises upon which these enterprises were conducted were far more primitive than those of the eleventh century. Colonization by communities, except in the case of little idealistic groups, the most widely successful of which were the Mormons, was no longer the rule. Every man was for himself; and the Devil, if he did not take the hindmost, at least reserved for himself the privilege of building the cities.

Here in the new industrial centers was a chance to build on a firm foundation and make a fresh start: such a chance as democracy had in the eighteenth century claimed for itself in political government. Almost everywhere that opportunity was fumbled. In an age of technical progress the city, as a social and political unit, lay outside the circle of invention. Except for utilities such as gas mains, water pipes, and sanitary equipment, often belatedly introduced, often slipshod, always ill-distributed, the industrial city could claim no important improvements over the seventeenth-century town. Indeed, the most wealthy and 'progressive' metropolises often denied themselves elementary necessities of life like light and air that even backward villages still possessed. Until 1838 neither Manchester nor Birming-

ham even functioned politically as incorporated boroughs: they were man-heaps, machine-warrens, not agents of human association for the promotion of a better life.

2: MECHANIZATION AND *ABBAU*

Before we inquire how this vast flood of people found urban accommodation, let us examine the assumptions and attitudes that people brought to the new task of city building.

The leading philosophy of life was the offspring of two entirely dissimilar types of experience. One was the rigorous concept of mathematical order derived from the renewed study of the motions of the heavenly bodies: the highest pattern of mechanical regularity. The other was the physical process of breaking up, pulverizing, calcining, smelting, which the alchemists, working with the mechanically advanced mine workers of the late Middle Ages, had turned from a mere mechanical process into the routine of scientific investigation. As formulated by the new philosophers of nature, this new order had no place for organisms or social groups, still less for the human personality. Neither institutional patterns nor esthetic forms, neither history nor myth, derived from the external analysis of the 'physical world.' The machine alone could embody this order: only industrial capital boasted corporate form.

So immersed are we, even at this late date, in the surviving medium of paleotechnic beliefs that we are not sufficiently conscious of their profound abnormality. Few of us correctly evaluate the destructive imagery that the mine carried into every department of activity, sanctioning the anti-vital and the anti-organic. Before the nineteenth century the mine had, quantitatively speaking, only a subordinate part in man's industrial life. By the middle of the century it had come to underlie every part of it. And the spread of mining was accompanied by a general loss of form throughout society: a degradation of the landscape and a no less brutal disordering of the communal environment.

Agriculture creates a balance between wild nature and man's social needs. It restores deliberately what man subtracts from the earth; while the plowed field, the trim orchard, the serried vineyard, the vegetables, the grains, the flowers, are all examples of disciplined purpose, orderly growth, and beautiful form. The process of mining, on the other hand, is destructive: the immediate product of the mine is disorganized and inorganic; and what is once taken out of the quarry or the pithead cannot be replaced.

Add to this the fact that continued occupation in agriculture brings cumulative improvements to the landscape and a finer adaptation of it to human needs; while mines as a rule pass quickly from riches to exhaustion, from exhaustion to desertion, often within a few generations. Mining thus presents the very image of human discontinuity, here today and gone tomorrow, now feverish with gain, now depleted and vacant.

From the eighteen-thirties on, the environment of the mine, once restricted to the original site, was universalized by the railroad. Wherever the iron rails went, the mine and its debris went with them. Whereas the canals of the eotechnic phase, with their locks and bridges and tollhouses, with their trim banks and their gliding barges, had brought a new element of beauty into the rural landscape, the railroads of the paleotechnic phase made huge gashes: the cuts and embankments for the greater part long remained unplanted, and the wound in the earth was unhealed. The rushing locomotives brought noise, smoke, grit, into the hearts of the towns: more than one superb urban site, like Prince's Gardens in Edinburgh, was desecrated by the invasion of the railroad. And the factories that grew up alongside the railroad sidings mirrored the slatternly environment of the railroad itself. If it was in the mining town that the characteristic process of *Abbau*—mining or un-building—was seen at its purest, it was by means of the railroad that this process was extended by the third quarter of the nineteenth century to almost every industrial community.

The process of un-building, as William Morton Wheeler pointed out, is not unknown in the world of organisms. In un-building, a more advanced form of life loses its complex character, bringing about an evolution downward, toward simpler and less finely integrated organisms. "There is," observed Wheeler, "an evolution by atrophy as well as by increasing complication, and both processes may be going on simultaneously and at varying rates in the same organism."

This held precisely true of nineteenth-century society: it showed itself clearly in the organization of urban communities. A process of up-building, with increasing differentiation, integration, and social accommodation of the individual parts in relation to the whole was going on: an articulation within an ever-widening environment was taking place within the factory, and indeed within the entire economic order. Food-chains and production-chains of a complicated nature were being formed throughout the planet: ice travelled from Boston to Calcutta and tea journeyed from China to Ireland, whilst machinery and cotton goods and cutlery from Birmingham and Manchester found their way to the remotest corners of the earth. A universal postal service, fast locomotion, and almost instantaneous communication by telegraph and cable synchronized the activities of vast masses of men who had hitherto lacked the most rudimentary facilities for coordinating their tasks. This was accompanied by a steady differentiation of

crafts, trades, organizations, and associations: mostly self-governing bodies, often legally incorporated. This significant communal development was masked by the fashionable theory of atomic individualism: so it rarely achieved an urban structure.

But at the same time, an *Abbau*, or un-building, was taking place, often at an even more rapid rate, in other parts of the environment: forests were slaughtered, soils were mined, whole animal species, such as the beaver, the bison, the wild pigeon, were practically wiped out, while the sperm whales and right whales were seriously decimated. Therewith the natural balance of organisms within their ecological regions was upset, and a lower and simpler biological order—sometimes marked by the complete extermination of the prevalent forms of life—followed Western man's ruthless exploitation of nature for the sake of his temporary and socially limited profit economy.

Above all, as we shall see, this un-building took place in the urban environment.

3: THE POSTULATES OF UTILITARIANISM

In so far as there was any conscious political regulation of the growth and development of cities during the paleotechnic period, it was done in accord with the postulates of utilitarianism. The most fundamental of these postulates was a notion that the utilitarians had taken over, in apparent innocence, from the theologians: the belief that a divine providence ruled over economic activity and ensured, so long as man did not presumptuously interfere, the maximum public good through the dispersed and unregulated efforts of every private, self-seeking individual. The non-theological name for this pre-ordained harmony was *laissez-faire*.

To understand the uncouth disorder of the industrial town one must analyze the curious metaphysical preconceptions that dominated both the scientific and the practical life. 'Without design' was a laudatory term in the Victorian period. As in the decadent period of Greece, Chance had been elevated into a deity that was supposedly in control not only of human destiny, but of all natural processes as well. "The gist of Darwin's theory," wrote Ernst Haeckel, the biologist, "is this simple idea: that the struggle for existence in nature evolves new species *without design*, just as well as man produces new varieties in cultivation with design." It was by follow-

ing what they presumed was nature's way that the industrialist and the municipal officer produced the new species of town, a blasted, de-natured man-heap adapted, not to the needs of life, but to the mythic 'struggle for existence'; an environment whose very deterioration bore witness to the ruthlessness and intensity of that struggle. There was no room for planning in the layout of these towns. Chaos does not have to be planned.

The historic justification for the *laissez-faire* reaction needs no demonstration now: it was an attempt to break through the network of stale privileges and franchises and trade regulations that the absolute State had imposed upon the decayed economic fabric and dwindling social morality of the medieval town. The new enterprisers had good reason to distrust the public spirit of a venal court or the social efficiency of the Circumlocution Offices of the growing taxation-bureaucracy. Hence the utilitarians sought to reduce governmental functions to a minimum: they wished to have a free hand in making investments, in building up industries, in buying land, in hiring and firing workers. Unfortunately, the pre-ordained harmony of the economic order turned out to be a superstition: the scramble for power remained a sordid scramble, and individual competition for ever-greater profits led the more successful to the unscrupulous practice of monopoly at the public expense. But design did not emerge.

In practice, the political equality that was slowly introduced into the Western polities from 1789 onward, and the freedom of initiative that was demanded by the industrialists were contradictory claims. To achieve political equality and personal freedom, strong economic limitations and political restraints were necessary. In countries where the experiment of equality was made without attempting to rectify annually the effects of the law of rent, the result was a stultification of the original purpose. In the United States, for example, the free bestowal of land upon settlers in 160-acre tracts under the Homestead Law did not lay the basis of a free polity: within a generation the unequal properties of the soil, the unequal talents of the users, had resulted in gross social inequalities. Without systematically removing the fundamental disparities that grew out of the private monopoly of land, the inheritance of large fortunes, the monopoly of patents, the only effect of *laissez-faire* was to supplement the old privileged classes with a new one.

