RICE UNIVERSITY

A CHRONOLOGICAL ANALYSIS OF
UTOPIAS, URBANISM, AND TECHNOLOGY

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ABSTRACT

A CHRONOLOGICAL ANALYSIS OF UTOPIAS, URBANISM, & TECHNOLOGY

By James L. Bottorff

This thesis is a comparative analysis of the chronological patterns of utopias, urbanism, and technology that have prevailed throughout European and American history. It analyzes a wide range of carefully selected utopian concepts, and compares them with the dominant urbanistic and technological events existing at similar points in time.

The result of this investigation is a theory that utopian activity has responded to urbanistic and technological trends in a recurring sequence, and that this pattern continues up to the nineteenth century. In the nineteenth and twentieth centuries, the recurring pattern becomes complex and less defined because of an increase in utopian concepts. Based on this theory, the thesis concludes that utopian activity has responded to the prevailing urbanistic trends and technological changes of society and the appearance of utopian activity has signaled society of important changes.
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Chapter 1. INTRODUCTION

1.1 Importance of Utopias and Urbanism
1.2 Statement of Thesis
1.3 Definition of Terms
1.1 THE IMPORTANCE OF UTOPIAS, URBANISM, & TECHNOLOGY

Familiarity with utopias, urbanism, and technology is one facet of a liberal education of planners and urban designers along with anthropologists, sociologists and many other professions. Numerous studies which have been conducted in all of these topics have voiced various points of view - social, economic, political, etc. - but very few have concentrated on the role of urbanism or technology in providing a stimulus for utopian activity.

Urbanism and technology have had a significant impact on Western civilization. The emergence of technology has provided man with the necessary agencies for developing his complex urban environment. Examples of these agencies include steam, electric power, mechanical transportation, complex machinery and mass production manufacturing, modern communication, corporate organization and administrative technique. Throughout history, the elements of technology have become the tools by which man constructed his society.

Utopian concepts are important because they represent one of the few outlets for man to exhibit pure originality. Past utopian proposals have not only presented new original ideas, but have also helped signal society of major changes in the urbanistic and technological structure of the environment. It seems essential that anyone who
proposes to refashion our physical or social environment should have a knowledge of the history and characteristics of utopias, urbanism, and technology. Since urban designers and planners help to refashion our society, it is felt that utopias and related topics have a place in the urban designer's overall education.

1.2 STATEMENT OF THE THESIS

The purpose of this investigation is twofold, and results from a genuine interest in the study of urban design and utopias.

- The first and most important goal of the thesis is the establishment of a basis for understanding the general patterns and trends of utopias, urbanism, and technology accompanied by a theory for why and how utopian activity has occurred at particular points in time.

- As a secondary objective, the thesis is aimed at the presentation of compact and comprehensive reference of selected utopians, their concepts, and some significant interactions.

Aside from this introductory material, the organization of the research consists of three remaining parts. Chapter 2 includes an explanation of the basic types of utopias, urbanistic trends, and technological changes. These topics from this point on will be referred to as "typologies". Chapter 3 provides necessary information relating to
the patterns that the typologies have followed throughout history.
Attention is given to the cyclical characteristics of utopias showing how the cycles have been influenced by technological and urbanistic factors. Based on the cyclical implications, a final theory is proposed which attempts to explain why and how the three typologies have interacted in the past and present. The concluding observations suggest that utopian activity has been stimulated by the urbanistic and technological typologies, and that the typical utopian response has been an immediate one, often signaling society of a major change.

The Appendices are an important source of reference related to the text of the thesis. Appendix A describes the thirty-one utopians which have been carefully selected to represent the best examples of their particular groups in history. Appendix B explains some of the related interactions between the utopians in Appendix A. Appendix C is simply a list of inventions relating to the technological material of the thesis.

1.3 DEFINITION OF TERMS

- CYCLE is usually used to express a recurrent period and is often used to predict things to come. In this study it is used to imply a recurring activity or condition having an inconsistent time factor in the past.
TECHNOLOGY is defined as the progress resulting from the use of machinery in industry, agriculture, communications, transportation, etc.

TYPOLOGY is defined as the types of utopias, urbanism and technology which are represented in the thesis. There are two types of utopias - physical and social; there are two types of urbanistic trends - urban and rural; and there are two types of technological changes - transportation and communication.

URBANISM is defined as a cumulative mode of life associated with the growth of cities including necessary transportation and communication links.

UTOPIA is defined as the "anticipation of an improved environment for man", sometimes referred to as "no-place".

The definition of utopia is especially important and deserves a more detailed explanation. According to the dictionary, the term "utopia" was coined by Sir Thomas More in the early sixteenth century as a result of a book of the same name which proposed an ideal society. The word "utopia" is compounded from the Greek words for "not" (ou) and "place" (topos), and their meaning is therefore "nowhere". "Utopia" can be described as "an impracticable scheme of social regeneration", and a utopian as one who envisions such a scheme. "Utopian" as an
adjective can suggest "ideal, chimerical, visionary, idealistic, and optimistic". 7

The idea of utopia; however, existed long before More's time. In most general terms, utopias are anticipations of an improved environment for man. A utopia is a relatively complete picture of a situation which is a desirable objective. It may have physical social, institutional, or spiritual aspects. Utopia is set up as a contrast to the contemporary, inadequate world with its characteristic imperfections. 8

Utopia represents one of the noblest aspects of man... In historical perspective it is clear that the vision of one century is often the reality of the next or the next after that. As the older ideal approaches closer to reality, the new ideal extends its vision still farther. Utopia is eternal, and who can calculate the inestimable influence which utopists have had in stimulating men to the dream of a better world, of prodding them to reshape reality closer to the ideal? 9
Chapter 2. UTOPIAN, URBANISTIC AND TECHNOLOGICAL TYPOLOGIES

2.1 Physical and Social Utopias
2.2 Urban and Rural Trends
2.3 Transportation and Communication Technology
2.4 Summary
Chapter 2. UTOPIAN, URBANISTIC, TECHNOLOGICAL TYPOLOGIES

In order to analyze and compare the utopian, urbanistic, and technological patterns, it is necessary to break each topic down to relative typologies:

- Utopian typologies are characterized by physical and social utopias, each dealing with a specific aspect of the environment.
- Urbanistic typologies consist of trends that relate to the strength and weaknesses of urban and rural areas.
- Technological typologies include the transportation and communication breakthroughs that have resulted from past inventions and achievements in technology.

There are many other typologies that could be included along with these - economic, political, etc. - but only those having an urbanistic and technological relationship to utopias have been selected for this investigation.

2.1 PHYSICAL AND SOCIAL UTOPIAS

According to Martin Meyerson and Thomas Reiner, there are two distinct utopian traditions that have prevailed throughout history. Meyerson states that the two traditions of utopias are "verbal" and "visual". Reiner makes a distinction between "ideal communities" and "utopias". Both Meyerson and Reiner speak of utopias as having two separate characteristics. One group deals with the social environment
and the second with the physical environment. Therefore, for the purpose of this thesis, these two traditions will be referred to as "social and "physical" utopias.

The social and physical utopias of the past seem to have developed separately through the first part of their history. Social utopians projected a desirable future in terms of altered social organizations and institutions, while physical utopians portrayed the ideal future in terms of altered artifacts and the organization of space.

Most of the social utopians of the past have related very little to the elements of the physical environment. In most cases the forms and interrelations of housing, workshops, facilities for education and recreation, and the distribution of open land have followed as afterthoughts. Conversely, the physical utopians have ignored class structure, the economic base, and the process of government in the desirable future they present.

Despite their mutual isolation, the two types of utopian traditions have some interesting similarities:

- They imply that man will be "better" in a new society or environment.
- They presuppose the achievement of the end result.
- They assume that man will behave as the creators of the utopia believe he should behave.
- They exaggerate and simplify basic principles and elements on which the future society is founded.
Most of the creators of social utopias believe that man will be happier, more productive, or more religious - or better, according to some moral criterion - if the institutions of society are altered.¹

The social utopians of the past have sought many goals including political freedom, social freedom, religious freedom, sexual freedom, economic freedom, freedom of movement, and freedom from industrialization. In almost all cases they have requested changes in society in order to obtain the goals. Freedom from want was the theme in the utopias of early capitalism. The earlier prototype utopias, such as Plato's 'Republic', were mostly concerned with moral values and economic welfare. The utopias of the past few hundred years have been mostly concerned with material abundance as a major theme.

Physical utopians imply that men will be healthier, more orderly, more satisfied, more inspired by beauty - better in some other way if the physical environment is appropriately arranged. Physical utopias often take the form of an ideal city or community with emphasis on communication and circulation within some design concept.

2.2 URBAN AND RURAL TRENDS

The evolution of urbanism in history is characterized by the rise and fall of empires, the growth and decay of cities, and changes from agricultural to industrial societies. The two trends which coincide with these conditions are urban and rural migrations of populations. Based
on these general facts, the typologies that have been selected to relate
to urbanism are "urban trends" and "rural trends". The following
quotation helps to strengthen the reason for selecting these two typologies:

For thousands of years historians have debated the causes
of the decline of cities and of the civilizations in which they
had grown and flourished. We still do not have the answers,
or at least any that are generally agreed upon...In all
probability the seeds of the growth of most great urban civil-
izations must be found within the societies themselves, just
as the causes of the decay also are internal social and cultural
factors. That the growth of cities and the development of
civilization proceed together we may be fairly sure; and that
the demoralization and destruction of the cities bring about a
fall of civilization also seems to be certain. Further than that
it hardly seems possible to go.5

Urbanism is a broad and difficult term to adequately define in
just a few words. A number of social scientists - Louis Wirth, Kingsley
Davis, Leonard Reissman and others - have gone to great lengths to
develop a meaning and definition for urbanism. In a very general
overview the definitions of urbanism usually include some reference
to urban and rural trends. For example, Louis Wirth states:

The city and the country may be regarded as two poles in
reference to one or the other of which all human settlements
tend to arrange themselves. In viewing urban-industrial and
rural-folk society as ideal types of communities, we may
obtain a perspective for the analysis of the basic models of
human association as they appear in contemporary civilization.6

Kingsley Davis made a study of the cycles of urbanization including
urban and rural migrations of human populations. In it he explains
why rural-urban migrations occur.
Why did the rural-urban migrations occur? The reason was that the rise in technological enhancement of human productivity, together with certain constant factors, rewarded urban concentration.

The urbanistic typologies which have been adopted for this investigation are based in part on the works of Wirth, Davis, Reissman and others. Although urban and rural trends are quite general terms, their respective patterns have an essential relationship to utopian and technological typologies.

2.3 TRANSPORTATION AND COMMUNICATION TECHNOLOGY

The two typologies which have been chosen to relate to the historical development of technology are "transportation breakthroughs" and "communication breakthroughs". Transportation breakthroughs refers to the inventions and achievements that helped to produce various new modes of transportation. Communication breakthroughs deal with the inventions that changed the patterns of communication between people.

During the past thousand years technological change has played a significant role in the gradual development of Western Civilization and has greatly changed society. The patterns of development resulting from inventions and applications of technology are characterized by transportation and communication breakthroughs.
2.4 SUMMARY

There are two important Utopian Typologies:

- PHYSICAL UTOPIAS - Imply that the ideal city is achieved by focusing on the physical environment.
- SOCIAL UTOPIAS - Propose a desirable future in terms of altered social organizations and institutions.

There are two dominant Urbanistic Typologies:

- URBAN TRENDS - The social and physical patterns of growth and change as related to urban areas. Usually associated with strong urban centers and a growing environment.
- RURAL TRENDS - The cultural and social trends related to the transition from urban to rural environments. Often characterized by a declining urban core and surrounding areas.

There are two significant Technological Typologies:

- TRANSPORTATION BREAKTHROUGHS - Inventions or technological innovations that helped to produce new modes of transportation.
- COMMUNICATION BREAKTHROUGHS - Technological achievements that changed the patterns and modes of communication.
Chapter 3. CHRONOLOGICAL PATTERNS

3.1 Utopian Activity

3.2 Urbanistic Trends

3.3 Technological Changes

3.4 Summary
Chapter 3. CHRONOLOGICAL PATTERNS

Chapter 3 is a historical perspective of the patterns relating to utopias, urbanism and technology. It emphasizes the fact that these typologies have each occurred in related stages through history, with gaps of inactivity between stages. Utopian activity has fluctuated between social and physical proposals; urbanistic trends have gone through periods of urban and rural migrations of population; and technological changes have occurred in the form of communication and transportation breakthroughs.

More detailed information on the utopian patterns and the interactions of utopians can be found in Appendices A and B. A chronological list of inventions that relate to the technological patterns can be found in Appendix C.

Ideally, a presentation of chronological patterns should include all the agencies that follow patterns in history - war, politics, ecology, economics, and many others - but most of the information on these patterns is quite lengthy and is obtainable from other reliable sources. There is a wealth of information on each of the typologies of utopias, urbanism, and technology, but very little that deals directly with their influences on utopian activity. Therefore, the purpose of this section is to discuss only those urbanistic and technological patterns that are related in some way to utopian activity.
3.1 UTOPIAN ACTIVITY

Utopias are much older than their name, and the utopian tradition probably had many beginnings. Plato's 'Republic' which is believed to have been written between 390 and 370 B.C. has often been referred to as the original. Utopian writings and ideal cities were quite common in Greece, and most of the early utopian concepts that followed dealt with the age old problems of economic organization of society, relations of sexes, and the laws of the land. Aristotle also states that Hippodamus of Miletos (fifth century B.C.) was the man "who invented town planning and designed the city of Piraeus". From the study of the ruins of several cities, it is believed that he had conceived the well-organized city plan which corresponded to an ideal social and political structure of the city that Plato imagined would be.

These beginnings were the start of a great many utopias lasting into the twentieth century. Their patterns, trends, and concepts have varied and changed through the years and often reflected the events of a particular point in time. As an example: the utopias related to Plato and More, and even those before them, dealt mostly with isolated societies. This trend continued until the mid-nineteenth century and the Industrial Revolution. Following the 1850's most of the utopian works began to suggest more cosmopolitan societies.
THE GOLDEN AGE (3000 B. C. -600 B. C.). The earliest signs of man's craving for a good society can be traced back to legends and fables of the Golden Age. The term "Golden Age" originally referred to a specific element in Greek mythology which attempted to account for the origin of mankind. "Parallel with this mythology were legends of strange peoples, either of an earlier age or dwelling in remote parts of the world, who embodied ideal personal and social qualities. These range from almost pure mythology or fantasy through all degrees of realism to what seem to be straightforward factual accounts by travelers.... As the centuries passed, there was a fusing of the mythological with the historical, until often no line of division is evident."3 The expression "The Golden Age" like the Platonic word "ideal", has gradually been broadened and blurred in its meaning, until in common usage it has come to be applied to any legendary age in which excellent conditions prevailed.4

CLASSIC PERIOD (600 B. C. -100 A. D.). The next utopian occurrences are connected with the great effort of the Greeks to settle many new lands between six hundred and three hundred B. C. At that time they both built and conceived ideal cities. "Hippodamus was the great planner of the fifth century; Plato, Aristotle, and Zeno were thinkers who dreamed of ideal cities; and Aristophanes built his city in the clouds."5
The first signs of the principle of law evolved as a basis of social conduct between the seventh and fifth centuries in Greece. A new form was given to political organization of the community: a government of laws determined by the people. Inspired by the political genius of men like Pericles, the democracy of Athens in the fifth century acquired a soul, and philosophers like Socrates focused on cultivating wisdom and intelligence. "Democracy in the Age of Pericles produced that inherent dignity of the individual born of free speech, a sense of unity with one's fellowman, and a full opportunity for participation in affairs of the community.... The discovery of freedom gave impetus to the search for truth as honest men desire it.... This was the environment of culture which produced Socrates, Plato, and Aristotle."^6

DARK AGES (100 A. D. - 1000 A. D.). In the late part of the fourth century B. C. there was a growing indifference toward the responsibility of government, and people were taking it for granted and doing what they pleased. Plato and Aristotle saw a degeneration of the democracy of Pericles. They perceived a growing abuse of individual liberty and became increasingly critical of democracy itself. Following this came the Peloponnesian Wars that weakened Athens and the Greeks were conquered. Their culture, however, dominated the conqueror. The Hellenistic period of cities followed this with monumental architecture and planning patterned after the Greeks, but there were no significant
ideal city proposals. Then for a long time, during the Dark Ages, there was a lack of social and physical utopias. "Certainly man did not dream less during the first fifteen centuries of the Christian era, but, as far as we know, his dreams took the form of a hundred per cent utopia...."7

MEDIEVAL PERIOD (1000 A. D. -1400 A. D.): Before the end of the Medieval Period, thoughts began to move from heaven back to man, and St. Thomas Aquinas spoke in the thirteenth century of the need of man for ethical principles as well as material comfort and said that a "stable society must integrate the town and the countryside."8

RENAISSANCE (1400-1750 A. D.) The beginning of the Renaissance coincided with the beginning of the second era of utopian thought, which was first expressed mainly as Ideal Cities in Italy and as literary utopias in England. One of the most influential of the Renaissance utopians was Antonio Filarete, a Florentine who was also known as a sculptor and architect. His ideal city of Sforzinda was brought into being between 1416 and 1464 while he was engaged in the service of Francisco Sforza of Milan, for whom the city was named. Among the other ideal cities that followed the lead of Sforzinda were the radio-concentric plans of Francisco di Georgio da Martini. Along with these ideal cities and in the first part of the sixteenth century is when literary utopians began to appear again. "Erasmus, the great humanist, wrote
in the first decade of the sixteenth century (in the house of Thomas More) his satire, 'In Praise of Folly', and a few years later, in 1516, Sir Thomas More wrote his 'Utopia' and started the tradition of literary utopias in the form of novels. This basic utopia began to lead man to think that paradise could not be in heaven but had to be built, that it was necessary for men to become specific and express their thoughts on many aspects of the organized life."

SEVENTEENTH CENTURY. The seventeenth century marked a great leap forward in natural sciences and philosophy, but social sciences were still undeveloped. Among the utopias of this century were 'Christianopolis' by the Lutheran minister, J. B. Andreae, who laid great emphasis on education, and 'City of the Sun' by Campanella also designed in great detail. Francis Bacon's 'New Atlantis' was based on the idea that science can increase man's happiness.

EIGHTEENTH CENTURY. "The eighteenth century created utopias which take us to several parts of the Earth where several utopias with one or more inhabitants were conceived, but none of them was very original; although it was during this century that man became convinced that he could create a perfect life if he only used his reason." The impact of this thought seems to have followed later in the nineteenth century.
INDUSTRIAL REVOLUTION (1750-1900) The nineteenth century shows the greatest number of utopian and semi-utopian novels along with proposals for trying to return to nature. One which influenced the establishment of a utopian community in America is that of Etienne Cabet who published 'Voyage En Icarie' in 1840. Also important is Edward Bellamy, who published 'Looking Backward' in 1888, because of his impact on public opinion which became the formation of many political clubs. William Morris in his 'News From Nowhere' (1890) fights against most of his contemporaries by disputing their faith in the Industrial Revolution. 13

Along with the Industrial Revolution came quite a number of physical utopians. Among the significant ones were Robert Owen, and his model industrial villages in Scotland in 1816, Titus Salt's Saltaire, built in the 1850's, and the technically advanced Victoria proposed by J. S. Buckingham in 1848. Following these were Cadbury's Bournville (1879, Soria y Mata (1882), and Lever's Port Sunlight (1888), where benevolent industrialists reproduced the rural atmosphere of cottage and village green in housing for factory workers. In 1898, in 'Tomorrow', Ebenezer Howard gathered together past and present ideas and proposed his Garden City concept. Raymond Unwin, a pioneer in housing in England, developed the idea of satellite communities about the periphery of the city. Each of these communities would range in population from 12,000 to 18,000 and would be small enough to
require no vehicular transportation within them. 14

As ugliness and congestion became problems, men in all walks of life became potential utopians. Patric Geddes in his 'Outlook Tower' urged a broader vision while John Ruskin and William Morris pleaded for craftsmanship. The scale of utopia kept getting larger until in the twentieth century, men began to analyze the city and the region rather than small colonies. Housing, previously neglected in the urban scene, began to receive attention. The literary and social utopians began to lose popularity and the physical ideal cities by men like Frank Lloyd Wright, Tony Garnier, and Le Corbusier achieved relative prominence. Each of these architects produced twentieth century utopias respecting the technical advances of the urban-ized society. Similar to J. S. Buckingham's Victoria which relied on technical improvements, Wright and Le Corbusier concluded that a new physical setting, such as they could create on the drawing board, was the right means of remaking industrial civilization. 15

Recognizing the desirability of good housing and stimulated by the proposals of the physical utopians, a number of industrial owners proposed some semi-utopias or model communities. One of the earliest of these towns was Bessbrook, built in 1846 for workers in the linen mills near Newry, Ireland. Sir Titus Salt built Saltaire for some 3,000 workers in his textile mill near Bradford, England. He intro-
duced some extensive community facilities in this development.
In 1865 the Krupp family began the first of several "model" villages for workers in their munitions and iron factories in Essen, Germany. George Cadbury, a chocolate manufacturer, began the town of Bournville in 1879. While this community was initiated as a "company" town it was converted to an autonomous village in 1900 and has about 2,000 people in it today. In France another chocolate manufacturer, M. Menier, built a workers' colony near Paris.

In 1917 Tony Garnier presented his ideas for La Cité Industrielle. His plans for the modern industrial city separated the civic center and residential sections from the factory district by a "greenbelt" and the highway and railroad traversed this broad buffer space.

AMERICAN UTOPIAS. America became the outlet for Europe's expanding population and in some ways became a site for ideal cities. There were more than two hundred utopias put into practice in America during the nineteenth century; Robert Owen's New Harmony, Oneida the so-called love colony, Brook Farm the colony of intellectuals, Economy and others. Most of the colonies failed not through economic disaster but through economic abundance. The most successful of the utopias during this period are those which imitated the prevailing methods of production, like Economy and Oneida. They did not threaten the rest of society with their aims. Almost all of these early utopias stressed group solidarity, rigidly defined social roles, hard work.
and participation. These were all attitudes and functions which were indispensable to the battle against adversity but which dissipated when economic prosperity arrived.

MODERN PERIOD (1900-1971) The twentieth century follows without a comparable number of social and literary utopias, although there are important authors like H. G. Wells and George Orwell. Two recent utopias that closely resemble the older tradition might be mentioned. 'Walden Two' by B. F. Skinner is quite typical of the escape into the small community, and Aldous Huxley's 'Island' (1962) is typical of an escape into a world deprived not only of pressures but also of many ideas which prevail at present.

Two people who have tried to face twentieth century problems by proposing physical utopias are Le Corbusier and Frank Lloyd Wright. "Corbusier accepted the dimensions of the problem but not the dynamic character of cities like Paris; thus, his plans lack in one of the four dimensions that of time, and cannot be considered practical. Frank Lloyd Wright, on the other hand, rejects the very basis of the twentieth century city, its size...."18

Neither Wright nor Le Corbusier dealt with the economic, social or political aspects of their new societies in much detail. They each made very different use of resources, and each had a different conception of the living patterns best suited to people.
HISTORICAL PERSPECTIVE. By putting utopian patterns into a historical perspective, one discovers that the social utopias have occurred during three major points in time. The first few appeared around 300 B.C. in Greece during the time of Plato's 'Republic'. The second group came over a thousand years later, and was climaxed by More's 'Utopia'. in 1516. Finally, the third period and the one with the greatest number of utopias, occurred in the late nineteenth and early twentieth centuries. This was also a major transition point between social utopias of the previous periods and the physical utopias of the third period.

Physical utopias and ideal cities appear in the same manner as social utopias, although in different periods of time. The majority of the physical concepts reach their maximum activity between the social periods. As illustrated in the diagram on page 26, the physical pattern consists of three groups which are relatively close to the social utopian groups.

UTOPIAN ACTIVITY CHART. The chart on page 26 illustrates the chronological pattern of utopias. The important observations are:

• There are three outstanding groups of utopian activity.
• Social and physical utopias have developed separately during the early periods of history but began to merge in the nineteenth and twentieth centuries.
• Physical and social utopians tend to group together.
The above diagram is based on the utopian references found in Appendix A.
3.2 URBANISTIC TRENDS

Throughout history one incentive in man's living pattern is his quest for fixed settlements and a home where he can live in comfort. Accompanying this urge has been close dependence of the individual and the social groups on each other. Utopians who have represented these groups and their civilizations most probably reacted in some way to the events of their own times. Consequently, in order to view these utopian typologies clearly, it seems important to understand the urbanistic trends concurrent with them.

One of the oldest sayings having to do with historical patterns deals with the cycle of civilizations. It reads: "I have always heard it said that peace brings riches; riches bring pride; pride brings anger; anger brings war; war brings poverty; poverty brings humanity; humanity brings peace; peace, as I have said, brings riches and so the world's affairs go round." Patterns and cycles are not uncommon in history, nature, economics, or even our present civilization.

By focusing on specific events which have caused urban and rural movements of populations, urbanistic patterns and trends can be traced. This section of Chapter 3 is concerned with the urbanistic trends of Western Civilization.
EARLY CIVILIZATIONS (3000-600 B.C.). Most early civilizations were agriculturally oriented. It was approximately 3000 B.C. when the first signs of writing appeared and this was followed by what can be called the first urban revolution. "It is no mere accident that in human history the invention of writing and the appearance of city life are twin features that date from the fourth millennium B.C. Cities ever since have been the chief repositories of social tradition, the points of contact between cultures, and the fountainheads of inspiration". 20

CLASSIC PERIOD (600 B.C.-100 A.D.). The areas of the first urban revolution were established in the lower valley of the Nile, in the delta lands of the head of the Persian Gulf, and in the plains of the Indus. For the first time, a considerable number of people could live without having to be food producers themselves. By concentrating the local surplus produced by intensive agriculture the earliest towns were supported. A second outgrowth, caused by transportation links, was the formation of trading towns in the coastlands of the Mediterranean. Following this came the first political empires in the fifth and fourth centuries B.C.: Greece and Rome. 21

DARK AGES (100-1000 A.D.). "The later phases of the Roman Empire became increasingly impoverished under the strain of maintaining its army, bureaucracy, and idle proletariat. Successive
tracts of the once closely-knit Empire lapsed into self-containedness, and as the Empire fell into disorganization, the civilized world, and with it the city idea, suffered geographical contraction in northern and western Europe.... No longer was there any incentive to rebuild the towns which had been sacked and pillaged." The towns lost much of their importance during this time, and the agricultural areas came back as major ways of life. This was the beginning of the Dark Ages in which there was only a minor trend back to urbanism based around focal points such as Cathedrals and Churches.

By the fifth century A. D., the Roman Empire had crumbled under the weight of luxury, pomp, and ceremony. Western civilization declined, trade disintegrated, and the urban population returned to rural life. Cities shrunk in size and importance and social and economic confusion followed.

MEDIEVAL PERIOD (1000-1400 A. D.). About the eleventh century A. D. a second urban revolution started as a result of increased trade and the protection furnished by feudal lords. Urban life was encouraged by the lords; "they granted charters which secured certain rights and privileges of citizenship to the urban dwellers." Out of this, merchants and craftsmen formed guilds to strengthen their social and economic positions. A wealthy mercantile class then rose to challenge the power of the feudal lords.
The number of towns increased rapidly during the Middle Ages, but they remained small in population. "Communication between towns was slow, facilities for transportation were cumbersome, and necessity for mutual assistance in times of conflict urgent." The power of the feudal lords declined, and a noble class took over. As the population and congestion within the cities grew so did the health and slum problems. The cities began to decline again in the fifteenth century. There was another emphasis on rural living, but only for a short time. In the late fifteenth century gunpowder was invented, and new techniques of warfare were introduced. This brought about heavy walls around the towns and a distinct separation between urban and rural environments. It also brought large populations back into the cities to participate in the commercial activity and to fill the ranks of the armies. This new activity became the beginning of the Renaissance period.

RENAISSANCE (1400-1750 A. D.). The Renaissance is characterized by the importance of the church movement, arts and crafts, the national unity of kings, and master builders. No major changes took place in the physical form of towns, but there was an emphasis on open space and court areas. Concurrent with this period was the colonization of America.

"Aided by the mariner's compass, courageous explorers in the fifteenth and sixteenth centuries extended the net of colonial empires
over the face of the globe. The eyes of people everywhere looked toward the new world in North America for relief from oppression and chaos. "26 The physical form of the new settlements varied a great deal from those in Europe at the same time because of the open space available. So once more agriculture became a principal occupation.