The freedom demanded by the utilitarians was in reality freedom for unrestricted profits and private aggrandizement. Profits and rents were to be limited only by what the traffic would bear: decent customary rents and a just price were out of the question. Only hunger, distress, and poverty, Townsend observed in his commentary on the English Poor Laws, could prevail on the lower classes to accept the horrors of the sea and the battle-field; and only these same helpful stimuli would "spur and goad" them on to factory labor. The rulers, however, maintained an almost unbroken

class front on any issue that concerned their pocketbooks as a class; and they never scrupled to act collectively when it was a question of beating down the working classes.

This theological belief in pre-ordained harmony had, however, an important result upon the organization of the paleotechnic town. It created the natural expectation that the whole enterprise should be conducted by private individuals, with a minimum amount of interference on the part of local or national governments. The location of factories, the building of quarters for the workers, even the supply of water and the collection of garbage, should be done exclusively by private enterprise seeking for private profit. Free competition was supposed to choose the correct location, provide the correct time-sequence in development, and create out of a thousand un-coordinated efforts a coherent social pattern. Or rather, none of these needs was regarded as worthy of rational appraisal and deliberate achievement.

Laissez-faire, even more than absolutism, destroyed the notion of a co-operative polity and a common plan. Did not the utilitarian expect the effects of rational design to appear from the unrestricted operation of conflicting random private interests? By giving rein to unrestricted competition, reason and co-operative order were to emerge: indeed rational planning, by preventing automatic adjustments, could, it was supposed, only interfere with the higher workings of a divine economic providence.

The main point to note now is that these doctrines undermined such municipal authority as had survived, and they discredited the city itself as anything more than a 'fortuitous concourse of atoms'—as the physics of the time erroneously described the universe—held together temporarily by motives of self-seeking and private profit. Even in the eighteenth century, before either the French Revolution or the coal-and-iron revolution had been consummated, it had become the fashion to discredit municipal authorities and to sneer at local interests. In the newly organized states, even those based on republican principles, only matters of national moment, organized by political parties, counted in men's hopes or dreams.

The time of the Enlightenment, as W. H. Riehl sharply said, was a period when people yearned for humanity and had no heart for their own people; when they philosophized about the state and forgot the community. "No period was more impoverished than the eighteenth century in the development of a common community spirit; the medieval community was dissolved and the modern was not yet ready. . . . In the satirical literature of the time, whoever wanted to portray a blockhead represented him as a Burgomaster, and if he wished to describe a meeting of Jackasses, he described a meeting of Town Councillors."

Urban growth had indeed begun, from industrial and commercial causes, even before the paleotechnic revolution was well started. In 1685, Man-

chester had about 6,000 people; in 1760, between 30,000 and 45,000. Birmingham had 4,000 at the first date and almost 30,000 in 1760. By 1801 Manchester's population was 72,275, and by 1851 it was 303,382. But once the concentration of factories abetted the growth of towns, the increase in the numbers became overwhelming. Since the increase produced extraordinary opportunities for profit making, there was nothing in the current traditions of society to curb this growth; or rather, there was everything to promote it.

4: THE TECHNICS OF AGGLOMERATION

The specialized industrial center originated as a spore, escaping from the corporate medieval town, either because of the nature of the industry—mining or glass-making—or because the monopolistic practices of the guilds prevented a new trade like machine knitting from springing up there. But by the sixteenth century, handicraft industry, too, was spreading through the countryside, particularly in England, in order to take advantage of cheap, unprotected cottage labor. So far had this practice gone that by 1554 an act to remedy the decay of corporate towns was passed, prohibiting anyone living in the country from disposing of his work by retail, except in fairs.

By the seventeenth century, even before the mechanization of spinning and weaving, the English cloth industries were dispersed in Shropshire and Worcestershire, with employers and workers both scattered in villages and market towns. Not merely did these industries escape from the town regulations: they escaped from the costly initiation fees and charitable dues of the guilds. With no customary wages, with no social security, the worker, as Adam Smith pointed out, was, under the discipline of starvation, fearful of losing his job. "If you would have your work tolerably executed, it must be done in the suburbs," he points out, "where the workmen, having no exclusive privilege, have nothing but their character to depend upon, and you must then smuggle it into town as best you can."

The increasing use of water power in production abetted the escape into upland regions where small, swift running streams, or rivers with falls, provided a head of water. Hence the textile industry tended to spread through the valleys of Yorkshire, or later along the Connecticut and the Merrimac in New England; and since the number of favorable sites in any one stretch was usually limited, relatively large plants, with factories four or five stories high, came in along with mechanization itself. A combina-

tion of cheap rural land, a docile, starvation-disciplined population, and a sufficient source of steady power filled the needs of the new industries.

But it took the better part of two centuries, from the sixteenth to the eighteenth, before all the agents of industrial agglomeration were developed in equal degree. Before this, the commercial advantages of the corporate town counterbalanced the industrial advantages of cheap power and cheap labor supplied by the factory village. Till the nineteenth century industry remained decentralized, in small workshops, scaled to agriculture: communities like Sudbury and country towns like Worcester in England.

Humanly speaking, some of the worst features of the factory system, the long hours, the monotonous work, the low wages, the systematic misappropriation of child labor, had been established under the decentralized eotechnic organization of production. Exploitation began at home. But water power and canal transportation did little damage to the landscape; and mining and smelting, as long as they remained small in scale and scattered, made scars that were easily healed. Even today, in the Forest of Dean, near the Severn, where the ancient practices of charcoal burning mingle with those of small scale mining, the mining villages are more comely than in more 'dynamic' areas, and both the mines and the slagheaps are easily hidden by trees or almost effaced by other vegetation. It was the change of scale, the unrestricted massing of populations and industries, that produced some of the most horrendous urban effects.

The use of Watt's steam engine as a prime mover, changed all this: particularly, it changed the scale and made feasible a far heavier concentration of both industries and workers, while it removed the worker himself farther from the rural base that gave the cottager with his garden an auxiliary supply of food and a touch of independence. The new fuel magnified the importance of the coal fields and fostered industry there or in places accessible by canal or railroad.

Steam worked most efficiently in big concentrated units, with the parts of the plant no more than a quarter of a mile from the power-center: every spinning machine or loom had to tap power from the belts and shafts worked by the central steam engine. The more units in a given area, the more efficient was the source of power: hence the tendency toward giantism. Big factories, such as those developed in Manchester, New Hampshire, from the eighteen-twenties onward—repeated in New Bedford and Fall River—could utilize the latest instruments of power production, whereas the smaller factories were at a technical disadvantage. A single factory might employ two hundred and fifty hands. A dozen such factories, with all the accessory instruments and services, were already the nucleus of a considerable town.

In their attempts to produce machine-made goods at low prices for consumption in the world market, the manufacturers cut costs at every point in order to increase profits. The most obvious place to begin this paring

was in the wages of the workers. In the eighteenth century, as Robert Owen noted, even the most enlightened manufacturers made unsparing use of child labor and pauper labor: but when the age of child workers was legally regulated and the supply diminished, it became necessary to tap other sources. To have the necessary surplus of workers, to meet the extra demands in the busy seasons, it was important for industry to settle near a great center of population, for in a country village the support of the idle might fall directly upon the manufacturer himself, who often owned the cottages and might, during a shutdown, lose his rents.

It was the manic-depressive rhythm of the market, with its spurts and stoppages, that made the large urban center so important to industry. For it was by drawing at need on an underlayer of surplus labor, fitfully employed, that the new capitalists managed to depress wages and meet any sudden demand in production. Size, in other words, took the place of an efficiently organized labor market, with union wage standards and public employment exchanges. Topographical agglomeration was a substitute for a well-timed and humanely regulated mode of production, such as has been coming into existence the last half-century.

If the steam-powered factory, producing for the world market, was the first factor that tended to increase the area of urban congestion, the new railroad transportation system, after 1830, greatly abetted it.

Power was concentrated on the coal fields. Where coal could be mined or obtained by cheap means of transportation, industry could produce regularly throughout the year without stoppages through seasonal failure of power. In a business system based upon time-contracts and time-payments, this regularity was highly important. Coal and iron thus exercised a gravitational pull on many subsidiary and accessory industries: first by means of the canal, and after 1830, through the new railroads. A direct connection with the mining areas was a prime condition of urban concentration: until our own day the chief commodity carried by the railroads was coal for heat and power.

The dirt roads, the sail-power, the horse-power of the eotechnic transportation system had favored a dispersal of the population: within the region, there were many points of equal advantage. But the relative weakness of the steam locomotive, which could not easily climb a grade steeper than two feet in a hundred, tended to concentrate the new industrial centers on the coalbeds and in the connecting valleys: the Lille district in France, the Merseburg and Ruhr districts in Germany, the Black Country of England, the Allegheny-Great Lakes region and the Eastern Coastal Plain in the United States.

Population growth, then, during the paleotechnic regime, showed two characteristic patterns: a general massing on the coal areas, where the new heavy industries, iron and coal mining, smelting, cutlery, hardware produc-

tion, glass manufacture, and machine-building flourished. And in addition a partly derivative thickening of population along the new railroad lines, with a definite clotting in the industrial centers along the great trunk lines and a further massing in the greater junction towns and export terminals. Along with this went a thinning out of population and a running down of activities in the back country: the falling off of local mines, quarries, and furnaces, and the diminishing use of highways, canals, small factories, local mills.

Most of the great earlier political and commercial capitals, at least in the Northern countries, shared in this growth. Not merely did they usually occupy geographically strategic positions: they had special resources of exploitation through their intimacy with the agents of political power and through the central banks and bourses that controlled the flow of investments. Moreover, they had the further advantage of having gathered, for centuries, a vast reserve of miserable people at the margin of subsistence: what was euphemistically called the Labor Supply. The fact that almost every great national capital became *ipso facto* a great industrial center served to give a further push to the policy of urban aggrandizement and congestion.

5: FACTORY, RAILROAD, AND SLUM

The main elements in the new urban complex were the factory, the railroad, and the slum. By themselves they constituted the industrial town: a word that described merely the fact that more than two thousand people were gathered in an area that could be designated with a proper name. Such urban clots could and did expand a hundred times without acquiring more than a shadow of the institutions that characterize a city in the mature sociological sense—that is, a place in which the social heritage is concentrated, and in which the possibilities of continuous social intercourse and interaction raise to a higher potential all the complex activities of men. Except in shrunken, residual forms, even the characteristic organs of the stone age city were lacking.

The factory became the nucleus of the new urban organism. Every other detail of life was subordinate to it. Even the utilities, such as the water supply, and the minimum of governmental offices that were necessary to a town's existence often, if they had not been built by an earlier generation, entered belatedly: an afterthought. It was not merely art and religion that were treated by the utilitarian as mere embellishments: intelligent political

administration long remained in the same category. In the first scramble of exploitation, no provisions would be made for police and fire protection, water and food inspection, hospital care, or education.

The factory usually claimed the best sites: mainly, in the cotton industry, the chemical industries, and the iron industries, the sites near a waterfront; for large quantities of water were needed now in the processes of production, supplying the steam boilers, cooling hot surfaces, making the necessary chemical solutions and dyes. Above all, the river or canal had still another important function: it was the cheapest and most convenient dumping ground for all soluble or suspendable forms of waste. The transformation of the rivers into open sewers was a characteristic feat of the new economy. Result: poisoning of the aquatic life: destruction of food: befouling of water so it was unfit to bathe in.

For generations, the members of every 'progressive' urban community were forced to pay for the sordid convenience of the manufacturer, who often, it happened, consigned his precious by-products to the river, for lack of scientific knowledge or the empirical skill to use them. If the river was a liquid dump, great mounds of ashes, slag, rubbish, rusty iron, and even garbage blocked the horizon with their vision of misplaced and unusable matter. The rapidity of production was in part matched by the rapidity of consumption, and before a conservative policy of scrap metal utilization became profitable, the formless or deteriorated end-products were cast back over the surface of the landscape. In the Black Country of England, indeed, the huge slag heaps still look like geological formations: they decreased the available living space, cast a shadow on the land, and until recently presented an insoluble problem of either utilization or removal.

The testimony that substantiates this picture is voluminous; indeed, it is still open for inspection in the older industrial cities of the Western World, despite herculean efforts to cleanse the environment. Let me however quote from an early observer, Hugh Miller, the author of 'Old Red Sandstone': a man thoroughly in harmony with his age, but not insensitive to the actual qualities of the new environment. He is speaking of Manchester in 1862.

"Nothing seems more characteristic of the great manufacturing city, though disagreeably so, than the river Irwell, which runs through the place. . . . The hapless river—a pretty enough stream a few miles up, with trees overhanging its banks and fringes of green sedge set thick along its edges—loses caste as it gets among the mills and print works. There are myriads of dirty things given it to wash, and whole wagonloads of poisons from dye houses and bleachyards thrown into it to carry away; steam boilers discharge into it their seething contents, and drains and sewers their fetid impurities; till at length it rolls on—here between tall dingy walls, there

under precipices of red sand-stone—considerably less a river than a flood of liquid manure.”

Note the environmental effect of the *massing* of industries that the new regime tended to make universal. A single factory chimney, a single blast furnace, a single dye works may easily have its effluvia absorbed by the surrounding landscape: twenty of them in a narrow area effectively pollute the air or water beyond remedy. So that the unavoidably dirty industries became through urban concentration far more formidable than they were when they had existed on a smaller scale and were more widely dispersed about the countryside. At the same time clean industries, such as the making of blankets, which still goes on at Witney, in England, with bleaching and shrinking conducted out in the open air of a charming countryside, became impossible under the old rural methods in the new centers. There chlorine took the place of sunlight, and for the healthful outdoor work that often accompanied the older processes of manufacture, with changes of scene as well as process to renew the spirit of the worker, came the dull drudgery of work within a dirty building hemmed in by other dirty buildings. Such losses cannot be measured in merely pecuniary terms. We have no calculus for figuring how much the gains in production were offset by the brutal sacrifice of life and a living environment.

While factories were usually set near the rivers, or the railroad lines that paralleled the rivers (except where a level terrain invited diffusion), no authority was exercised to concentrate factories in a particular area, to segregate the more noxious or noisy industries that should be placed far from human habitations, or to insulate for domestic purposes the appropriate adjacent areas. ‘Free competition’ alone determined location, without thought of the possibility of functional planning: and the jumbling together of industrial, commercial, and domestic functions went on steadily in industrial cities.

In areas with a rough topography, such as the valleys of the Allegheny plateau, a certain amount of natural zoning might take place, since only the river bottoms would afford enough space for a big mill to spread—though this disposition ensured that the maximum amount of noxious effluvia would rise and spread over the homes on the hillsides above. Otherwise living quarters were often placed within the leftover spaces between the factories and sheds and the railroad yards. To pay attention to such matters as dirt, noise, vibration, was accounted an effeminate delicacy. Workers’ houses, often those of the middle classes, too, would be built smack up against a steel works, a dye plant, a gas works, or a railroad cutting. They would be built, often enough, on land filled in with ashes and broken glass and rubbish, where even the grass could not take root; they might be on the edge of a dump or a vast permanent pile of coal and slag: day in and day out the stench of the refuse, the murky outpouring of chim-

neys, the noise of hammering or of whirring machinery, accompanied the household routine.

In this new scheme, the town itself consisted of the shattered fragments of land, with odd shapes and inconsequential streets and avenues, left over between the factories, the railroads, the freight yards and dump heaps. In lieu of any kind of over-all municipal regulation or planning, the railroad itself was called upon to define the character and project the limits of the town. Except in certain parts of Europe where old-fashioned bureaucratic regulations happily kept the railroad stations at the outskirts of the historic city, the railroad was permitted, or rather, was invited to plunge into the very heart of the town and to create in the most precious central portions of the city a waste of freight yards and marshalling yards, economically justifiable only in the open country. These yards severed the town’s natural arteries and created an impassable barrier between large urban segments: sometimes, as in Philadelphia, a veritable Chinese wall.

Thus the railroad carried into the heart of the city not merely noise and soot but the industrial plants and the debased housing that alone could thrive in the environment it produced. Only the hypnotism of a new invention, in an age uncritically enamored of new inventions, could have prompted this wanton immolation under the wheels of the puffing Juggernaut. Every mistake in urban design that could be made was made by the new railroad engineers, for whom the movement of trains was more important than the human objects achieved by that movement. The wastage of space by railroad yards in the heart of the city only furthered its more rapid extension outward; and this in turn, since it produced more railroad traffic, gave the extra sanction of profits to the misdemeanors so committed.

So widespread was this deterioration of environment, so hardened have people in big cities become to it in the course of a century, that even the richer classes, who could presumably afford the best, to this day often indifferently embrace the worst. As for housing itself, the alternatives were simple. In the industrial towns that grew up on older foundations, the workers were first accommodated by turning old one-family houses into rent barracks. In these made-over houses, each separate room would now enclose a whole family: from Dublin and Glasgow to Bombay, the standard of one room per family long held. Bed overcrowding, with three to eight people of different ages sleeping on the same pallet, often aggravated room overcrowding in such human sties. By the beginning of the nineteenth century, according to a Dr. Willan, who wrote a book on the diseases of London, it had produced an incredible state of physical defilement among the poor. The other type of dwelling offered to the working class was, essentially, a standardization of these degraded conditions; but it had this further defect, that the plans of the new houses and the ma-

materials of construction usually had none of the original decency of the older burgher houses: they were meanly built from the ground up.