The agricultural trend in America lasted until the nineteenth century and the industrial revolution. However, there were a number of inventions of the eighteenth century which were of major importance in causing the revolution. The steam engine, and theories of capitalism touched off tremendous activities. Along with these came new forms of transportation and communications that began to congest the cities.

INDUSTRIAL REVOLUTION (1750-1900). The impact of the industrial revolution "brought exploitation of the poor and, with poverty, came the slums, row upon row of crowded workers' houses in the shadow of the factory..." 27 The degraded environment continued into the latter part of the century. People couldn't migrate back to the country as before because they needed the work found in the cities.

At this same time utopian proposals began to focus on planned communities away from the problems of the cities. There began to be an idealistic trend towards rural environments. The schemes of Owen and Buckingham and others had strong influences.
MODERN PERIOD (1900-1971). Finally in the twentieth century governments assumed more and more responsibility for improving cities and the trend of urban and agricultural revolutions have become less defined. The present patterns are "no longer either physical or socially a simple clear-cut dichotomy of town and country; rather it is an urban-rural continuum that presents itself." There is a less definite point where rural ends and urban begins.

URBANISTIC TRENDS CHART. The chart on page 33 illustrates the periods of urban and rural movements that coincide closely with respective utopian activities and technological changes. There are three important periods of change and each is characterized by a strong and a weak central core. The following points summarize the chart:

- There are three periods of urban-rural movements.
- As population and density increase in the nineteenth and twentieth centuries, the rural and urban fluctuations become less defined and finally result in planned decentralization combined with the redevelopment of city cores.
- The three urbanistic periods coincide with the utopian activity groups illustrated on page 26 and the technological phases on page 38.
The above diagram illustrates only those urbanistic movements that are pertinent to the utopian and technological activities discussed in this thesis.
3.3 TECHNOLOGICAL PATTERNS

According to Carleton S. Coon, technology and the discovery of new inventions were usually a by-product of the materials that man had to work with, and the use of technology followed an obvious and natural pattern. After each significant discovery it took man a certain amount of time to improve and perfect the mechanical means by which he could control and use it. "When a certain level of perfection had been reached, people were ready for a new discovery, which they then made. As time went on, the rate of discovery of new sources of energy and of progress in mechanical inventions to use them increased cumulatively, until now it is almost impossible for a single man to keep himself informed of these matters." Technology was at first isolated in cultural centers of the world, but with the transportation and communication it spread to areas with new potentials.

The industrial revolution was actually the result of a series of industrial changes that began in a much earlier time than the eighteenth century. According to Lewis Mumford the machine has swept over our civilization in three successive waves:

The first wave, which was set in motion around the tenth century, gathered strength and momentum as other institutions in civilization were weakening and dispersing; this early triumph of the machine was an effort to achieve order and power by purely external means, and its success was partly due to the fact that it evaded many of the real issues of life and turned away from the momentous moral and social difficulties that it had neither confronted nor solved... The second wave heaved upward in the eighteenth century after a long steady roll through the
Middle Ages, with its improvements in mining and iron working...
In the course of this effort, various moral and social and political
problems which had been set to one side by the exclusive develop-
ment of the machine, now returned with double urgency... Those
fortunate members of society that were in complete harmony with
the machine achieved that state only by closing up various important
avenues of life... Finally, we begin in our own day to observe
the swelling energies of a third wave. As the result of this
third wave, the machine ceases to be a substitute for God or
for an orderly society; and instead of its success being measured
by the mechanization of life, its worth becomes more and more
measurable in terms of its own approach to the organic and the
living. 30

TRANSPORTATION. Prior to the Industrial Revolution, man
had always worked with inventions, but most of these were simple
hand machines. The earliest and most significant transportation
breakthroughs occurred in the early Greek civilization. These in-
cluded complex road systems, wheeled vehicles pulled by animals,
boats, and the riding of horses.

The Renaissance Period produced many of the inventions that
contributed to transportation technology - gunpowder, simple hand
machines, printing press, and the processing of various materials.
It was not until 1765 and the invention of the steam engine, that man
was able to become independent of hand operation. These breakthroughs
caused an increase in production of products and the necessity for
transportation in trading of goods.

The development of transportation systems was a major contributing
factor to the Industrial Revolution. Before the invention of the steam
engine, goods were hauled in wagons, towed on river barges and carried
in large sailing ships. In 1809, the first steamboat was used in the United States; in 1825, the first steam railroad was operated for public transportation in England; and in 1829, a railroad line was laid in the United States. Industrial production increased and domestic and foreign commerce expanded. "Between 1850 and 1880, export trade from the United States increased from $17,000,000 to $100,000,000."

In the 1800's, traffic congestion began to appear and many forms of transportation modes were attempted - horse-drawn omnibuses in Paris (1819), elevated cable cars in New York (1867), electric street railway (1885), underground railways (1895), and automobiles and airplanes (1900's).

All of these elements, combined with increased population, have aided the complexity and congestion of the twentieth century urbanization and have stimulated utopian activity to the extent that it is difficult to separate the various typologies.

COMMUNICATION. European and American civilization seems to have moved at the rate man has communicated his ideas. "In ancient times men sent their messages by 'runner'. The printing press and postal service were initiated in the fifteenth century, and thoughts of men could be recorded for all to see and read. This transmission, however, depended upon the carrier on foot or horseback." Carlton S. Coon emphasizes the evolution of technological inventions and their
impact on communication within society. According to Coon:

Writing began about 3000 B.C., the first postal service around 700 B.C., printing about A.D. 1450, the telegraph in 1835, the telephone in 1876, the common use of radio in 1915, and of television in 1941. These are probably the most vital dates in the history of technology.34

The sequence of inventions responsible for changes in communication trends is illustrated in the diagram on page 38. Through the course of history there has been a series of communication revolutions. Each of these has been associated with the beginning of other events.

In 300 B.C. we see our first evidence of kingdoms, with complex political and religious hierarchies. About 700 B.C. the first empire appeared. Shortly after the invention of printing, in the middle of the fifteenth century, the world's first overseas trading companies owned by stockholders were incorporated, and along with the telegraph, complex manufacturing plants came into existence. Cartels appeared with the telephone, World War II and the United Nations with television. These coincidences, like the structure of human institutions, occurred naturally.35

Many of the inventions of the nineteenth century - the radio, telephone, etc. - drastically altered the effect of space and time and have contributed to the complex civilization existing in the twentieth century today.

TECHNOLOGICAL CHANGES CHART. The following observations summarize the chronological pattern of changes in technology.

- There have been three phases of transportation and communication breakthroughs that relate to utopian and urbanistic activity.
- The gaps between technological changes coincide with the gaps of urbanistic and utopian activity.
The breakthroughs illustrated in the above diagram represent only those that existed and coincided with particular utopian and urbanism patterns in Europe and America. For a complete list of inventions see Appendix C.
3.4 SUMMARY

Utopian Activity:

- In a historical perspective, utopias appear as three distinct groups: (1) During the third, fourth, and fifth centuries B. C.; (2) From the fifteenth century to the middle of the seventeenth century A. D.; (3) The nineteenth and twentieth centuries.

- Social and physical utopias developed separately during the early periods of history and began to merge in the later nineteenth century. The early utopias stressed moral values and the later ones emphasized material abundance.

- The prevailing technology appears to stimulate the shifts in utopian activity.

Urbanistic Trends:

- There are various degrees of urban to rural migrations throughout history. A number of these are concurrent with the utopian and technological activity. (See the Urbanistic Trends Chart).

- As population and complexity increase, the distinction between rural and urban environments becomes less defined. This is apparent in the nineteenth and twentieth centuries.

- Technological developments have often been a partial cause for urban or rural movements.

Technology:

- There have been three phases of technological breakthroughs related to urbanism and utopias: (1) From the sixth to third centuries B. C., (2) Between 1000 and 1500 A. D., (3) During the eighteenth and twentieth centuries A. D.

- The technological breakthroughs coincide closely to the urbanistic and utopian activity patterns.
A comparative analysis of the chronological charts in Chapter 3 reveals that utopian, urbanistic, and technological typologies have two common characteristics:

- Their strongest periods of activity occur in similar time zones.
- The dominant activity of each typology is usually preceded and followed by little or no activity.

The material presented in these charts is the basis for Chapter 4, which compares the cyclical characteristics of the typologies and proposes a theory for explaining their fluctuating patterns.

<table>
<thead>
<tr>
<th>Utopian Activity</th>
<th>Urbanistic Trends</th>
<th>Technological Changes</th>
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<tbody>
<tr>
<td>Time</td>
<td>Time</td>
<td>Time</td>
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<tr>
<td>3000 B.C.</td>
<td>1000 B.C.</td>
<td>2000 B.C.</td>
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<td>Group 1</td>
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<td>Group 3</td>
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Figure 4.
Chapter 4. CONCLUSION

4.1 Cyclical Characteristics

4.2 A Theory

4.3 Summary of Observations
Chapter 4. CONCLUSION

In the Introduction it was stated that utopian activity has responded to the effects of urbanism and technology. The purpose of this section is to expand that statement by comparing the typologies.

Utopian, urbanistic, and technological typologies were defined in Chapter 2, and their chronological patterns analyzed in Chapter 3. The two sections in this concluding chapter develop a theory that explains why and how this sequence evolved. The first section compares the cyclical characteristics of the typologies and makes certain observations related to why utopian activity occurred. The second part proposes a theory that illustrates the recurring sequence of utopias, urbanism, and technology.

4.1 CYCLICAL CHARACTERISTICS

Historical cycles are not a proven fact and there is a great amount of disagreement concerning them. Even the very detailed theories of Arnold Toynbee, have received many criticisms. One problem with cyclical investigations is that one tends to project the cycle into the future. But cycles can have many different meanings. For the purpose of this thesis, a "cycle" is defined as a recurring activity or condition that has been observed throughout history, with an inconsistent time factor. It is not intended to be projected into the future because the characteristics of the cycle can change with time.
The above diagram is a cyclical interpretation of the utopian activity patterns discussed in Chapter 3. For further information on the individual utopias see Appendix A.
This section of the conclusion is stating that a cyclical sequence can be noted in the utopian, urbanistic, and technological patterns of the past. The comparison of these topics is illustrated in detail in the Cyclical Characteristics Chart. The following observations have been made:

- Physical and Social utopias appear separately until the nineteenth century.
- Peaks in physical utopian activity follow significant achievements in technology and are characterized by stable urban environments.
- Peaks in social utopian activity are associated with unstable urban environments and often follow an urbanistic response to the by-products of earlier technological achievements.
- Technological complexity and the existence of many utopians seem to account for the merging of typologies in the nineteenth and twentieth centuries.

4.2 A THEORY

The analysis of the chronological patterns of utopias, urbanism, and technology has revealed that each of these typologies has three related periods of activity. The cyclical comparison of characteristics of these periods has revealed an obvious pattern of events. The sequence of these events accounts for the following proposed theory:
This thesis proposes that the chronological patterns of utopias, urbanism, and technology have recurred in a sequence of development similar to that shown in the above diagram. The theory is based entirely on the material presented in Chapter 3, and on the selected references in Appendix A. Following is a summary of the recurring process:

Phase 1  SIGNIFICANT TECHNOLOGICAL ACHIEVEMENTS

Phase 2  UTOPIAN RESPONSE TO TECHNOLOGY
(Usually Proposals by Physical Utopians)

Phase 3  URBANISTIC RESPONSE TO TECHNOLOGY

Phase 4  UTOPIAN RESPONSE TO URBANISM
(Usually Proposals by Social Utopians)

Utopias repeated in the above four phases until the nineteenth century. During the nineteenth and twentieth centuries an additional and final phase is observed:

Phase 5  MERGING OF UTOPIAN & URBANISM TYPOLOGIES
(Physical & Social Utopias Appear Concurrently)
(Urban & Rural Movements Become Less Defined)
The theory that utopians can be thought of as "reporters" signaling society of important changes, may possibly lead to a new way of analyzing utopian works. In the past, most utopian proposals have been assessed according to their influence on our physical and social environments. This thesis has proposed the opposite view - that two agencies of American and European history (urbanism and technology) have provided the stimuli for most utopian proposals.

The aim of finding a theory to explain utopian activity based on the development of urbanism and technology can be said to have been achieved only in part. The theory cannot be projected into the future because it begins to change in the nineteenth and twentieth centuries, and the recurring patterns become less distinct. A more detailed study needs to be done relating specifically to the recent utopians of the twentieth century.

To further establish the theory a comparison of the utopian activities of other agencies is needed. This might include a wide range of economic, social, and political topics. A question that remains is whether or not utopians of other civilizations have responded to urbanism and technology in a fashion similar to those studied in this thesis.
4.3 SUMMARY OF OBSERVATIONS

The following observations are based on the proposed theory and the cyclical characteristics of utopias, urbanism, and technology.

- Utopian and urbanism typologies have responded to technological achievements in related patterns.

- The recurrence of clusters of utopian theories at points in time suggest the possibility of a cyclical pattern.

- As population, congestion, and complexity of urbanism increase, the utopian cyclical activity becomes more complex. Utopian typologies begin to overlap.

- Utopian activity appears as a transitional element between urbanistic and technological events.

- Utopians tend to intervene in the problems of society and environment immediately without waiting for any general reform of society.

- Utopians have served as "reporters", signaling society of major social and physical changes resulting from technological and urbanistic trends.
APPENDICES

Appendix A. Catalogue of Utopian References
Appendix B. Utopian Interrelationships
Appendix C. List of Inventions
APPENDIX A. CATALOGUE OF UTOPIAN REFERENCES

This portion of the thesis is an explanation of popular utopian concepts and their characteristics. There are a great number of works to select from and those presented here represent the most significant of the social and physical traditions. Entire books have been written about many of these utopias and it would be next to impossible to precisely explain each concept in detail and still retain the scope of the thesis. The material that follows is simply an attempt to catalogue these utopians and their ideas in an over-view fashion.
CONTENTS:

HIPPODAMUS / GREEK IDEAL CITIES / FIFTH CENTURY B.C.
PLATO / 'REPUBLIC' / FOURTH CENTURY B.C.
ARISTOTLE / IDEAL STATE / THIRD CENTURY B.C.