In both the old and the new quarters a pitch of foulness and filth was reached that the lowest serf's cottage scarcely achieved in medieval Europe. It is almost impossible to enumerate objectively the bare details of this housing without being suspected of perverse exaggeration. But those who speak glibly of urban improvements during this period, or of the alleged rise in the standards of living, fight shy of the actual facts: they generously impute to the town as a whole benefits which only the more favored middle-class minority enjoyed; and they read into the original conditions those improvements which three generations of active legislation and massive sanitary engineering have finally brought about.

In England, to begin with, thousands of the new workers' dwellings, in towns like Birmingham and Bradford, were built back to back. (Many still exist.) Two rooms out of four on each floor therefore had no direct daylight or ventilation. There were no open spaces except the bare passages between these doubled rows. While in the sixteenth century it was an offense in many English towns to throw rubbish into the streets, in these early industrial towns this was the regular method of disposal. The rubbish remained there, no matter how vile and filthy, "until the accumulation induced someone to carry it away for manure." Of this there was naturally no lack in the crowded new quarters of the town. The privies, foul beyond description, were usually in the cellars; it was a common practice to have pigsties under the houses, too, and the pigs roamed the streets once more, as they had not done for centuries in the larger towns. There was even a dire lack of toilets: the 'Report on the State of Large Towns and Populous Districts' (1845) states that "in one part of Manchester in 1843-44 the wants of upward 700 inhabitants were supplied by 33 necessities only—that is, one toilet to every 212 people."

Even at such a low level of design, even with such foul accompaniments, not enough houses were built in many cities; and then far worse conditions prevailed. Cellars were used as dwelling places. In Liverpool, one-sixth of the population lived in "underground cellars," and most of the other port cities were not far behind: London and New York were close rivals to Liverpool: even in the nineteen-thirties, there were 20,000 basement dwellings in London medically marked as unfit for human occupation. This dirt and congestion, bad in themselves, brought other pests: the rats that carried bubonic plague, the bedbugs that infested the beds and tormented sleep, the lice that spread typhus, the flies that visited impartially the cellar privy and the infant's food. Moreover the combination of dark rooms and dank walls formed an almost ideal breeding medium for bacteria, especially since the overcrowded rooms afforded the maximum possibilities of transmission through breath and touch.

If the absence of plumbing and municipal sanitation created frightful stenches in these new urban quarters, and if the spread of exposed excrement, together with seepage into local wells, meant a corresponding spread of typhoid, the lack of water was even more sinister. It removed the very possibility of domestic cleanliness or personal hygiene. In the big capital cities, where some of the old municipal traditions still lingered, no adequate provision for water was made in many new areas. In 1809 when London's population was about a million, water was available over the greater part of the city only in the basements of houses. In some quarters, water could be turned on for only three days in a week. And though iron pipes made their appearance in 1746, they were not extensively used until a special act in England in 1817 required that all new mains be built of iron after ten years.

In the new industrial towns, the most elementary traditions of municipal service were absent. Whole quarters were sometimes without water even from local wells. On occasion, the poor would go from house to house in the middle-class sections, begging for water as they might beg for bread during a famine. With this lack of water for drinking and washing, it is no wonder that the filth accumulated. Open drains represented, despite their foulness, comparative municipal affluence. And if families were thus treated, one need scarcely turn to the documents to find out how the casual laborer fared. Deserted houses of uncertain title were used as lodging-houses, fifteen or twenty people in a single room. In Manchester, according to the police statistics of 1841, there were some 109 lodging-houses where people of both sexes slept indiscriminately; and there were 91 mendicant lodging-houses. "Playfair told the Health of Towns Commission in 1842 that in all Lancashire there was only one town, Preston, with a public park, and only one, Liverpool, with public baths."

This depression of living quarters was well-nigh universal among the workers in the new industrial towns, once the new industrial regime was fully established. Local conditions sometimes permitted an escape from the extreme of foulness I have been describing: the housing of the mill-workers at Manchester, New Hampshire, for example, was of a far superior order; and in the more rural industrial towns of America, particularly in the Middle West, there was at least a little free elbow room and garden space for the workers. But wherever one looks, the improvement was but one of degree: the *type* had definitely changed for the worse.

Not merely were the new cities as a whole bleak and ugly, environments hostile to human life even at its most elementary physiological level, but the standardized overcrowding of the poor was repeated in middle-class dwellings and in the barracks of the soldiers, classes that were not being directly exploited for the sake of profit. Mrs. Peel cites a sumptuous mid-Victorian mansion in which the kitchen, pantry, servants' hall, house-

keeper's room, butler's and footmen's bedrooms were all placed in the cellar: two rooms in front and two rooms in the rear looked into a deep back basement: all the others were 'lighted' and 'ventilated' by panes of glass high up in the inner walls. Corresponding forms of degraded housing were worked out in Berlin, Vienna, New York, and Paris during the middle of the nineteenth century. The new apartment houses of the middle classes backed upon deep, airless courts that had most of the characteristics of cellars even when they were technically above ground. Only 'backward' towns escaped these infamies.

To judge by popular oratory, these defects were narrow in range, and, in any event, have been wiped out during the past century through the onward march of science and humanitarian legislation. Unfortunately, popular orators—and even historians and economists who supposedly deal with the same set of facts—have not formed the habit of making firsthand surveys of the environment: hence they ignore the existence of clots of degraded paleotechnic housing remaining in almost unmodified form throughout the Western World today: even back-to-back houses, tenements with airless courts, and cellar-lodgings. These clots not merely include most of the workers' dwellings built before 1900; they include a great part of what has been done since, though they show improvements in sanitation. The surviving mass of housing that was built between 1830 and 1910 did not represent even the hygienic standards of its own day; and it was far below a standard framed in terms of present-day knowledge of sanitation, hygiene, and child care—to say nothing of domestic felicity.

"Slum, semi-slum, and super-slum—to this has come the evolution of cities." Yes: these mordant words of Patrick Geddes apply inexorably to the new environment. Even the most revolutionary of contemporary critics lacked genuine standards of building and living: they had no notion how far the environment of the upper classes themselves had become impoverished. Thus Friedrich Engels, in order to promote the resentment needful for revolution, not merely opposed all "palliative" measures to provide better housing for the working classes: he seems to have held that the problem would be solved eventually for the proletariat by a revolutionary seizure of the commodious quarters occupied by the bourgeoisie. This notion was qualitatively inept and quantitatively ridiculous. Socially speaking, it merely urged as a revolutionary measure the miserable process that had actually gone on in the older towns as the richer classes moved out of their original quarters and divided them up for the working class occupation. But above all the suggestion was naïve because it did not perceive that the standards embodied even in the more pretentious new residences were often *below* those desirable for human life at any economic level.

In other words, even this revolutionary critic was apparently unaware of the fact that the upper-class quarters were, more often than not, intoler-

able super-slums. The necessity for increasing the amount of housing, for expanding the space, for multiplying the equipment, for providing communal facilities, was far more revolutionary in its demands than any trifling expropriation of the quarters occupied by the rich would be. The latter notion was merely an impotent gesture of revenge: the former demanded a thoroughgoing reconstruction of the entire social environment—such a reconstruction as the world is perhaps on the brink of today, though even advanced countries, like England and Sweden and The Netherlands, have not as yet grasped all the dimensions of this urban change.

6: HOUSES OF ILL-FAME

Let us look more closely at these new houses of the working classes. Each country, each region, each population group had its own special pattern: tall tenements in Glasgow, Edinburgh, Paris, Berlin, Hamburg, Genoa, or two story buildings, with four, five, sometimes six rooms in London, Brooklyn, Philadelphia, Chicago: vast wooden firetraps called three-deckers in New England, happily blessed with open air porches, or narrow brick row houses, still clinging to an older Georgian row pattern, in Baltimore.

But in industrial housing there are certain common characteristics. Block after block repeats the same formation: there are the same dreary streets, the same shadowed, rubbish-filled alleys, the same absence of open spaces for children's play and gardens; the same lack of coherence and individuality to the local neighborhood. The windows are usually narrow; the interior light insufficient; no effort is made to orient the street pattern with respect to sunlight and winds. The painful grayish cleanliness of the more respectable quarters, where the better-paid artisans or clerks live, perhaps in a row, perhaps semi-detached, with a soiled pocket-handkerchief of grass before their houses, or a tree in a narrow courtyard in the rear—this respectability is almost as depressing as the outright slatternliness of the poorer quarters: more so indeed, because the latter often at least have a touch of color and life, a Punch-and-Judy show in the street, the chatter of the market stalls, the noisy camaraderie of the public house or bistro; in short, the more public and friendly life that is lived in the poorer streets.

The age of invention and mass production scarcely touched the worker's house or its utilities until the end of the nineteenth century. Iron piping

came in; likewise the improved water closet; eventually the gas light and the gas stove, the stationary bathtub with attached water pipes and fixed outlets; a collective water system with running water available for every house, and a collective sewage system. All these improvements slowly became available to the middle and upper economic groups after 1830; within a generation of their introduction, they indeed became middle-class necessities. But at no point during the paleotechnic phase were these improvements made available to the mass of the population. The problem for the builder was to achieve a modicum of decency *without* these new expensive utilities.

This problem remained soluble only in terms of a primitive rural environment. Thus the original division of Muncie, Indiana, the 'Middle-town' of Robert Lynd's survey, had houses eight to a block, each on a lot sixty-two and a half feet wide and a hundred and twenty-five feet deep. This certainly provided better conditions for the poorer workers than what followed when rising land values crowded the houses and narrowed the garden space and the play space, and one out of four houses still lacked running water. In general the congestion of the industrial town increased the difficulties in the way of good housing, and added to the cost of overcoming these difficulties.

As for the furnishings of the interiors, Gaskell's picture of the housing of the working classes in England struck the lowest level; but the sordor continued, despite minor improvements, in the century that followed. The effects of pecuniary poverty were in fact aggravated by a general falling off in taste, which accentuated the impoverishment of the environment, by offering barbarous wall paper, meretricious bric-a-brac, framed oleograph pictures, and furniture derived from the worst examples of stuffy middle-class taste: the dregs of the dregs.

In China a friend of mine reports seeing a miner, grimy, bent with toil, tenderly fondling a stalk of delphinium as he walked along the road; but in the Western World, down to the twentieth century, when the allotment garden began to have its beneficent effect, the same instinct for fresh vital form was destined to feed on the deliberate monstrosities that the manufacturer offered to the working classes under the guise of fashion and art. Even religious relics, in Catholic communities, reached an esthetic level so low as to be almost a profanation. In time, the taste for ugliness became ingrained: the worker was not willing to move from his older quarters unless he could carry a little of its familiar filth, confusion, noise, and overcrowding with him. Every move toward a better environment encountered that resistance: a real obstacle to decentralization.

A few such houses, a few such lapses into filth and ugliness, would have been a blot; but perhaps every period could show a certain number of houses of this description. Now, however, whole quarters and cities,

acres, square miles, provinces, were filled with such dwellings, which mocked every boast of material success that the 'Century of Progress' uttered. In these new warrens, a race of defectives was created. Poverty and the environment of poverty produced organic modifications: rickets in children, due to the absence of sunlight, malformations of the bone structure and organs, defective functioning of the endocrines, through a vile diet; skin diseases for lack of the elementary hygiene of water; small-pox, typhoid, scarlet fever, septic sore throat, through dirt and excrement; tuberculosis, encouraged by a combination of bad diet, lack of sunshine, and room overcrowding, to say nothing of the occupational diseases, also partly environmental.

Chlorine, ammonia, carbon monoxide, phosphoric acid, fluorine, methane, not to add a long list of some two hundred cancer-producing chemicals, pervaded the atmosphere and sapped vitality: often in stagnant lethal concentrations, increasing the incidence of bronchitis and pneumonia, causing widespread death. Presently the recruiting sergeant was not able to use the children of this regime even as cannon fodder: the medical discovery of England's mistreatment of her workers, during the Boer War and the First World War, did perhaps as much as any one other factor to promote better housing there.

The crude results of all these conditions may be followed in the mortality tables for adults, in the disease rates for urban workers compared with agricultural workers, in the expectations of life enjoyed by the various occupational classes. Above all, perhaps the most sensitive barometer of the fitness of the social environment for human life is the infant mortality tables.

Wherever the comparison was made between country and city, between middle-class quarters and poor quarters, between a low density district and a high density district, the higher rate of disease and death usually fell in the latter class. Had other factors stayed the same, urbanization by itself would have been sufficient to lop off part of the potential gains in vitality. Farm laborers, though they remained throughout the nineteenth century a depressed class in England, showed—and still show—a much longer expectation of life than the higher grades of town mechanics, even after municipal sanitation and medical care had been introduced. Indeed, it was only by a continual influx of new life from the country that the cities so hostile to life could survive at all. The new towns were established in the mass by immigrants. In 1851, out of 3,336,000 people of twenty years and upward inhabiting London and 61 other English and Welsh towns, only 1,337,000 had been born in the town of their residence.

Taking the infant-mortality rate, the record is even more disgraceful. In New York City, for example, the mortality rate for infants in 1810 was between 120 and 145 per thousand live births; it rose to 180 per

thousand by 1850, 220 in 1860, and 240 in 1870. This was accompanied by a steady depression in living conditions: for after 1835, the overcrowding was standardized in the newly built tenement houses. These recent calculations corroborate what is known about the infant mortality rate in England during the same period: there the rise took place after 1820 and fell most heavily on the towns. There are doubtless other factors responsible for these retrograde tendencies; but the new towns, as an expression of the entire social complex, conditioning hygiene, diet, working conditions, wages, child care, education, had an important part to play in the result.

There has been much unwarranted congratulation over improvements in urban health under industrialism because those who believed that progress automatically occurred in every department of life during the nineteenth century refused to face the harsh facts. They did not let themselves make comparative studies between town and country, between the mechanized and the unmechanized; and they assisted further in creating confusion by using crude mortality tables, not corrected according to age and sex groups, and not therefore allowing for the heavier distribution of adults in the cities and the larger incidence of children and old people, more subject to disease and death, in the countryside.

These statistics made town mortality rates look more favorable than they really were on close actuarial analysis. To this day scarcely the beginnings have been made toward a satisfactory analysis of births and deaths, health and disease, in relation to environment. By lumping urban and rural rates together in a 'national' figure the relatively poorer showings of the 'prosperous' industrialized and urban areas have been concealed.

Similar misleading analyses, disguised as objective research, continue to be made. Thus Mabel Buer attempted to vindicate the industrial revolution from the charge of creating urban blight by making a study of the decrease in the death rate that took place before 1815—that is, before overcrowding, bad sanitation, and the general urbanization of the population had produced their characteristic devitalizing results. There is no need to cast doubt upon this earlier improvement any more than one need forget the steady *general* drop in the death rate throughout the nineteenth century. But it fails to wipe out the equally indisputable fact of later deterioration.

Instead of giving credit for the early advance to the mechanization of industry, one should give due credit to quite another department—the increase of the food supply, which provided a better diet and helped raise resistance to disease. Still another factor may have had a part: the wider use of soap, made possible by the increased amount of available fats. The use of soap in personal hygiene may have extended from the washing of the nipples of the nursing mother to the child in her care: finally it passed by example from the feminine to the masculine half of society. That in-

creased use of soap is not easily measurable in trade schedules; for soap was originally a commercial monopoly, and as such, a luxury article: ordinary soap was mainly produced and consumed within the household. The spread of the soap-and-water habit might well account for the lowering of infant mortality rates before the nineteenth century; even as the dearth of water and soap might account in part for the deplorable infant death rates of the paleotechnic town.

In the main, hygienic poverty was widespread. Lack of sunlight, lack of pure water, lack of untainted air, lack of a mixed diet—these lacks were so common that they amounted to a chronic starvation among the greater part of the population. Even the more prosperous classes succumbed: sometimes even prided themselves on their vital deficiencies. Herbert Spencer, who was a non-conformist even to his own creed of utilitarianism, was forced to preach the gospel of play and physical relaxation to his contemporaries; and in his 'Essays on Education' he went so far as to make a special plea to parents to permit their children to *eat fruit*.

7: A CLOSE-UP OF COKETOWN

One may grant that at the tempo at which industrialism was introduced into the Western World, the problem of building adequate cities was almost insoluble. The premises which made these operations possible also limited their human success. How build a coherent city out of the efforts of a thousand competing individualists who knew no law but their own sweet will? How integrate new mechanical functions in a new type of plan that could be laid out and speedily developed—if the very essence of such integration depended upon the firm control of public authorities who often did not exist, or who, when they did exist, exercised no powers except those specifically granted by the state, which put individual property rights at the top? How provide a multitude of new utilities and services for workers who could not afford to rent any but the most destitute types of shelter? How create a good physical plan for social functions that themselves remained abortive?

Cities that still contained vital residues of medieval tradition, like Ulm, sometimes managed, through the slow tempo of their growth and a bold policy of large-scale municipal land ownership, to effect the transition with relatively little loss. Where industry came in explosively, however, as in Nuremberg, the results were as vile as in towns that had no historic shell

whatever. And in the New World, towns were built as late as 1906 (Gary, Indiana) with no regard for any physical features except the location of the industrial plant. As for still later industrial complexes like the motor car metropolis of Detroit, they learned nothing from the mistakes of the past: did not Henry Ford assert that history was bunk? So the plants they erected in accord with the most advanced engineering practice were set in the midst of an urban welter—classic models of municipal disorganization and technical incompetence. The very age that boasted its mechanical conquests and its scientific prescience left its social processes to chance, as if the scientific habit of mind had exhausted itself upon machines, and was not capable of coping with human realities. The torrent of energy that was tapped from the coal beds ran downhill with the least possible improvement of the environment: the mill-villages, the factory agglomerations, were socially more crude than the feudal villages of the Middle Ages.