ANTONIO FILARETE / SFORZINDA / 1460 A.D.
SIR THOMAS MORE / 'UTOPIA' / 1518
J. V. ANDREAE / 'CHRISTIANOPOLIS' / 1619
TOMASO CAMPANELLA / 'CITY OF THE SUN' / 1623
FRANCIS BACON / 'NEW ANT LANTIS' / 1650
JAMES HARRINGTON / 'OCEANA' / 1656

ROBERT OWEN / 'NEW HARMONY' / 1824
ETIENNE CABIT / 'VOYAGE EN ICARIE' / 1840
JAMES BUCKINGHAM / 'VICTORIA' / 1848
CHARLES FOURIER / THEORY OF SOCIAL ORGANIZATION / 1876
SORIA Y MATA / LINEAR CITY THEORY / 1882
EDWARD BELLAMY / 'LOOKING BACKWARD' / 1888
WILLIAM MORRIS / 'NEWS FROM NOWHERE' / 1890
H. G. WELLS / 'THE TIME MACHINE' (1894), 'A MODERN UTOPIA' (1905)
EBENEZER HOWARD / 'TOMORROW' / 1893
TONY GARNIER / 'LA CITE INDUSTRIELLE' / 1904
RAYMOND UNWIN / 'SATELLITE COMMUNITIES' / 1909
LE CORBUSIER / 'LA VILLE CONTEMPORAINE' / 1922
FRANK LLOYD WRIGHT / 'BROADACRE CITY' / 1932
ASCORAL / 'THREE HUMAN ESTABLISHMENTS' / 1945
FRANZ WERFEL / 'THE STAR OF THE UNBORN' / 1946
B. F. SKINNER / 'WALDEN TWO' / 1946
ALDOUS HUXLEY / 'APE & ESSENCE' / 1948
GEORGE ORWELL / 'NINETEEN EIGHTY-FOUR' / 1949
RAY BRADBURY / 'FAHRENHEIT 451' / 1954
G. A. JELLYCOE / 'MOTOPIA' / 1961
ARCHIGRAM / 'LIVING CITY' / 1963
ROBERT BOGUSLAW / 'THE NEW UTOPIANS' / 1965
HIPPODAMUS / GREEK IDEAL CITIES / FIFTH CENTURY B.C.

It is believed that the planner Hippodamus influenced the construction of three hundred cities in Greece and adjacent areas. However, out of all of these, only a handful still remains. According to Aristotle, Hippodamus of Miletos, (fifth century B.C.) was the "man who invented town planning." Hippodamus advanced positive theories about the art and science of city planning, and he has been credited with the origination of the "gridiron" street system of Greek cities. The gridiron pattern was vigorously applied by Hippodamus to obtain a rational arrangement of buildings and circulation. Aristotle states that he was "the first man not engaged in politics who attempted to speak on the subject of the best form of constitution". Hippodamus suggested that property should be of three types: (1) Sacred (for offerings), (2) Public (to support the warrior class), and (3) Private (land owned by farmers).
PROPERTY SHOULD BE:
1. Sacred
2. Public
3. Private

INVENTED TOWN PLANNING

INFLUENCED 300 OTHER GREEK CITIES

DEVELOPED THE "GRIDIRON" PLAN
"The 'Republic' is probably the most famous of Plato's dialogues. It contains the forerunners of many a line of enquiry taken up by later thinkers down to our own times." 3

In the fourth century B. C., Plato expressed his ideas more systematically than most others of his time. This is illustrated in the 'Republic' as well as his other works - 'Laws' and 'Crito'.

"Plato attempted to create an ideal whether or not it existed, as Socrates implied when speaking about justice, that seeking ideal justice was worthwhile, whether or not it existed." 4 In this respect Plato is rightly called the first utopian. His city is a classic example of a city that is static in character, having only 5040 citizens (that is about thirty thousand to fifty thousand people). It is well organized in order to guarantee happiness, controlling not only the number of citizens but also their wants to a very static level by not allowing them to be victims of their passions - and for this reason keeping all artists who express emotions under control. Plato was suggesting a mode of life similar to Aristotle, one that was neither impoverished or luxurious. An important fact related to why he wrote when he did is the existence of the long war between Athens and Sparta. 5 He wrote during a time of defeat of much of his real world.

53
Figure 2.

Plato's 'Republic'

AN IDEAL STATE

EQUALITY OF SEXES

CLASSES OF CITIZENS
1. Guardians
2. Soldiers
3. Workers

INFLUENCED OTHER UTOPIANS

POLITICAL ORGANIZATION FOR JUSTICE
For Plato, the citizens in the ideal state are divided into three classes: the guardians, the soldiers, and the common people. "The guardians are a small 'elite which alone wields political power. When the state is first set up, the lawmaker appoints the guardians, and thereafter they will be succeeded by their own kin.... The guardians' task is to see that the lawmakers will is done. To make sure they will do this Plato has a whole set of plans on how they must be brought up and live." 6

In another of Plato's dialogues, the 'Statesman', he describes various political organizations that might exist in a city. The different possibilities depend on the number of rulers and on the manner of their rule. There might be a monarchy, or an oligarchy, or a democracy, and each of these may function either according to legal principles, or else without them, making a possibility of six combinations: 7

"If there is no rule of law, power in the hands of many is considered to be productive of the least evil, since there will be no unity of purpose. On the other hand, if there is rule of law, democracy is the worst constitution, because now a common purpose is required if anything is to be achieved. Here, then, a monarch is to be preferred. There remains the possibility of a mixed constitution, taking some of the elements of the six simple ones." 8
Figure 2a.

Monarchy:

THE RULE OF ONE

Democracy:

THE RULE OF MANY

The Ideal State:

COMBINES MONARCHY & DEMOCRACY
ARISTOTLE / IDEAL STATE / THIRD CENTURY B.C.

Aristotle's ideal state emphasizes the importance of the family unit. He felt that in order to develop real affection there must be some restriction of the area in which it operates. "To receive proper attention a child must be in the care of its parents; purely communal responsibility in this sphere tends to produce neglect."

With regard to the ownership of land, Aristotle recommends that it should be private but its products should be enjoyed by the community. This amounts to a form of enlightened private ownership where the owner uses his wealth to the advantage of the community.

On the question of various different types of constitution, Aristotle largely follows Plato's scheme. He does bring out the importance of wealth as against numbers. "It does not matter whether the few or the many govern, but whether they do or do not command economic power. . . . . . just claims to power, Aristotle recognizes that all and sundry will demand power for themselves invoking the same principle of justice in each case. This is that equals should have equal shares and unequals not."

In his account of the ideal state, Aristotle states that "its population must have the right size with the right skills, it should be taken into glance from a hilltop, and its citizens should be Greeks who alone combine the vitality of the North with the intelligence of the East."
FILARETE, ANTONIO / SFORZINDA / 1460 A.D.

One of the earliest and most influential of the Renaissance ideal city theories was that proposed by Antonio Filarete, a Florentine who was also known as a sculptor and architect. His ideal city of Sforzinda was brought into being between 1460 and 1464 while he was engaged in the service of Francesco Sforza of Milan, for whom the city is named.

Sforzinda was the first star-shaped city of the Renaissance, its form being determined by the intersection of two squares inscribed in a circle. In his treatise, Filarete goes into considerable discussion of the magical and astrological meanings which the plan form has. The astrology was forgotten by other designers, but the form was not. The star-shaped form seemed to fulfill the Renaissance desire for unity, harmony, and static being. Sforzinda became the typical ideal city plan of the Renaissance.

Among those who followed the lead of Sforzinda was Francisco di Giorgio da Martini. In his treatise on civil and military architecture, he presented a number of town plans, all radio concentric in form. He designed for hill sights as well as flat ones, using spiral roads to lead up to the town center at the peak of the hill. Similar plans were proposed by Pietro Cataneo, Vasari Giovanni, Vincenzo Scamozzi and others.
INFLUENCED OTHER
ITALIAN IDEAL CITIES
FIRST STAR SHAPED
CITY OF THE RENAISSANCE

INFLUENCED BY
ASTROLOGY
EXpressed unity,
Harmony, and
Static being

Sforzinda
"TWO SQUARES
IN A CIRCLE"
MORE, SIR THOMAS / 'UTOPIA' / 1518

More's fame rests entirely on his political concepts described in 'Utopia'. According to Bertrand Russell, "This is a piece of speculative social and political theory, evidently inspired by Plato's 'Republic'. It is in the form of a report by a shipwrecked sailor who lived five years in this island community. As in Plato, there is great emphasis on communal property, and for similar reasons. Where things are privately owned, it is held, a thorough respect for the common weal cannot emerge..... That all men should be equal is, in Utopia, a basic fact taken for granted."13

The organization of More's ideal state is described as including a capital city and fifty-three other towns, all built on the same pattern, with identical dwellings to which all people have free access. Each city was to have a maximum population of 6000 families with no family having more than sixteen or less than ten members. There was to be no private property and therefore no stealing. As for dress, everyone was to wear the same kind of clothes, except for minor distinctions between married women and spinsters. People do work that best suits their own talents and the system of rule is a form of representative democracy by indirect election. The head of the state is elected for life, provided he behaves, otherwise he is disposed of. The social life of the community is also subject to strict rules.14
Figure 5.

INFLUENCED
BY PLATO'S
'REPUBLIC'

IN A CAPITAL CITY WITH
53 OTHER TOWNS

EMPHASIS ON
COMMUNAL PROPERTY

More's 'Utopia'

ALL MEN SHOULD
BE EQUAL

IDENTICAL DWELLINGS AND
CLOTHING FOR EVERYONE
Andreae states that the Christian way will be found in his "new Republic which it seems best to call Christianopolis," built, as he admits, for himself so that he may exercise the dictatorship. "Only in the full-scale utopia of Christianopolis, by far his best work, do we see the society outlined in all aspects. Andreae sets forth in the good ship, Phantasy, upon the Academic Sea, and after shipwreck reaches his haven, a triangular island in such beauty that one might think "here the heavens and the earth had been married and were living together in everlasting peace." 15

The main city of his concept is Caphar Salama (village of peace), which is laid out in a perfect square with four towers looking toward the four quarters of the earth. The city is functionally zoned with areas for specific types of industry related to the resources and raw materials required. The entire physical plan of Caphar Salama is designed with laboratories, equipment, classrooms, and factories to further the new science and its application. The singularly advanced views of Christianopolitans in scientific matters are directly attributable to Andreae's lifelong interest in this area.

This emphasis for science and education became a stimulus for the organization of the British Royal Society plus influencing many of the ideals of Bacon and Campanella. 16
Figure 6.

INFLUENCED THE BRITISH ROYAL SOCIETY

INFLUENCED BY PLATO'S CONCEPTS

Andreae's Christianopolis

INFLUENCED BACON & HARRINGTON

ZONED FOR INDUSTRY

RELEGIOUS & SCIENCE
EXAM REQUIRED BEFORE ENTERING THE CITY
TOMMASO CAMPANELLA / 'CITY OF THE SUN' / 1623

The utopia 'City of the Sun' is said to be Campanella's most characteristic work: "it reveals his polemical nature, his grandiose schemes, his paradoxical fusion of rationalism and mysticism, and his indefatigable ingenuity and learning." His description of the 'City of the Sun' has been interpreted in many different ways: "different critics see in it an academic speculation, an escapist dream, an idyll, a precise goal for the Calabrian rising to realize, a glorification of the Papacy, a truly Christian society... a hodgepodge of contradictory notions, an imitation of the utopias of Plato and More.... Almost any interpretation and its opposite seem to have been imposed on the work." 17

The physical form of Campanella's ideal city involved seven huge rings around it. It was planned so that anyone succeeding in storming the first ring would find it twice as hard to take the second, and still harder to take the third. Astrology also had an effect on the city form. The seven walls were named for the seven planets of knowledge and rose symbolically in ever-decreasing circles up to a high hill to the temple on the crest.
IMITATED THE IDEAS OF PLATO AND MORE

RETAINED OLD TRADITIONS AND PRACTICES

SIMILARITIES WITH BACON'S CONCEPTS

INFLUENCED BY ASTROLOGY

SEVEN RING WALLS TO KEEP OUT INTRUDERS

Campanella's 'City of the Sun'
Bacon's utopia describes what might be called a "think factory". This institute, called Salomon's House, involved the sending of several representatives abroad every twelve years to obtain knowledge of the sciences, arts, manufactures, and inventions of all the world. New Atlantis was based on the idea that science could increase man's happiness. 18

Although Bacon's influence reached a peak in the decade immediately before and after the Restoration (1650-1670), the imprint of his ideas as expressed in Salomon's House was apparent earlier in utopias. His college of light was clearly reflected not only in numerous imaginary colleges but also, in many others, it was the Romantic Model for the Royal Society, established later. It is said that Bacon fired the imagination of man with a "picture of society based on scientific research and its products." 19

Bacon undoubtedly had the reform of England in mind when he wrote his utopia because, he carefully preserves existing institutions and, instead of advocating revolution or radical change, superimposes science and advanced knowledge on a society which was essentially that of Jacobean England.
Figure 8.

INFLUENCED BY
ANDREAE'S UTOPIA

WAS NEVER
COMPLETED

INFLUENCED BY
SCIENCE AND
INVENTIONS

Bacon's
New Atlantis

DESCRIBED THE
POTENTIAL OF
SCIENCE

INFLUENCED THE
BRITISH ROYAL SOCIETY

SCIENCE COULD
INCREASE MANS
HAPPINESS

INFLUENCED OTHER
UTOPIAN WORKS
Harrington's was a political utopia advocating a land use where the landed gentry should be in leadership and the commonality should have the preponderance of power (all land should be held in common).

"In Oceana Harrington examined The Commonwealth of Israel, the Roman Republic, and the modern political structure of Venice, sifting the problems of each to find causes and effects, the origins of disorder, before deciding upon the component parts of his projected state. A close and careful investigation of the facts of social history led Harrington to his principle: in the balance of economic property (which then meant agrarian power) lay the balance of political power, the stability and strength of government. Harrington attempted to determine empirically the universal laws operative in society. In this effort he reflected the atmosphere of his age and the general search for new knowledge in all areas."

James Harrington was only one of many political utopists of that period that saw the main source of man's betterment in a form of government actually patterned on economic forces. He justified movement in government by pointing out the motion of the universe. However, regardless of his imagery and understanding, he contributed no scientific or technical facts.
INFLUENCED THE AMERICAN CONSTITUTION

REFLECTED THE ATMOSPHERE OF THAT TIME

INFLUENCED THE BRITISH ROYAL SOCIETY

PATTERNED GOVERNMENT AFTER ECONOMICS

Harrington's 'Oceana'

NO SCIENTIFIC CONTRIBUTIONS

INFLUENCED THE FRENCH CONSTITUTION

SEPARATED THE BRANCHES OF GOVERNMENT

Figure 9.
Owen's New Harmony was based on the idea that inhabitants would engage in both agriculture and manufacturing, using the latest and best models of available machinery and equipment. Owen seriously tried to implement his ideas in Indiana, with little success.