The new urban emergent, the coal-agglomeration, which Patrick Geddes called the conurbation, was neither isolated in the country nor attached to an old historic core. It spread in a mass of relatively even density over scores and sometimes hundreds of square miles. There were no effective centers in this urban massing: no institutions capable of uniting its members into an active city life: no political organization capable of unifying its common activities. Only the sects, the fragments, the social debris of old institutions remained, left like the muddied debris scattered by a great river after the flood has subsided: a no-man's-land of social life. These new cities not merely failed for the most part to produce art, science, or culture: they failed at first even to import them from older centers. When a surplus was locally created it was promptly drained off elsewhere: the rentiers and financiers employed it upon personal luxuries, or upon philanthropies, like that of Carnegie's Music Hall in New York, which often benefited the capital cities long before any similar bequests were made to the region from which the riches were originally drawn.

Approach more closely the paleotechnic town: examine it with eye, ear, nose, touch. Present-day observers, because of the growing contrast with the emerging neotechnic environment, can at last see what only poets like Hugo or Ruskin or Morris saw a hundred years ago: a reality that the philistines, tangled in their utilitarian web of dreams, alternately denied as a sentimental exaggeration or greeted with enthusiasm as an indisputable mark of 'progress.'

Night spread over the coal-town: its prevailing color was black. Black clouds of smoke rolled out of the factory chimneys, and the railroad yards, which often cut clean into the town, mangling the very organism, spread soot and cinders everywhere. The invention of artificial illuminating gas was an indispensable aid to this spread: Murdock's invention dates back to the end of the eighteenth century, and during the next generation its

use widened, first in factories, then in homes; first in big cities, later in small centers; for without its aid work would frequently have been stopped by smoke and fog. The manufacture of illuminating gas within the confines of the towns became a characteristic new feature: the huge gas tanks reared their bulk over the urban landscape, great structures, on the scale of a cathedral: indeed, their tracery of iron, against an occasional clear lemon-green sky at sunrise, was one of the most pleasant esthetic elements in the new order.

Such structures were not necessarily evil; indeed, with sufficient care in their segregation they might have been comely. What was atrocious was the fact that, like every other building in the new towns, they were dumped almost at random; the leakage of escaping gas scented the so-called gas-house districts, and not surprisingly these districts frequently became among the most degraded sections of the city. Towering above the town, polluting its air, the gas tanks symbolized the dominance of 'practical' interests over life-needs.

The poisonous pall of smoke had already come into the pottery districts in the eighteenth century, through the use of cheap salt glazes; now it closed in everywhere, in Sheffield and Birmingham, in Pittsburgh, Essen, and Lille. In this new environment black clothes were only a protective coloration, not a form of mourning; the black stovepipe hat was almost a functional design—an assertive symbol of steam power. The black dyes of Leeds, for example, turned its river into a dark poisonous sewer; while the oil smudges of soft coal spat everywhere; even those who washed their hands left a rim of undissolved grease around the side of the wash-bowl. Add to these constant smudges on flesh and clothing the finely divided particles of iron from the grinding and sharpening operations, the unused chlorine from the soda works, later, the clouds of acrid dust from the cement plant, the various by-products of other chemical industries: these things smarted the eyes, rasped the throat and lungs, lowered the general tone, even when they did not produce on contact any definite disease. As for the reek of coal itself, it is perhaps not a disagreeable one: man with his long savage past has become fond of musty odors: so perhaps its chief misdemeanor was that it suppressed or made people insensitive to pleasanter smells.

Under such conditions, one must have all one's senses blunted in order to be happy; and first of all, one must lose one's taste. This loss of taste had an effect upon diet: even well-to-do people began to eat canned goods and stale foods, when fresh ones were available, because they could no longer tell the difference. The enfeeblement of elementary taste-discrimination extended to other departments than food: color-discrimination became feeble, too: the darker tones, the soberer colors, the dingier mixtures, were preferred to pure bright colors, and both the Pre-Raphaelites

and the Impressionist painters were reviled by the bourgeoisie because their pure colors were thought 'unnatural' and 'inartistic.' If an occasional touch of bright color was left, it was only in the signs on the hoardings—for Coleman's mustard or Reckitt's blue—paper surfaces that remained cheerful because they frequently had to be changed.

Dark, colorless, acrid, evil-smelling, this new environment was. All these qualities lowered human efficiency and required extra compensation in washing and bathing and sanitation—or at the last extreme, in medical treatment. The cash expenditure on cleaning alone was no small expenditure in the paleotechnic town, at least after the need for cleanliness itself was acknowledged. Take one item alone from a typical paleotechnic survival: Pittsburgh. Its smoke pollution began early, for a print in 1849 shows it in full blast. A generation ago the annual cost of keeping Pittsburgh cleaned was estimated at some \$1,500,000 for extra laundry work, \$750,000 for extra general cleaning, and \$60,000 for extra curtain cleaning. This estimate, about \$2,310,000 per year, did not count the losses due to the corrosion of buildings or the increased costs of painting wood-work, nor yet the extra costs of lighting during periods of smog.

Even after strenuous efforts to reduce smoke pollution, a single great steel plant in the heart of Pittsburgh still makes mock of these efforts at improvement—indeed, so heavy is the hold of paleotechnic tradition, that the municipal authorities only recently helpfully connived at the extension of this plant, instead of firmly demanding its removal. So much for pecuniary losses. But what of the incalculable losses through disease, through ill-health, through all the forms of psychological deterioration from apathy to outright neurosis? The fact that such losses do not lend themselves to objective measurement does not make them non-existent.

Indifference to these forms of devitalization during the paleotechnic period rested mainly on invincible ignorance. In 'Technics and Civilization' I quoted the indignation and surprise of a leading apologist for this civilization, Andrew Ure, over the testimony offered by the astute physicians called before Sadler's Factory Investigation Committee. These physicians referred to the experiments made by Dr. Edwards of Paris upon the growth of tadpoles, proving that sunlight was essential to their development. From this they concluded—we now know with complete justification—that it was equally necessary to the growth of children. Ure's proud answer was that the gas lighting of the factories was a sufficient substitute for the sun. So contemptuous were these utilitarians of nature and well-tried human custom that they brought up more than one generation upon a devitalized diet, based purely on the consumption of calories. That diet has been improved during the last generation by a fresh budget of scientific knowledge, only to be debased once more by the spreading use of poisonous insecticides and pesticides, food preservatives

and additives, to say nothing of equally fatal radioactive poisons like Strontium 90. As for the paleotechnic environment, it still widely resists correction, and casts its blight over tens of millions of people.

Next to dirt, the new towns boasted another distinction, equally appalling to the senses. The baneful effects of this blight have been recognized only in recent years, thanks to advances in technics not unconnected with that typical biotechnic invention, the telephone. I refer to noise. Let me quote an ear-witness account of Birmingham in the middle of the nineteenth century.

"In no town in the world are the mechanical arts more noisy: hammerings incessantly on the anvil; there is an unending clang of engines; flame rustles, water hisses, steam roars, and from time to time, hoarse and hollow, rises the thunder of the proofing house [where firearms are tested]. The people live in an atmosphere vibrating with clamor; and it would seem as if their amusement had caught the general tone, and become noisy, like their inventions." The indifference to clang and racket was typical. Did not the manufacturers of England keep Watt from reducing the noise made by his reciprocating engine because they wanted auricular evidence of its power?

Today, numerous experiments have established the fact that noise can produce profound physiological changes: music can keep down the bacteria count in milk; and by the same token definite ailments, like stomach ulcers and high blood pressure, seem to be aggravated by the strain of living, say, within sound of a busy motorway or airport. The diminishment of working efficiency through noise has likewise been clearly established. Unfortunately, the paleotechnic environment seemed specially designed to create a maximum amount of noise: the early hoot of the factory whistle, the shriek of the locomotive, the clank and urge of the old-fashioned steam engine, the wheeze and screech of the shafts and belting, the click and whirr of the loom, the pounding of the drop hammer, the mutter and snuffle of the conveyor, the shouts of the workers who worked and 'rested' amid this varied clamor—all these sounds abetted the general assault on the senses.

When reckoning up the vital efficiency of the country as compared with the city, or the medieval town as opposed to the paleotechnic town, one must not forget this important factor in health. Nor have recent improvements in certain departments, the use of rubber heels and rubber tires, for instance, lessened the strength of the indictment. The noise of the gasoline driven motor cars and trucks in a busy city, as they start up, change gears, acquire speed, is a sign of their technical immaturity. Had the energy that has been put into styling car bodies gone into the design of a silent thermo-electric power unit, the modern city would not be as backward as its paleotechnic predecessor in the matter of noise and fumes.