New Harmony represented an applied effort to achieve a set of goals, some of which Owen describes in his book 'A New View of Society'. Owen believed that industry, if it were properly organized, would require but little labor and at the same time provide abundance. He proposed a simple physical structure of the community: most of its features were collective-community dining halls, lecture halls, work places, and even sleeping quarters for the children. Owen stressed work, education, and participation. He expected that at New Harmony the ideals expressed in its constitution would be self-evident and therefore enforced by individuals and the group alike. The ideals were never realized and the community failed in three years.

"Robert Owen, through his utopian writing and his personal work, gave rise to the great co-operative movement, had a profound effect on education, gave its name and much of its content to socialism, greatly influenced the trade union movement, and was forerunner of the ethical cultural movement." 21
Figure 10.

FORERUNNER OF THE ETHICAL CULTURAL MOVEMENT

PROPOSED A PHYSICAL COMMUNITY STRUCTURE

INFLUENCED THE GREAT CO-OPERATIVE MOVEMENT

INFLUENCED TRADE UNIONS

INFLUENCED EDUCATION

Owen's New Harmony
In 1838, inspired by a reading of More's 'Utopia', Cabit wrote 'A Voyage to Icaria' (in French) and published it in 1840. He also wrote numerous newspaper articles and a history of the French Revolution.

Cabit's 'Icaria' is an example of Utopian Socialism of particular interest because of the attempts made to realize it in America, and because of the failure of those attempts. "His brand of communism is based on the doctrines that social inequalities are survivals of man's savage state when, being ignorant, might was right; that brotherly love and altruism are natural instincts which need development; that all men, by nature, are brethren; that social and political inequality is a breach of the law of nature; that social community cannot be established by conspiracy and violence...." 'Icaria' consisted of a highly sophisticated and metropolitan form of life where everything had been arranged and attended to. The inhabitants hope for peace - both internal and external, and all citizens are members of a national militia.

Cabit was encouraged by Robert Owen's attempt in 1825 to realize New Harmony, Indiana, and tried to put his Icarian Scheme into practice in Texas on the Red River. This failed and he tried again at Nauvoo, Illinois with fifteen hundred inhabitants. This also failed in 1886.
Figure 11

INFLUENCED BY TECHNICAL INNOVATIONS

ENCOURAGED BY OWEN'S CONCEPTS

REGIMENTATION AND STANDARDIZATION

Cabit's Voyage en Icarie

THEORY FAILED IN REALITY

A MECHANICALLY ORGANIZED SOCIETY

UTOPIAN SOCIALISM
Buckingham relied on the technological improvements of the time and appealed to the middle classes for a "Model Society" formed out of a model town association. He thought that, given a successful model town, the rest of England might in time be colonized by the surplus population, and thus the old centers of black industry would be wiped out. Buckingham was one of the first utopians to provide plans and specifications of his ideas. Much of his work had a direct influence on the ideas of Howard and his Garden City concept.

Buckingham's plan for Victoria specified a multitude of features within the community and recommended that industries using "steam engines" be situated at least one-half mile from the town. It was also suggested that sites would be reserved for "suburban villas" in the agricultural land surrounding the town. Buckingham explains most of his concept in his treatise entitled 'National Evils and Practical Remedies'. He explains his "Associated Temperance Community of About 10,000 Inhabitants", which adhered to the distinction of class, placing the finer homes near the center of his plan, and receding in class to the humble dwellings and workshops about the periphery. His utopian proposal was never executed, but it did focus attention upon the growing evils of the urban environment.23
Buckingham's 'Victoria'

A. 1000 HOUSES
B. ARCADE, SHOPS, WORK
C. 560 HOUSES
D. RETAIL SHOPS
E. 290 HOUSES
F. PROMENADE
G. 120 HOUSES
H. SCHOOLS
J. PUBLIC BLOGS
K. 24 MANSIONS
L. CENTRAL SQUARE

APPEALED TO THE MIDDLE CLASS
EARLIEST UTOPIAN WITH PLANS AND SPECIFICATIONS

PROPOSED SUBURBAN VILLAS AROUND A TOWN
ADHERED TO CLASS DISTINCTIONS

INFLUENCED BY TECHNOLOGY
Fourier differs from early utopians in that he is concerned with finding out what human nature is, rather than trying to modify it. His utopia is based upon man's physical and mental makeup. His design package was aimed at maintaining property rights, interest on capital, and existing inequalities in wealth. Fourier's system offered the inducements of substantial financial returns to investors.

Charles Fourier recognized that work could be disagreeable and rewarded disagreeable work with the highest pay. "Fourier, who spoke of Owen only with contempt, had the distinction of being applied almost exclusively in the United States, where in the forties and fifties, Fourierism attained the dignity of a national movement."

Advocated in America by Brisbane and Horace Greeley, Fourier's units were called Phalanxes, and were composed as follows: seven-eighths of the members were to be farmers or mechanics, the rest capitalists, scientists, and artists. All who wished could own as much stock as they wanted in the Phalanx. At the end of the year five-twelfths of the profit would go to labor, four-twelfths to capital and three to skill or talent. There were no fixed classes; however, a man could belong to two or all three groups and at the end of the year get his share of labor's share, according to the work he put in and his share of capital's share, according to the amount of stock he owned.\textsuperscript{24}
PROPOSED ARTIFICIAL UNITS CALLED PHALANXES

INCLUDED:
Artists
Scientists
Farmers
Mechanics
Capitalists

BASED ON MAN'S PHYSICAL & MENTAL MAKEUP

FINANCIAL RETURNS TO INVESTORS

FOURIERISM BECAME A NATIONAL MOVEMENT
Abandoning the gridiron and concentric forms of the crowded cities of his time, Soria y Mata proposed the theory of a linear city - 'La Ciudad Lineal'. He conceived of expanding the city along the spine of communication - the highway. Following along with the roadway, housing and industry bordered a continuous artery linking the existing cities. "Soria intended that his 'linear city' should connect old 'point cities' and envisaged continents crossed by great webs of these strip settlements." The physical form of his city consisted of a single street of 500 metres wide with room for belt trains and trams, conduits for water, gas and electricity, reservoirs, gardens, and at intervals buildings for different municipal services - fire, sanitation, health, police, etc. This was supposed to resolve almost all the complex problems that are produced by massive populations of urban life. As Soria states: "our projected city unites the hygienic conditions of country life to the great capital cities and moreover assumes that the railways, like today's streets and pavements, will carry free or for little all citizens." 

"In 1892 Soria y Mata founded the Madrid Company of Urbanization, for the construction of an endlessly expanding linear city. 'Symmetry, sexuality, and progress' were to be the benefits bestowed on the happy homeowners of the Ciudad Lineal."

79
Figure 14.

INFLUENCED THE LINEAR CITY SCHEMES BY GARNIER, WRIGHT, LE CORBUSIER, & ASCORAL

INFLUENCED HIGHLY BY TECHNOLOGY & COMMUNICATIONS

INTRODUCED THE LINEAR CITY CONCEPT
Bellamy is especially important because of his ideas and their great impact on public opinion. His ideal society suggested that man would rise to a proper state of dignity or nobility once the economic shackles that bind him are loosened. He had a major influence on the "New Deal" in America.

Bellamy's utopia was rational, orderly, friendly, technologically advanced, and offered material abundance not only to provide for basic needs but also for leisure. Like Owen and More, however, his vision was static and rigid. He saw in the utopian ideal a possibility for abundance that could be achieved only through a participation in the society and through work. His novel, 'Looking Backwards' (1888), reflected these ideas and sold over a million copies in America. It inspired many similar works and prompted the formation of a large group of nationalist clubs organized to carry out Bellamy's vision. "In America, the name Bellamy is almost synonymous with utopia. Bellamy has assumed a position as the modern representative in the sequence of classic utopists: Plato, More, Bacon, Campanella, Bellamy."
Figure 15.

Bellamy's 'Looking Backward'

Forecast Inventions

Based on Economic Materialism

Glamorized the Military

Technologically Advanced Theories

Greatest Impact of All American Utopians
WILLIAM MORRIS / NEWS FROM NOWHERE / 1890

Morris fights against most of his contemporaries by disputing their faith in the industrial revolution and by leaving his citizens free to decide for themselves. He was skeptical of modern technology. He responded to the Industrial Revolution by voicing a need for luxury rural living and better craftsmanship. 30

Starting from an awareness of the ugliness of the industrial landscape, "Morris gradually brought to light the political and economic factors which were preventing any possible remedy, and arrived independently at Socialism to the extent, in fact, of becoming active in the English workers' movement." Morris was one of the first real modern utopians as were Bellamy, H. G. Wells, and Skinner. These utopians stressed peace, abundance, leisure, equality, consonance of men and their environment. 31
Skeptical of modern technology

Pleased for craftsmanship

Disputes the industrial revolution

Morris' 'News From Nowhere'

Responded to the economic & political factors of the industrial revolution

Pointed out the ugly industrial landscape
H. G. WELLS / A MODERN UTOPIA (1905) / THE TIME MACHINE (1894)

In his book 'The Time Machine' (1894), Wells describes a future city with an Upper World of ruins and an Under World where people live permanently underground. He warned and predicted dystopias or bad cities. In 'A Modern Utopia' (1905), Wells brings together, compares, and criticizes important points that all the other utopias have raised. Wells is concerned to provide for the education, discipline, and maintenance of people who will be sufficiently disinterested and intelligent to keep the vast organization a going concern.28

"As criticism of existing conditions, 'A Modern Utopia' springs most immediately from the social and economic unrest that brought the Liberal party to power with an overwhelming majority in the General Election of 1906, gave Labor fifty-three seats, and started England along the path to being one of the most advanced of the 'socialistically paternal' states of the early twentieth century." In response to the conditions of his day, Wells wrote, as Lewis Mumford remarks, a "quintessential" utopia, one which sums up and clarifies the utopias of the past.29
INFLUENCED BY SOCIAL & ECONOMIC UNREST OF THE EARLY TWENTIETH CENTURY

VISUALIZED A PERMANENT UNDERGROUND CITY

H. G. Wells

TIME MACHINE

WARNED & PREDICTED BAD CITIES - "DYSTOPIAS"

SUMS UP & CLARIFIES UTOPIAS OF THE PAST
Many of Howard's concepts resulted from the reconstruction of Buckingham's earlier ideas. Howard developed the Garden Cities Concept which paved the way for numerous other garden cities and suburbs in both Europe and America. Howard is said to be one of the first superficial utopians, or shell builders.\(^3\)\\n
Howard presented his ideas in the book 'Tomorrow'. "Even though the motor car was not in common use, and not mentioned in Howard's book, the radial roads form the boundaries of the wards." Howard proposed a cluster of cities grouped around a Central City similar to Unwin's concept. The purpose was that "each inhabitant of the whole group would enjoy all the advantages of a great and most beautiful city in which could be found the university, art galleries, theatres and so on which no small town can afford."\(^3\)\\n
"One of the earliest and, in many ways, the best practical expression of Howard's ideas is to be found in Hampstead Garden Suburb. The Garden Suburb was started in 1907 to the design of Sir Raymond Unwin; it was never able to cater for all classes."\(^4\)
CORRECT PRINCIPLE OF A CITIES GROWTH WAS OPEN COUNTRY EVER NEAR AT HAND AND RAPID COMMUNICATION BETWEEN OFF-SHOOTS

Figure 18.

DEVELOPED THE GARDEN CITIES CONCEPT

RECONSTRUCTED THE EARLIER IDEAS OF BUCKINGHAM

Howard's 'Tomorrow'

ONE OF THE FIRST LARGE SCALE UTOPIANS

INFLUENCED UNWIN'S CONCEPTS ALONG WITH THE ENGLISH NEW TOWNS
Garnier's plan for an Industrial City of 35,000 people was the first really contemporary vision for a new city. He recognized the need for separating the industrial areas from other uses, and designed the whole urban area in great but coherent detail. The city center is in the middle of a long-rectangular residential area, the main railway line serving it from a lower level, while the industrial estate is at the top with plenty of space for industrial communications and expansion. Garnier's ideal industrial city "grew out of a broad understanding of social requirements. The balance of its layout is not destroyed by concentration on single issues, on the specialized problems of traffic or the more or less specialized problems of housing which absorbed the advocates of the garden city. Garnier sought for an organic interrelationship between all the functions of his town. There is a clear separation of all the different functions of the town: work, residence, leisure, and transport. Industry is cut off from the town proper by a green belt... The middle of Garnier's town is reserved for a civic centre, a high school district, and very complete and elaborate athletic fields." The urban vision of Garnier is probably one of the first really important and vital statements of urban planning in the twentieth century.
Garnier's La Cite' Industrielle

A. Civic Center  
B. Residential Dist.  
C. Industrial Dist.  
D. Port  
E. Railroad

Sought an organic interrelationship between all functions  
Grew out of a broad understanding of social requirements

First contemporary vision for a new city - influenced by modern technology
Unwin was highly influenced by the ideas of Howard and developed the idea of satellite communities about the periphery of a central city (12-18,000 pop.). How fully Unwin absorbed and developed the ideas of Howard can be studied in his great book 'Town Planning in Practice', published in 1909. Unwin emphasized that, in the design for any but the smallest residential area, provisions should be made for churches, chapels, public halls, libraries, institutes, shops, inns, and schools, and that these should be "the centre of the scheme." He maintained that this was impossible, when designing for individuals or speculative builders; the "creation of a village community could only be achieved if control was in the hands of some co-operative body." He condemned the segregation of classes as "foreign to the traditions of our country", resulting in bad municipal government by unfair distribution of local taxation, in exaggeration of differences of habit and thought, and architecturally, in dreary monotony. 35

Unwin planned and built Letchworth in England as a Garden City and a non-profit corporation venture. It was designed for 32,000 people but forty years after its beginning housed only 15,000. Hampstead Garden Suburb and Welwyn Garden City followed.
Figure 20.