Instead, the 'progressive' metropolises of motordom, like Los Angeles, exhibit, indeed magnify, all the urban evils of the paleotechnic period.

Experiments with sound made in the nineteen-thirties in Chicago show that if one grades noise by percentages up to one hundred per cent—which is the sound, like an artillery cannonade, that would drive one mad if continued over an extended period—the countryside has only from eight to ten per cent noise, the suburbs fifteen, the residential districts of the city twenty-five per cent, commercial districts thirty per cent, and industrial districts thirty-five. These broad lines would doubtless hold almost anywhere during the last century and a half, though perhaps the upper limits were higher. One must remember, too, that the paleotechnic towns made no effort to separate factories from workers' homes; so that in many towns noise was omnipresent, in the day and often in the night. The age of air transportation, whose noisy planes destroy the residential value of suburbs in the neighborhood of airports, now threatens to widen even further this assault on life and health.

Considering this new urban area on its lowest physical terms, without reference to its social facilities or its culture, it is plain that never before in recorded history had such vast masses of people lived in such a savagely deteriorated environment, ugly in form, debased in content. The galley slaves of the Orient, the wretched prisoners in the Athenian silver mines, the depressed proletariat in the insulae of Rome—these classes had known, no doubt, a comparable foulness; but never before had human blight so universally been accepted as normal: normal and inevitable.

8: THE COUNTER-ATTACK

Perhaps the greatest contribution made by the industrial town was the reaction it produced against its own greatest misdemeanors; and, to begin with, the art of sanitation or public hygiene. The original models for these evils were the pest-ridden prisons and hospitals of the eighteenth century: their improvement made them pilot plants, as it were, in the reform of the industrial town. Nineteenth-century achievements in molding large glazed drains and casting iron pipes, made possible the tapping of distant supplies of relatively pure water and the disposal, at least as far as a neighboring stream, of sewage; while the repeated outbreaks of malaria, cholera, typhoid, and distemper served as a stimulus to these innovations, since a succession of public health officers had no difficulty in establishing

the relation of dirt and congestion, of befouled water and tainted food, to these conditions.

On the essential matter of urban deterioration, John Ruskin had spoken to the point. "Providing lodgements for [working people] means," he said, "a great deal of vigorous legislation and cutting down of vested interests that stand in the way; and after that, or before that, so far as we can get it, through sanitary and remedial action in the houses that we have, and then the building of more, strongly, beautifully, and in groups of limited extent, kept in proportion to their streams, and walled round, so that there may be no festering and wretched suburb anywhere, but clean and busy streets within, and the open country without, with a belt of beautiful garden and orchard round the walls, so that from any part of the city perfectly fresh air and grass and the sight of the far horizon may be reachable in a few minutes walk." That happy vision beckoned even the manufacturers who, here and there, in Port Sunlight and Bournville, began to build industrial villages that rivalled in comeliness the best of the later suburbs.

To bring back fresh air, pure water, green open space, and sunlight to the city became the first object of sound planning: the need was so pressing that despite his passion for urban beauty, Camillo Sitte insisted upon the *hygienic* function of the urban park, as a *sanitary green*, to use his own expression: the 'lungs' of the city, whose function became newly appreciated through their absence.

The cult of cleanliness had its origins before the paleotechnic era: it owes much to the Dutch cities of the seventeenth century, with their plentiful water supplies, their large house windows showing up every particle of dust inside, their tiled floors; so that the scrubbing and scouring of the Dutch housewife became proverbial. Cleanliness got new scientific reinforcements after 1870. As long as the body was dualistically separated from the mind, its systematic care might be slighted, as almost an indication of more spiritual preoccupations. But the new conception of the organism that grew up in the nineteenth century, with Johannes Müller and Claude Bernard, reunited the physiological and the psychological processes: thus the care of the body became once more a moral and esthetic discipline. By his researches in bacteriology Pasteur altered the conception of both the external and the internal environment of organisms: virulent microscopic organisms flourished in dirt and ordure, and largely disappeared before soap-and-water and sunlight. As a result, the farmer milking a cow today takes sanitary precautions that a mid-Victorian London surgeon did not trouble to take before performing a major operation, till Lister taught him better. The new standards for light, air, and cleanliness which Florence Nightingale established for hospitals she even carried into the white-walled living room of her own home—a true prelude to

Le Corbusier's admirably hygienic 'Esprit Nouveau' in modern architecture.

At last, the industrial town's indifference to darkness and dirt was exposed for what it was, a monstrous barbarism. Further advances in the biological sciences threw into relief the misdemeanors of the new environment with its smoke and fog and fumes. As our experimental knowledge of medicine increases, this list of evils lengthens: it now includes the two hundred-odd cancer-producing substances still usually found in the air of most industrial cities, to say nothing of the metallic and stone dusts and poisonous gases that raise the incidence and increase the fatality of diseases of the respiratory tract.

Though the pressure of scientific knowledge worked slowly to improve conditions in the city as a whole, it had a quicker effect on the educated and comfortable classes: they soon took the hint and fled from the city to an environment that was not so inimical to health. One of the reasons for this tardy application of modern hygiene to city design was the fact that individual improvements in the hygienic equipment of dwellings made a radical alteration in costs; and these costs were reflected in heavier municipal investments in collective utilities, and in heavier municipal taxes to keep them up.

Just as early industrialism had squeezed its profits not merely out of the economies of the machine, but out of the pauperism of the workers, so the crude factory town had maintained its low wages and taxes by depleting and pauperizing the environment. Hygiene demanded space and municipal equipment and natural resources that had hitherto been lacking. In time, this demand enforced municipal socialization, as a normal accompaniment to improved service. Neither a pure water supply, nor the collective disposal of garbage, waste, and sewage, could be left to the private conscience or attended to only if they could be provided for at a profit.

In smaller centers, private companies might be left with the privilege of maintaining one or more of these services, until some notorious outbreak of disease dictated public control; but in the bigger cities socialization was the price of safety; and so, despite the theoretic claims of *laissez faire*, the nineteenth century became, as Beatrice and Sidney Webb correctly pointed out, the century of municipal socialism. Each individual improvement within the building demanded its collectively owned and operated utility: watermains, water reservoirs, and aqueducts, pumping stations: sewage mains, sewage reduction plants, sewage farms. Only the public ownership of land for town extension, town protection, or town colonization was lacking. That step forward was one of the significant contributions of Ebenezer Howard's garden city.

Through this effective and widespread socialization, the general death rate and the infant mortality rate tended to fall after the eighteenth-seventies; and so manifest were these improvements that the social invest-

ment of municipal capital in these utilities rose. But the main emphasis remained a negative one: the new quarters of the city did not express, in any positive way, the understanding of the interplay between the organism as a whole and the environment that the biological sciences brought in. Even today one would hardly gather from the fashionable pseudo-modern use of large sealed glass windows, that Downes and Blunt had established as early as 1877 the bactericidal properties of direct sunlight. That irrationality betrays how superficial the respect for science still is in many presumably educated people, even technicians.

For the first time, the sanitary improvements made originally in the Sumerian and Cretan palaces, and extended to the patrician families of Rome at a later date, were now made available to the entire population of the city. This was a triumph of democratic principles that even dictatorial regimes could not inhibit: indeed, one of the greatest public benefits conferred by the overthrower of the Second French Republic, was in the redoubtable cleaning up of Paris under Baron Haussmann, a service far more essential, indeed far more original, than any of his more famous acts of town planning proper.

New York was the first big city to achieve an ample supply of pure water, through the building of the Croton system of reservoirs and aqueducts, opened in 1842; but in time every big city was forced to follow this example. Sewage disposal remained a difficult matter, and except in cities small enough to have sewage farms capable of transforming all such waste, the problem has not yet been adequately solved. Nevertheless, the standard of one private, sanitary toilet per family—a water closet connected to public mains in closely built communities—was established by the end of the nineteenth century. As for garbage, the usual dumping or burning of this valuable agricultural compost remains one of the persistent sins of unscientific municipal housekeeping.

The cleaning of streets remained a more difficult problem, until Belgian blocks and asphalt became universal, the horse was eliminated, and the public water supply became plentiful; yet in the end it proved easier to handle than the cleansing of the air. Even today, the screening out of the ultraviolet rays, through excess of dust and smoke, remains one of the vitality-lowering attributes of the more congested urban centers, which the showy but technically antiquated motor car has increased rather than lessened, even adding the invisible poison of carbon monoxide. As a partial offset, the introduction of running water and baths into the dwelling house—and the intermediate stage of re-establishing public baths, abandoned after the Middle Ages—must have helped in reducing both disease generally and infant mortality in particular.