INFLUENCED BY HOWARD'S GARDEN CITY CONCEPT

Published ideas in 'Town Planning in Practice'

Planned and built Letchworth in England

Unwin's Satellite Communities

Proposed satellite communities around a central city core

Influenced Hampstead Garden Suburb & other English garden cities

Condemned the segregation of classes

CONDEMNED THE SEGREGATION OF CLASSES
Le Corbusier conceived the city as a machine for daily living. His ideas and concepts influenced many other groups such as the ASCORAL. Le Corbusier's first utopian scheme, La Ville Contemporaine, was displayed in a Paris exposition in 1922. It was a city of magnificent skyscrapers surrounded by a broad open space park and was designed for a population of 3 million including the outlying garden cities. The transportation center, rail and airfield, was the hub of the concept. About the outskirts of the city were garden cities of single houses. In 1925, he adapted his "City of Tomorrow" to the 'Plan Voisin' for the center of Paris. In a sense he began to develop utopian theories for existing cities. He assumed a leading role in CIAM and organized the Assembly of Constructors for an Architectural Renovation (ASCORAL). 38

One of the principles on which Le Corbusier based his ideal cities was: "a city made for speed is made for success." He conceived the city as a complex machine with certain human elements such as proper light, greenery, spaciousness, silence, privacy and beauty. Corbusier arrived at many of his ideas from the works of Garnier and distilled them with a wide range of individual new artifacts, such as the skyscraper, and the motorway. He was able to set cities in a form that embodied nearly all the technological ideas that had been pushing their way into older urban patterns. 39
Figure 21.

IDEAS INFLUENCED
THE ASCORAL GROUP

FIRST UTOPIAN
SCHEME WAS 'LA VILLE
CONTEMPORAINE'
(ILLUSTRATED)

PROPOSED THE 'PLAN
VOISIN' SCHEME FOR
PARIS

"A CITY MADE FOR
SPEED IS MADE FOR
PROGRESS"

HIGHLY INFLUENCED
BY TECHNOLOGY

INFLUENCED BY
GARNIER'S IDEAS
In his book 'The Living City', Wright sets forth his concept for Broadacre City which is essentially based on the idea that people and their activities should be dispersed. He believed that the fusion of town and country would be accomplished by the diffusion of city and functions throughout the land. Wright rejected the basis of the twentieth century city, and tried to create a pattern of built-up and non built-up areas with the lowest density ever proposed for a city. Essentially a "linear" city form, Wright's proposal distributes industry, commerce, housing, social facilities, and agriculture along the railroad artery and has access to highways. The unit which dominates this plan is the minimum of one acre of land for each family rather than the neighborhood unit, although the various neighborhood facilities are provided. 43

To achieve the ideal city of Broadacre, Wright developed a set of codes to good planning which became the basis of his land use planning. He advocated one strongly defined single set of government for each county. As for economics he proclaimed three artificialities: rent for land, rent for money, and rent or unearned increment of the machine itself. He proposed the elimination of economic blight by detailing Broadacres as a "free city" - no landlord and no tenant, all the land was pre-allocated according to its nature, its use, and the functional requirements of that use before being sold. 44
Figure 22.

PEOPLE AND ACTIVITIES INFLUENCED BY LINEAR SHOULD BE DISPERSED CITY CONCEPTS

FUSION OF TOWN AND COUNTRY BY DIFFUSING CITY FUNCTIONS

LOWEST DENSITY EVER REJECTED THE BASIS PROPOSED FOR A CITY OF THE TWENTIETH CENTURY

Wright's Broadacre City

A. COUNTY SEAT  F. HOTEL  L. MOTOR INN  S. HOMES & APARTMENTS
B. MARKET  G. SANITARIUM  M. INDUSTRY  T. TEMPLE & CEMETARY
C. SPORTS  H. INDUSTRY  N. MERCHANDISING  U. RESEARCH
D. OFFICE  J. FRANKS  P. RAILROADS  V. ZOO
E. STADIUM  K. PARK  R. ORCHARDS  W. SCHOOLS
ASCORAL / "THREE HUMAN ESTABLISHMENTS" / 1945

In 1945 ASCORAL, under the leadership of Le Corbusier, shifted attention from the existing urban center to a consideration of the basic organization of urban settlement in the industrial age. The group was responsible for introducing the "Three Human Establishments": the farming unit, the radioconcentric city, and the linear industrial city. Even though ASCORAL used the theories of Le Corbusier, it was highly influenced by the earlier utopians.

In the studies by the ASCORAL group there is a fusion between the concentric form of the "garden city" and the ribbon form of the "linear city". The principal forms of circulation - water, rail, air and highway - became the arteries along which self-contained industrial cities are distributed. "Although it is assumed that open space surrounding these industrial clusters would be maintained, the 'greenbelt' is here used as a buffer between the various and separate land uses: housing, highways and factories." 40

The term ASCORAL stands for the Assembly of Constructors for an Architectural Renovation.
THE RADIOCONCENTRIC CITY
UNDER THE LEADERSHIP OF LE CORBUSIER

THE FARMING UNIT
HIGHLY INFLUENCED BY EARLIER UTOPIANS

ASCORAL

A. EXISTING CENTRAL CITY
B. AUTO HIGHWAY
C. VERTICAL RESIDENCE
D. COMMUNITY FACILITIES
E. HORIZ. RESID.
F. FACTORIES
G. RAILROAD
H. SVC. HIGHWAY
J. RIVER
K. INDUSTRIAL COMMUNITIES

THE LINEAR INDUSTRIAL CITY

FUSION BETWEEN THE GARDEN CITY & THE LINEAR CITY
ALDOUS HUXLEY / BRAVE NEW WORLD (1932) / APE AND ESSENCE (1948)

In 'Brave New World', Huxley writes of a bad world (dystopia) inhabited by two billion people - the same as the population of the earth in 1932. He speaks of a static society in a static culture where science led man to the point of complete loss of his freedom and turned him into a human object. 41

His next dystopia, 'Ape and Essence', speaks of a new society consisting of people suffering from the effects of radioactivity, which, because of a great number of deformed babies, is being gradually wiped out. A community where "ends are ape-chose; and only the means are man". 42

In 1946, in 'Revisits Brave New World', Huxley explains what disasters we should expect because of over-population, over-organization, and brain washing. He heads to the conclusion that what we need is population control through persuasion.
SCIENCE LED MAN TO THE LOSS OF FREEDOM AND TURNED HIM INTO A HUMAN OBJECT

"ENDS ARE APE CHOSEN AND THE MEANS ARE MAN"

A "DYSTOPIA" OF TWO BILLION INHABITANTS

PREDICTS A SOCIETY SUFFERING FROM RADIOACTIVITY

Figure 24.
GEORGE ORWELL / NINETEEN EIGHT-FOUR / 1949

Orwell predicts a society where total control has been established over man by the Party which can listen to every word he utters and watch every gesture he makes throughout his life. This ruling power is not interested in man, his happiness, or his long life; it does not care to build new buildings; or to allow any travel and communication.45

FRANZ WERFEL / THE STAR OF THE UNBORN / 1946

Werfel presents a world with cities built below ground where everything has been standardized and yet there is no dissatisfaction as man's ingenuity has already been exhausted.46

B. F. SKINNER / WALDEN TWO / 1948

Skinner speaks of a utopia of escape into a small community. He was a psychologist and inventor and was inspired to develop his community through "behavioral engineering" concepts.47

RAY BRADBURY / FAHRENHEIT 451 / 1954

Bradbury visualizes a world inhabited by a nomadic society of people living in cars and in houses with four walls of television, whose ears are sealed tight with little seashell thimble radios, who cannot hear normal speech, who cannot see normal forms because of
the speed at which they travel - a place where nobody knows anyone, where highways are full of crowds going "somewhere". Books and reading material concerning history are not allowed and violators are seriously punished, and their books burned.48

G. A. JELLICOE / 'MOTOPIA' / 1961

'Motopia' arises from the realization that our present physical conditions are being thrown into chaos by the advent of one car per family and one car per person. The social idea of Motopia is the separation of mechanical and biological man. The general concept is based on two principles, one scientific and the other romantic: (a) the roads are placed on the roofs of buildings and leave the whole ground free for the pedestrian, and (b) the maximum contrast is made between the geometry of the buildings and the free and natural shapes of the ground landscape.

ARCHIGRAM GROUP / 1960's

It is difficult to explain in a clear and precise way who and what the Archigram Group is. In very general terms the Archigram expresses the phenomenon of the English youth of the sixties - urbanistic, architectural and sociological fields. Typical of Archigram's "fantastic" proposals are: the living city, which was directed towards a concern for the individual, the group, and for the total community; the Sin Centre, an original and highly sophisticated structural gesture that underlined services and air conditioning ducts as desired visual
objects; the Plug-in City that was intended for any type of terrain, whether already built upon or not.

ROBERT BOGUSLAW / 'THE NEW UTOPIANS' / 1965

Boguslaw discusses utopian schemes of the past in the language of modern system design. He makes humanitarian concepts more meaningful to the engineer, and attempts to relate the art and science of system design to the concerns of both sociology and social philosophy.

In 'The New Utopians', Boguslaw is concerned with non-people and with people-substitutes. Their planning done with computer hardware, system procedures, functional analyses, and heuristics. Impatience with "human error" becomes the unifying imperative among the new utopians. The theoretical and practical solutions they seek call increasingly for decreases in the number and in the scope of responsibility of human beings within the operating structures of their new machines systems.
APPENDIX E. UTOPIAN INTERRELATIONSHIPS

The charts in this section relate mostly to the utopians of Appendix A, and summarize some of the significant facts associated with utopian concepts and theories. The three charts are as follows:

UTOPIAN INTERACTIONS. This first chart deals with the interactions between the utopians without respect to the physical or social typologies. Its main purpose is to illustrate graphically the utopias that have obvious influences on other utopian concepts.

TYPOLOGY COMPARISONS. This second chart is based on the typology information of Chapter 2. It is an attempt to place the utopians in either a physical or social category and then in a sub-category within the physical and social ones. The influences associated with each utopian are also shown.

CHRONOLOGICAL CHART. This third chart is similar to the chronological charts of Chapter 3, except that it illustrates the information in the form of a matrix rather than a time scale. It also is a summary of the events associated with the utopian, urbanistic, and technological typologies.
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<td>WELLS</td>
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<tr>
<td>HOWARD</td>
</tr>
<tr>
<td>GARNIER</td>
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<tr>
<td>UNWIN</td>
</tr>
<tr>
<td>LE CORBUSIER</td>
</tr>
<tr>
<td>WRIGHT</td>
</tr>
<tr>
<td>ASCORAL</td>
</tr>
<tr>
<td>WERFEL</td>
</tr>
<tr>
<td>SKINNER</td>
</tr>
<tr>
<td>HUXLEY</td>
</tr>
<tr>
<td>ORWELL</td>
</tr>
<tr>
<td>BRADBURY</td>
</tr>
<tr>
<td>JELLICOE</td>
</tr>
<tr>
<td>ARCHIGRAM</td>
</tr>
<tr>
<td>BOGUSLAW</td>
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</tbody>
</table>

105
## Typology Comparisons

### Table: Utopian Influences

<table>
<thead>
<tr>
<th>DATE</th>
<th>PHYSICAL UTOPIANS</th>
<th>SOCIAL UTOPIANS</th>
<th>INFLUENCES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>* TECH.</td>
<td>* URB.</td>
<td>TECH.</td>
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<tr>
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<td>HIPPODAMUS</td>
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<td>1619</td>
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<td></td>
<td>ANDREAE</td>
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<td>1623</td>
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<td></td>
<td>CAMPOCELLA</td>
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<tr>
<td>1650</td>
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<td>BACON</td>
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<td>1656</td>
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<td>1824</td>
<td>OWEN</td>
<td>OWEN</td>
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<td>1840</td>
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<td>CARIT</td>
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<td>1848</td>
<td>BUCKINGHAM</td>
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<td>BUCKINGHAM</td>
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<td>1876</td>
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<td>FOURIER</td>
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<td>1882</td>
<td>SERIA Y MOTA</td>
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<td>1888</td>
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<td>BELOMY</td>
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<td>1890</td>
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<td>MORRIS</td>
</tr>
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<td>1894</td>
<td></td>
<td></td>
<td>WELLE</td>
</tr>
<tr>
<td>1908</td>
<td>HOWARD</td>
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</table>

* TECH. = a utopian response to technological changes

* URB. = a utopian response to urbanistic trends
<table>
<thead>
<tr>
<th>DATE</th>
<th>PHYSICAL UTOPIANS</th>
<th>SOCIAL UTOPIANS</th>
<th>INFLUENCES</th>
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<tbody>
<tr>
<td>1904</td>
<td>GARNER</td>
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<tr>
<td>1905</td>
<td>Unwin</td>
<td>Wells</td>
<td></td>
</tr>
<tr>
<td>1909</td>
<td>Le Corbusier</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1922</td>
<td>Wright</td>
<td></td>
<td>Large Plans</td>
</tr>
<tr>
<td>1932</td>
<td>Wright</td>
<td>Huxley</td>
<td>Predictions</td>
</tr>
<tr>
<td>1945</td>
<td>Ascoral</td>
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<td>Urban Settlement</td>
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<tr>
<td>1946</td>
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<td>Huxley</td>
<td>Predictions</td>
</tr>
<tr>
<td>1946</td>
<td></td>
<td>Verf el</td>
<td>Predictions</td>
</tr>
<tr>
<td>1949</td>
<td>Orwell</td>
<td>Orwell</td>
<td>Predictions</td>
</tr>
<tr>
<td>1954</td>
<td>Orwell</td>
<td>Bradbury</td>
<td>Predictions</td>
</tr>
<tr>
<td>1959</td>
<td>Jellicoe</td>
<td></td>
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</tr>
<tr>
<td>1961</td>
<td>Archigram</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1965</td>
<td>Bogue Jaw</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*TECH. = a utopian response to technological changes

*URB. = a utopian response to urbanistic trends
<table>
<thead>
<tr>
<th>PERIOD</th>
<th>UTOPIAN TYPOLOGY</th>
<th>URBANISTIC EVENTS</th>
<th>CULTURAL EVENTS</th>
<th>MAJOR INNOVATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Golden Age</td>
<td>Myths &amp; Legends</td>
<td>Excellent Conditions</td>
<td>Beginning of Travel &amp; Trading</td>
<td>Writing, Books, Trade, Tools &amp; Agriculture</td>
</tr>
<tr>
<td>Classic Period</td>
<td>Ideal Cities &amp;</td>
<td>Rise &amp; Fall of</td>
<td>Emergence of</td>
<td>Transportation</td>
</tr>
<tr>
<td>900-1000 A.D.</td>
<td>Political Concepts</td>
<td>Empires</td>
<td>Political Wars &amp; Poverty</td>
<td>Ships &amp; Sails</td>
</tr>
<tr>
<td>Dark Ages</td>
<td>Lack of Physical</td>
<td>Social and</td>
<td>Major Urban</td>
<td>Weapons, Ships</td>
</tr>
<tr>
<td>1000-1300 A.D.</td>
<td>&amp; Social Utopias</td>
<td>Economic</td>
<td>Revolution</td>
<td>&amp; Large Ships</td>
</tr>
<tr>
<td>Medieval</td>
<td>Mostly Physical</td>
<td>Fuedal Lords</td>
<td>Science and</td>
<td>Mariners's</td>
</tr>
<tr>
<td>1000-1400</td>
<td>Utopias</td>
<td>Offered Protection</td>
<td>Philosophy</td>
<td>Compasses, Science</td>
</tr>
<tr>
<td>Renaissance</td>
<td>Ideal Cities in</td>
<td>Discovery of</td>
<td>Interests</td>
<td>And Physics</td>
</tr>
<tr>
<td>1400-1750</td>
<td>Italy &amp; Social</td>
<td>America</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Utopias in England</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial</td>
<td>Greatest Number</td>
<td>Revolutions, &amp;</td>
<td>Factory Towns</td>
<td>Telegraph, Teletype,</td>
</tr>
<tr>
<td>Revolution</td>
<td>Of Physical &amp;</td>
<td>Decay of</td>
<td>&amp; Crowded</td>
<td>Steam Engine, &amp;</td>
</tr>
<tr>
<td>1750-1900</td>
<td>Social Utopias</td>
<td>Central Cities</td>
<td>Conditions</td>
<td>Irrigation, &amp;</td>
</tr>
<tr>
<td>Modern</td>
<td>Emphasis on Both</td>
<td></td>
<td></td>
<td>Scientific &amp;</td>
</tr>
<tr>
<td>1900-1971</td>
<td>Physical Utopias &amp; Social Utopias</td>
<td>Combining Concepts</td>
<td>World Wars II, etc. &amp; Other Revolutions</td>
<td>Technical &amp; Research</td>
</tr>
</tbody>
</table>

Figure 27.
APPENDIX C. LIST OF INVENTIONS

The following list of inventions is not complete. It is meant merely to provide a chronological framework of technological facts for the interpretation of the thesis. The list is reproduced from Lewis Mumford's 'Technics and Civilization', and it describes mostly inventions that are part of Western Civilization.


<table>
<thead>
<tr>
<th>Tenth Century</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of water-clocks and water-mills.</td>
</tr>
<tr>
<td>The iron horse-shoe and an effective harness for horses. Multiple yoke for oxen. Possible invention of the mechanical clock.</td>
</tr>
<tr>
<td>999: Painted glass windows in England</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Eleventh Century</th>
</tr>
</thead>
<tbody>
<tr>
<td>1011-19: Movable type (Pi Sheng)</td>
</tr>
<tr>
<td>1050: First real lenses (Alhazen)</td>
</tr>
<tr>
<td>1065: Oliver of Malmesbury attempts flight</td>
</tr>
<tr>
<td>1060: Decimal system (Azachel)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Twelfth Century</th>
</tr>
</thead>
<tbody>
<tr>
<td>Military use of gunpowder in China. The magnetic compass, known to the Chinese 1160 B.C., comes into Europe, via the Arabs.</td>
</tr>
<tr>
<td>1105: First recorded windmill in Europe (France)</td>
</tr>
<tr>
<td>1109: Bologna University</td>
</tr>
<tr>
<td>1110: Cannon used by Moors</td>
</tr>
<tr>
<td>1114: Paper (Spain)</td>
</tr>
<tr>
<td>1147: Use of wood cuts for capital letters. (Benedictine monastery at Engelberg)</td>
</tr>
<tr>
<td>1150: Fixed steering rudder</td>
</tr>
<tr>
<td>1158: Bridge at Avignon. 13 stone arches—3,600 ft. long</td>
</tr>
<tr>
<td>1190: Paper mill (at Herault, France)</td>
</tr>
<tr>
<td>1195: Magnetic compass in Europe (English Citation)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Thirteenth Century</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical clocks invented.</td>
</tr>
<tr>
<td>1232: Hot-air balloons (in China)</td>
</tr>
<tr>
<td>1247: Cannon used in defence of Seville</td>
</tr>
<tr>
<td>1260: Pivot magnetic compass (Peter Peregrinus)</td>
</tr>
<tr>
<td>1270: Treatise on lenses (Vitello) Compound lenses (Roger Bacon)</td>
</tr>
<tr>
<td>1272: Silk reeling machine (Bologna)</td>
</tr>
<tr>
<td>1280: Opus Ruralium Commodorum—Compendium of Agricultural Practice (Petrus de Crescents)</td>
</tr>
<tr>
<td>1283-1299: Spectacles</td>
</tr>
<tr>
<td>1289: Block printing (Ravenna)</td>
</tr>
<tr>
<td>1290: Paper mill (Ravensburg)</td>
</tr>
<tr>
<td>1293: Spinning wheel</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fourteenth Century</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical clock becomes common. Water-power used to create draft for blast furnace: makes cast iron possible. Treadle loom (inventor unknown). Invention of rudder and beginning of canalization. Improved glass-making.</td>
</tr>
<tr>
<td>1300: Wooden type (Turkestan)</td>
</tr>
<tr>
<td>1315: Beginnings of Scientific Anatomy through dissection of human body (Raimondo de Luzi of Bologna)</td>
</tr>
<tr>
<td>1320: Water-driven iron works, near Dobrilugk</td>
</tr>
<tr>
<td>1322: Sawmill at Augsburg</td>
</tr>
<tr>
<td>1321: Cannon (Gunpowder: 816 A.D. (Magnus Graecus))</td>
</tr>
<tr>
<td>1330: Crane at Lüneburg</td>
</tr>
<tr>
<td>1345: Division of hours and minutes into sixties</td>
</tr>
<tr>
<td>1338: Guns</td>
</tr>
<tr>
<td>1330: Wire-pulling machine (Rudolph of Nürnberg)</td>
</tr>
<tr>
<td>1370: Perfected mechanical clock (von Wyck)</td>
</tr>
<tr>
<td>1382: Giant cannon—1.26 metres long</td>
</tr>
<tr>
<td>1390: Metal types (Korea)</td>
</tr>
<tr>
<td>1390: Paper roll</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fifteenth Century</th>
</tr>
</thead>
<tbody>
<tr>
<td>1402: Oil painting (Bros. van Eyck)</td>
</tr>
<tr>
<td>1405: Diving suit (Konrad Kyser von Eichstadt)</td>
</tr>
<tr>
<td>1405: Infernal machine (Konrad Kyser von Eichstadt)</td>
</tr>
<tr>
<td>1409: First book in movable type (Korea)</td>
</tr>
</tbody>
</table>
Sawmill at Madeira
Observatory at Samarkand

1420: Authentic wood engraving

1410; Paddle-wheel boat designed (Fontana)

1438: Wind-turbine (Mariano)

1430: Velocipede (Fontana)

1440: Copperplate engraving

1446: Rediscovery of wagon on springs

1470: Foundations of trigonometry (J. Müller Regiomontanus)

1472: Observatory at Nürnberg by Bernard Walther

1472: Leonardo da Vinci made the following inventions:
- Centrifugal pump
- Dredge for canal-building
- Polygonal fortress with outworks
- Breech-loading cannon
- Rifled firearms
- Antifriction roller bearing
- Universal joint
- Conical screw
- Rope-and-belt drive
- Link chains
- Submarine-boat
- Bevel gears
- Spiral gears
- Proportional and paraboloidal compasses
- Silk doubling and winding apparatus
- Spindle and flyer
- Parachute
- Lamp-chimney
- Ship's log
- Standardized mass-production house

1481: Canal lock (Dionisio and Petro Domenico)

1483: Copper etching (Wenceslaus von Olmütz)

1492: First globe (Martin Behaim)

SIXTEENTH CENTURY


1500: First portable watch with iron main-spring (Peter Henlein)

1500: Mechanical farming drill (Casella)

1500-1650: Intricate cathedral clocks reach height of development

1508: Multicolored woodcut

1511: Pneumatic beds (Vegetius)

1516: Fire-engine (Platner)

1520: Folder-cutting machine

1528: Re-invention of taxi meter for coaches

1530: Foot-driven spinning wheel (Jürgens)

1534: Paddle-wheel boat (Blasco de Garay)

1535: Diving bell (Francesco del Marmi)

1539: First astronomical map (Alessandro Piccolomini)

1544: Cosmographia Universalis (Sebastian Münster)

1545: Lead pencil (Gesner)

1552: Screw lathe (Jacques Besson)

1556: Calculating machine (Pascal)

1558: Balance spring for clocks

1565: Gregorian calendar revision

1567: Discovery of minute organisms (Leeuwenhoek)

1569: Industrial exhibition at Rathaus, Augsburg

1570: Pendulum clock (Huygens)

1573: Law of probability (Pascal)

1575: Hero's Opera (translation)

1579: Automatic ribbon loom at Dantzig

1582: Tide-mill pump for London (Morie)

1585: Decimal system (Simon Stevin)

1589: Knitting machine (William Lee)

1589: Man-propelled wagon (Gilles de Bom)

1590: Compound microscope (Jansen)

1594: Use of clock to determine longitude

1595: Design for metal bridges—arch and chain (Veranzio)

1597: Revolving theater stage

SEVENTEENTH CENTURY


1600: Dibbling of wheat to increase yield (Stat)

1606: Treatise on terrestrial magnetism and electricity (Gilbert)

1608: Academia dei Lincei at Rome

1609: First law of motion (Galileo)

1610: Discovery of gases (Van Helmont)

1613: Gunpowder in mine blasting

1614: Discovery of logarithms by John Napier

1615: Use of triangulation system in surveying by Willem Snell van Roijen (1581-1626)

1617: First logarithm table (Henry Briggs)

1618: Machine for plowing, manuring and sowing (Ramsay and Wilgoose)

1619: Use of coke instead of charcoal in blast furnace (Dudley)

1620: Adding machine (Napier)

1624: Sulphuric acid (Cornelius Drebbel)

1624: First patent law protecting inventions (England)

1628: Steam engine (described by Wroe-ter)

1630: Patent for steam engine (David Ramsey)

1635: Discovery of minute organisms (Leeuwenhoek)

1636: Infinitesimal calculus (Fermat)

1636: Fountaing pen (Schwenter)

1636: Threshing machine (Van Bergh)

1637: Periscope (Hevel, Danzig)

1643: Barometer (Torricelli)

1647: Calculation of fociuses of all forms of lens

1650: Calculating machine (Pascal)

1650: Magic lantern (Kircher)

1652: Air pump (v. Guericke)

1659: Law of probability (Pascal)

1667: Pendulum clock (Huygens)

1668: Balance spring for clocks (Hooke)

1669: Red corpuscles in blood (Schwammerdam)

1668: Probability law applied to insurance (Jan de Witt)

1665: Steam automobile model (Vehbiest, S. J.)

1666: Mirror telescope (Newton)

1667: Cellular structure of plants (Hooke)

1667: Steam automobile model (Vehbiest, S. J.)

1668: Paris Observatory

1667: Seed drill (Worlidge)

1671: Speaking tube (Morland)

1673: New Type fortification (Van Bureun)

1675: First determination of speed of light (Roemer)

1675: Greenwich Observatory founded

1677: Foundation of Ashmolean Museum

1678: Power loom (De Gennes)
1679-1681: First modern tunnel for transport, 515 feet long, in Languedoc Canal
1680: First power dredge (Cornelius Meyer)
1680: Differential calculus (Leibnitz)
1680: Gas engine using gunpowder (Huygens)
1682: Law of gravitation (Newton)
1682: 100 H.P. pumping works at Marly (Ranneguin)
1683: Industrial Exhibition at Paris
1684: Fodder-chopper run by water-power (Delabadjie)
1685: Foundation of scientific obstetrics (Van Deventer)
1687: Newton's Principia
1688: Distillation of gas from coal (Clayton)
1695: Atmospheric steam engine (Papin)

EIGHTEENTH CENTURY

Rapid improvements in mining and textile machinery, Foundation of modern chemistry.