All in all, the work of the sanitary reformers and hygienists, a Chadwick, a Florence Nightingale, a Louis Pasteur, a Baron Haussmann, robbed

urban life at its lower levels of some of its worst terrors and physical debasements. If the creative aspects of city life were diminished by industrialism, the evil effects of its waste-products and excrement were also in time reduced. Even the bodies of the dead contributed to the improvement; they formed a green ring of mortuary suburbs and parks around the growing city; and here, again, Haussmann's bold and masterly treatment of this problem must earn a respectful salute.

The new industrial environment was so glaringly lacking in the attributes of health, that it is hardly any wonder that the counter-movement of hygiene provided the most positive contributions to town planning during the nineteenth century. The new ideals were provisionally embodied in a Utopia, called 'Hygeia, or the City of Health,' brought forth by Dr. Benjamin Ward Richardson in 1875. Here one discovers unconscious holdovers that reject the accepted degree of overcrowding; for whereas, less than a generation later, Ebenezer Howard provided 6,000 acres to hold and encircle 32,000 people, Richardson proposed to put 100,000 people on 4,000 acres. In the new city, the railroads were to be underground, despite the coal-burning locomotives then current; but no cellars of any kind were to be permitted in houses, a prohibition that was given statutory backing in England. But the construction was to be of brick, inside and outside, capable of being hosed down—a recurrent masculine dream—and the chimneys were to be connected to central shafts, to convey the unburned carbon to a gas furnace where it would be consumed.

Archaic as some of these proposals now are, in many ways Dr. Richardson was not merely ahead of his own times: he was equally ahead of our own day. He proposed to abandon "the old idea of warehousing diseases on the largest possible scale," and advocated a small hospital for every 5,000 people. By the same token, the helpless, the aged, and the mentally infirm were to be housed in modest-sized buildings. Richardson's physical conceptions of the city are now dated: but his contributions to collective medical care are still, I submit, worth pondering. With ample rational justification he proposed to go back to the high medical and human standards of the medieval town.

9: THE UNDERGROUND CITY

Mainly, it was by the reactions that it produced, by the exodus that it prompted, that the paleotechnic regime had an effect upon future urban forms. These counter-attacks were abetted, from the eighteen-eighties on,

by a transformation within industry itself, furthered by the applications of science directly to invention; for the new regime was based on electric energy and the lighter metals, like aluminum, magnesium, and copper, and on new synthetic materials, like rubber, bakelite, and the plastics. The inner improvement of the industrial town proceeded partly from these innovations, which we associate with the spread of the private bathroom, the telephone, the motor car, and radio communication; but the even deeper reaction to the classic pattern of Coketown was that embodied in the emerging concept of the Welfare State. There is no better witness to the impoverished or positively evil conditions brought in by the industrial town than the mass of legislation that has accumulated, in the last century, aimed at their correction: sanitary regulations, health services, free public schools, job security, minimum wage provisions, workers' housing, slum clearance, along with public parks and playgrounds, public libraries and museums. These improvements have yet to find their full expression in a new form of the city.

But the archetypal industrial town nevertheless left deep wounds in the environment; and some of its worst features have remained in existence, only superficially improved by neotechnic means. Thus the automobile has been polluting the air for more than half a century without its engineers making any serious effort to remove the highly toxic carbon monoxide gas from its exhaust, though a few breaths of it in pure form are fatal; nor have they eliminated the unburned hydrocarbons which help produce the smog that blankets such a motor-ridden conurbation as Los Angeles. So, too, the transportation and highway engineers who have recklessly driven their multiple-laned expressways into the heart of the city and have provided for mass parking lots and garages to store cars, have masterfully repeated and enlarged the worst errors of the railroad engineers. Indeed, at the very moment the elevated railroad for public transportation was being eliminated as a grave nuisance, these forgetful engineers re-installed the same kind of obsolete structure for the convenience of the private motor car. Thus much of what appears brightly contemporary merely restores the archetypal form of Coketown under a chrome plating.

But there is one aspect of the modern city where the hold of Coketown grips even tighter, and the final effects are even more inimical to life. This is in the knitting together of necessary underground utilities to produce a wholly gratuitous result: the underground city, conceived as an ideal. As one should expect of a regime whose key inventions came out of the mine, the tunnel and the subway were its unique contributions to urban form; and not uncharacteristically, both these utilities were direct derivatives of war, first in the ancient city, and later in the elaborate sapping and mining necessary to reduce the baroque fortification. Though

the surface forms of Coketown's transportation and shelter have been widely replaced, its underground network has prospered and proliferated. The water main and the sewer, the gas main and the electric main, were all valuable contributions to the upper level city; and under certain limited conditions, the underground railroad, the motor car tunnel, and the underground lavatory could be justified. But these utilities have now been augmented by underground shops and stores, finally by the underground air raid shelter, as if the kind of environment that served the physical mechanisms and utilities of the city brought any real advantages to its inhabitants. Unfortunately, the underground city demands the constant attendance of living men, also kept underground; and that imposition is hardly less than a premature burial, or at least preparation for the encapsulated existence that alone will remain open to those who accept mechanical improvement as the chief justification of the human adventure.

The underground city is a new kind of environment: an extension and normalization of that forced upon the miner—severed from natural conditions, under mechanical control at every point, made possible by artificial light, artificial ventilation, and the artificial limitations of human responses to those that its organizers deem profitable or serviceable. This new environment coalesced gradually out of a series of empirical inventions: hence even in the most ambitious metropolises, only rarely have the streets or the underground utilities (like the great sewers of Paris) been designed with a view to their economic repair and connection with neighboring buildings, though it is plain that in the more crowded quarters of a city, a single tunnel, accessible at intervals, should serve as a collective artery, and would in the long run effect great economies.

In analyzing the costs of housing a generation ago, Henry Wright discovered that the cost of a whole room was buried in the street, in the various mechanical utilities necessary for the house's functioning. Since then, the relative cost of these underground pipes and wires and conduits has increased; while with every extension of the city, as with every increase of internal congestion, the cost of the whole system disproportionately increases, too.

Given the pressure to sink capital more extensively into the underground city, less money becomes available for space and architectural beauty above ground: indeed, the next step in the city's development, already taken in many American cities, is to extend the principle of the underground city even to the design of buildings that are visibly above ground, and so defeat art at every point. With air conditioning and all-day fluorescent lighting, the internal spaces in the new American skyscraper are little different from what they would be a hundred feet below the surface. No extravagance in mechanical equipment is too great to produce this uniform internal environment: though the technical ingenuity spent

on fabricating sealed-in buildings cannot create the equivalent of an organic background for human functions and activities.

All this is merely by way of preparation. For the successor of the paleotechnic town has created instruments and conditions potentially far more lethal than those which wiped out so many lives in the town of Donora, Pennsylvania, through a concentration of toxic gases, or that which in December 1952 killed in one week an estimated five thousand extra of London's inhabitants. The exploitation of uranium to produce fissionable materials threatens, if continued, to poison the lithosphere, the atmosphere, the biosphere—to say nothing of the drinking water—in a fashion that will outdo the worst offenses of the early industrial town; for the pre-nuclear industrial processes could be halted, and the waste products be absorbed or covered over, without permanent blight.

Once fission takes place, however, the radioactivity released will remain throughout the life of the products, sometimes a life measured in many centuries or even millennia: it cannot be altered or disposed of without contaminating, ultimately, the area where it is dumped, be it the stratosphere or the bottom of the ocean. Meanwhile, the manufacture of these lethal materials goes on, without abatement, in preparation for collective military assaults aimed at exterminating whole populations. To make such criminally insane preparations tolerable, public authorities have sedulously conditioned their citizens to march meekly into cellars and subways for 'protection.' Only the staggering cost of creating a whole network of underground cities sufficient to house the entire population as yet prevents this perverse misuse of human energy.

The Victorian industrialist, exposing his fellow citizens to soot and smog, to vile sanitation and environmentally promoted disease, still nourished the belief that his work was contributing, ultimately, to 'peace and plenty.' But his heirs in the underground city have no such illusions—they are the prey of compulsive fears and corrupt fantasies whose ultimate outcome may be universal annihilation and extermination; and the more they devote themselves to adapting their urban environment to this possibility, the more surely they will bring on the unrestricted collective genocide many of them have justified in their minds as the necessary price of preserving 'freedom' and 'civilization.' The masters of the underground citadel are committed to a 'war' they cannot bring to an end, with weapons whose ultimate effects they cannot control, for purposes that they cannot accomplish. The underground city threatens in consequence to become the ultimate burial crypt of our incinerated civilization. Modern man's only alternative is to emerge once more into the light and have the courage, not to escape to the moon, but to return to his own human center—and to master the bellicose compulsions and irrationalities he shares with his rulers and mentors. He must not only unlearn the art of war, but acquire and master, as never before, the arts of life.