1700: Water power for mass-production (Polhem)
1703: Atmospheric steam engine (Newcomen)
1707: Physician's pulse watch with second hand (John Floger)
1708: Wet sand iron casting (Darby)
1709: Coke used in blast furnace (Darby)
1710: First stereotype (Van der Mey and Muller)
1711: Sewing machine (De Camus)
1714: Mercury thermometer (Fahrenheit)
1714: Typewriter (Henry Mill)
1716: Wooden railways covered with iron
1719: Three color printing from copper plate (Le Blond)
1722: First exact measurement of blood pressure (Stephen Hales)
1727: Invention of stereotype (Ged)
1727: Light-images with silver nitrate (Schulzer; see 1839)
1730: Stereotyping process (Goldsmith)
1733: Flying shuttle (Kay)
1733: Roller spinning (Wyatt and Paul)
1736: Accurate chronometer (Harrison)
1736: Commercial manufacture of sulphuric acid (Ward)
1738: Cast-iron rail tramway (at Whitchurch, England)
1740: Cast steel (Huntsman)
1745: First technical school divided from army engineering at Brunschweig
1749: Scientific calculation of water resistance to ship (Euler)
1755: Iron wheels for coal cars

1761: Air cylinders; piston worked by water wheel. More than tripled production of blast furnace (Smeaton)
1763: Slide rest (French encyc.)
1765-1769: Improved steam pumping engine with separate condenser (Watt)
1767: Cast iron rails at Coalbrookdale
1769: Steam carriage (Cugnot)
1770: Caterpillar tread (R. L. Edge worth; see 1902)
1772: Description of ball-bearing (Narlo)
1774: Boring machine (Wilkinson)
1775: Reciprocative engine with wheel (Brothers Cragane)
1778: Modern water closet (Bramah)
1778: Talking automaton (von Koenen)
1779: Bridge cast-iron sections (Darby and Wilkinson)
1781-1786: Steam engine as prime mover (Watt)
1781: Steamboat (Jouffroy)
1781: Drill plow (Proude; also used by Babylonians: 1700-1200 B.C.)
1782: Balloon (J. M. and J. E. Montgolfier). Original invention Chinese
1784: Puddling process—reverberatory furnace (Cort)
1784: Spinning mule (Crompton)
1785: Interchangeable parts for muskets (Le Blane)
1785: First steam printing mill at Pappelwick
1785: Power loom (Cartwright)
1785: Chlorine as bleaching agent (Berthollet)
1785: Screw propeller (Bramah)
1787: Iron boat (Wilkinson)
1787: Screw propeller steamboat (Fitch)
1788: Threshing machine (Meikle)
1790: Manufacture of soda from NaCl (Le Blance)
1790: Sewing machine first patented (M. Saint—England)
1791: Gas engine (Barker)
1792: Gas for domestic lighting (Murdock)
1793: Cotton gin (Whitney)
1793: Signal telegraph (Claude Chappe)
1794: École Polytechnique founded
1795-1809: Food-canning (Appert)
1796: Lithography (Senefelder)
1796: Natural cement (J. Parker)
1796: Tug helicopter (Cayley)
1796: Hydraulic press (Bramah)
1797: Screw-cutting lathe (Maudsley). Improved slide-rest metal lathe (Maudsley)
1799: Humphry Davy demonstrates anesthetic properties of nitrous oxide
1800: Conservatoire Nationale des Arts et Metiers (Paris)
1800: Manufactured bleaching powder (Tennant)

NINETEENTH CENTURY


1800: Galvanic cell (Volta)
1801: Public railroad with horsepower —Wandsbrough to Croydon, England
1801: Steamboat Charlotte Dundas (Symington)
1801-1802: Steam carriage (Trevithick)
1802: Machine dresser for cotton warps (necessary for power weaving)
1802: Planing machine (Bramah)
1803: Side-paddle steamboat (Fulton)
1804: Jacquard loom for figured fabrics
1805: Twin screw propeller (Stevens)
1807: First patent for gas-driven automobile (Isaac de Rivaz)
1807: Kymograph—moving cylinder for recording continuous movement (Young)
1813: Power boom (Ilorpoeks)
1814: Grass tedder (Sahnot)
1814: Steam printing press (Koenig)
1817: Push-cycle (Drais)
1818: Milling machine (Whitney)
1818: Stethoscope (Laennec)
1820: Bentwood (Sargent)
1820: Incandescent lamp (De la Rue)
1820: Modern planes (George Rennie)
1821: Iron steamboat (A. Mainly)
1822: First Scientific Congress at Leipzig
1822: Steel alloys (Faraday)
1823: Principle of motor (Faraday)
1823-1843: Calculating machines (Babbage)
1824: Portland cement (Aspdin)
1825: Electro-magnet (William Stewart)
1825: Stockton and Darlington Railway
1825-1843: Thames tunnel (Mare I. Brunel)
1826: Reaping machine (Bell). First used in Rome and described by Pliny
1827: Steam automobile (Hancock)
1827: High pressure steam boiler—1,400 lbs. (Jacob Perkins)
1827: Chromo-lithography (Zahn)
1828: Hot blast in iron production (J. B. Nielson)
1828: Machine-made steel pen (Gillot)
1829: Blind print (Braille)
1829: Filtration plant for water (Chélen Water Works, London)
1829: Liverpool and Manchester Railroad Station
1829: Sewing machine (Thimonnier)
1829: Paper matrix stereotype (Génonx)
1830: Compressed air for sinking shafts and tunnels under water (Thomas Cochrane)
1830: Elevators (used in factories)
1831: Reaping machine (McCormick)
1831: Dynamo (Faraday)
1832: Water turbine (Fourneyron)
1833: Magnetic telegraph (Gauss and Daguerre)
1833: Laws of Electrolysis (Faraday)
1833: Electric battery in power boat (M. I. Jacob)
1833: Auline dye in coal tar (Runge)
1833: Workable liquid refrigerating machine (Jacob Perkins)
1835: Application of statistical method to social phenomena (Quetelet)
1835: Commutator for dynamo
1835: Electric telegraph
1835: Electric automobile (Davenport)
1836: First application of electric telegraph to railroads (Robert Stephenson)
1837: Electric motor (Davenport)
1837: Needle telegraph (Wheatstone)
1838: Electro-magnetic telegraph (Morse)
1838: Single wire circuit with ground (Steinheil)
1838: Steam drop hammer (Nasmyth)
1838: Two-cycle double-acting gas engine (Barnett)
1838: Propeller steamship (Eriessen: see 1805)
1838: Boat driven by electric motor (Jacob)
1839: Manganese steel (Heath)
1839: Electrotype (Jacobi)
1839: Callotype (Talbot)
1839: Daguerreotype (Niépce and Daguerre)
1839: Hot vulcanization of rubber (Goodyear)
1839: Grove's incandescent lamp
1840: Corrugated iron roof—East Counties Railroad Station
1840: Micro-photography (Donne)
1840: First steel cable suspension bridge, Pittsburgh (Roebling)
1841: Paper positives in photography (Talbot)
1841: Conservation of energy (von Mayer)
1842: Electric engine (Davidson)
1842: Conservation of energy (J. R. von Mayer)
1843: Aerostat (Henson)
1843: Typewriter (Thurber)
1843: Spectrum analysis (Miller)
1843: Gutta percha (Montgomery)
1844: Carbon arc lamp (Poucalt)
1844: Nitrous oxide application (Dr. Horace Wells); see 1799
1844: Practical wood-pulp paper (Keller)
1845: Cork-and-rubber linoleum (Galloway)
1845: Electric arc patented (Wright)
1845: Modern high speed sewing machine (Elias Howe)
1845: Pneumatic tire (Thomson)
1845: Mechanical boiler-stoker
1846: Rotating cylinder press (Hoe)
1846: Ether (Warren and Morton)
1846: Nitroglycerine (Sobrero)
1846: Gun-cotton (C. F. Schonbein)
1847: Chloroform-anæsthetics (J. Y. Simpson)
1847: Electric locomotive (M. G. Farmer)
1847: Iron building (Bogardus)
1847: Modern safety match (R. C. Botger)
1848: Rotary fan (Lloyd)
1849: Electric locomotive (Page)
1850: Rotary ventilator (Fabry)
1850: Ophthalmoscope
1851: Crystal Palace, First International Exhibition of Machines and the Industrial Arts (Joseph Paxton)
1851: Electric motor car (Page)
1851: Electro-magnetic clock (Shepherd)
1852: Reaper (McCormick)
1853: Science Museum (London)
1853: Great Eastern steamship—680 feet long—watertight compartments
1853: Mechanical ship's log (William Siemens)
1853: Mass-production matches (Denison, Howard and Curtis)
1853: Multiple telegraph on single wire (Ginrl)
1854: Automatic telegraph message recorder (Hughes)
1855: Commercial production of aluminum (Deville)
1855: 800 H.P. water turbine at Paris
1855: Television (Caselle)
1855: Iron-plated gunboats
1855: Safety lock (Yale)
1856: Open hearth furnace (Siemens)
1856: Bessemer converter (Bessemer)
1856: Color photography (Zenkner)
1858: Phonograph (Edison)
1859: Phonograph, Voice vibrations recorded on revolving cylinder (Scott)
1859: Oil mining by digging and drilling (Drake)
1859: Storage cell (Planté)
1860: Ammonia refrigeration (Carre)
1860: Asphalt paving
1860-1863: London "Underground"
1861-1864: Dynamo motor (Pacinotti)
1861: Machine gun (Galling)
1862: Monitor (Eríssong)
1863: Gas engine (Lenoir)
1863: Ammonia soda process (Solvay)
1864: Theory of light and electricity (Clerk-Maxwell)
1864: Motion picture (Ducos)
1864 and 1875: Gasoline engine motor car (S. Marcus)
1865: Pasteurization of wine (L. Pasteur)
1866: Practical dynamo (Siemens)
1867: Dynamite (Nobel)
1867: Re-enforced concrete (Monier)
1867: Typewriter (Scholes)
1867: Gas engine (Otto and Langen)
1867: Two-wheeled bicycle (Michaux)
1868: Tungsten steel (Mushet)
1869: Periodic table (Mendelevjev and Lothar Meyer)
1870: Electric steel furnace (Siemens)
1870: Celluloid (J. W. and I. S. Hyatt)
1870: Application of hypnotism in psychopathology (Charcot)
1870: Artificial madder dye (Perkin)
1871: Aniline dye for bacteria staining (Weigert)
1872: Model airplane (A. Penaud)
1872: Automatic airbrake (Westinghouse)
1873: Ammonia compression refrigerator—Carlo Linde (München)
1874: Stream-lined locomotive
1875: Electric car (Siemens)
1875: Standard time (American railroads)
1876: Bon Marché at Paris (Boileau and G. Eiffel)
1876: Discovery of toxins
1876: Four-cylinder gas engine (Otto)
1876: Electric telephone (Bell)
1877: Microphone (Edison)
1877: Bactericidal properties of light recorded on revolving cylinder
1879: Crystal Palace. First International Exhibition of Machines and the Industrial Arts (Joseph Paxton)
1880: Conservation of energy (J. R. von Mayer)
1881: Chloroform-anaesthetics (J. Y. Simpson)
1882: Compressed air refrigerator (Drake)
1883: Multiple telegraph on single wire (Ginrl)
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1885: Television (Caselle)
1885: Iron-plated gunboats
1885: Safety lock (Yale)
1886: Open hearth furnace (Siemens)
1886: Bessemer converter (Bessemer)
1886: Color photography (Zenkner)
1888: Phonograph (Edison)
SUMMARY OF INVENTIONS

Scientific and Technological Research

Railways, Power Conversion & Mass Prod.

Textiles & Chemistry

Waterwheels, Science and Physics

Iron-moulding and Mining Industry

Cannons, Ships & Windmills

Scientific and Technical Research Laboratories

General introduction of scientific and technical research laboratories.

1890-1893: Diesel motor
1892: Artificial silk of wood pulp (Cross, Bevan and Beadle)
1893: Moving picture (Edison)
1893: By-product coke oven (Hoffman)
1894: Jenkin's "Phantoscope"—first moving picture of modern type
1895: Motion picture projector (Edison)
1895: X-ray (Roentgen)
1896: Steam-driven aerodrome flight—one half mile without passenger (Langley)
1896: Radio-telegraph (Marconi)
1896: Radio activity (Becquerel)
1898: Osmium lamp (Welsbach)
1898: Radium (Curie)
1898: Garden City (Howard)

TWENTIETH CENTURY

1900: High speed tool steel (Taylor & White)
1900: Nernst lamp
1900: Quantum theory (Planck)
1901: National Bureau of Standards—United States
1902: Caterpillar tread improved. [See 1770]
1902: Radial type airplane engine (Charles Manly)
1903: First man-lifting airplane (Orville and Wilbur Wright)
1903: Electric fixation of nitrogen
1903: Arc process nitrogen fixation (Birkeland and Eyde)
1903: Radio-telephone
1903: Deutsches Museum (München)
1903: Oil-burning steamer
1903: Tantalum lamp (von Bolton)
1904: Fleury tube
1904: Moore tube light
1905: Rotary mercury pump (Gaede)
1905: Cyanamide process for nitrogen fixation (Rothe)
1906: Synthetic resins (Baekeland)
1906: Audion (De Forest)
1907: Automatic bottle machine (Owen)
1907: Tungsten lamp
1907: Television-photograph (Korn)
1908: Technisches Museum für Industrie und Gewerbe (Wien)
1909: Duralumin (Wilms)
1910: Gyro-compass (Sperry)
1910: Synthetic ammonia process for nitrogen fixation (Haber)
1912: Vitamins (Hopkins)
1913: Tungsten filament light (Coolidge)
1920: Radio broadcasting
1922: Perfected color-organ (Wilfred)
1927: Radio television
1933: Aerodynamic motor car (Fuller)

Figure 28.

Bronze

Iron

Simple Machines

Hand Tools

Advanced Agriculture

Paper

Glass Making

Boats

Scientific and Technical Research

Railways, Power Conversion & Mass Prod.

Textiles & Chemistry

Waterwheels, Science and Physics

Iron-moulding and Mining Industry

Cannons, Ships & Windmills

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FOOTNOTES

Chapter 1. INTRODUCTION

1 Lewis Mumford, Technics and Civilization, p. 3.
2 Arthur Ernest Morgan, Nowhere was Somewhere, p. 12.
4 Websters New World Dictionary, p. 1605.
5 Sylvia Fleis Fava, Urbanism in World Perspective, p. 47.
7 William Nelson, Twentieth Century Interpretations of Utopia, p. 108.
10 Constantinos A. Doxiadis, Between Dystopia and Utopia, "Definitions".

Chapter 2. UTOPIAN, URBANISTIC & TECH. TYPOLOGIES

4 Ibid., p. 234.
6 Louis Wirth, "Urbanism as a Way of Life", Urbanism in World Perspective, p. 46.
Chapter 3. CHRONOLOGICAL PATTERNS

1 Arthur E. Morgan, *Nowhere was Somewhere*, p. 91.


3 *Op. cit.*, Morgan, p. 120.


22 Arthur Gallion & Simon Eisner, The Urban Pattern, p. 3.
26 Ibid, p. 63.
27 Ibid, p. 66.
28 Ibid, p. 66.
30 Lewis Mumford, Technics and Civilization, p. 5.
32 Ibid, p. 64.
33 Ibid, p. 64.

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1 Arthur Gallion & Simon Eisner, The Urban Pattern, p. 15.
2 Christopher Tunnard, The City of Man, p. 57.
3 Bertrand Russell, Wisdom of the West, p. 64.
4 Constantinos Doxiadis, Between Dystopia and Utopia, p. 29.
5 Lewis Mumford, The Story of Utopias, p. 35.
7 Ibid, p. 66.
8 Ibid, p. 67.
9 Ibid., p. 94.
10 Ibid., p. 95.
11 Ibid., p. 95.
14 Ibid., p. 181.
15 Nell Eurich, Science in Utopia, p. 129.
17 Glenn Robert Negley, The Quest for Utopia, p. 315.
19 Ibid., p. 147.
20 Ibid., p. 102.
21 Arthur Morgan, Nowhere was Somewhere, p. 163.
26 Sibyl Moholy-Nagy, Matrix of Man, p. 271.
29 H. G. Wells, A Modern Utopia, p. x.
33 Ibid, p. 34.
34 Ibid, p. 35.
42 Ibid, p. 16.
44 Frank Lloyd Wright, The Living City, p. 19.
46 Ibid, p. 17.
48 Ibid, p. 17.
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