INTRODUCTION

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Oriental Despotism

1.

WHEN in the 16th and 17th centuries, in consequence of the commercial and industrial revolution, Europe's trade and power spread to the far corners of the earth, a number of keen-minded Western travelers and scholars made an intellectual discovery comparable to the great geographical exploits of the period. Contemplating the civilizations of the Near East, India, and China, they found significant in all of them a combination of institutional features which existed neither in classical antiquity nor in medieval and modern Europe. The classical economists eventually conceptualized this discovery by speaking of a specific "Oriental" or "Asiatic" society.

The common substance in the various Oriental societies appeared most conspicuously in the despotic strength of their political authority. Of course, tyrannical governments were not unknown in Europe: the rise of the capitalist order coincided with the rise of absolutist states. But critical observers saw that Eastern absolutism was definitely more comprehensive and more oppressive than its Western counterpart. To them "Oriental" despotism presented the harshest form of total power.

Students of government, such as Montesquieu, were primarily concerned with the distressing personal effects of Oriental despotism, students of economy with its managerial and proprietary range. The classical economists particularly were impressed by the large water works maintained for purposes of irrigation and communication. And they noted that virtually everywhere in the Orient the government was the biggest landowner.[1]

These were extraordinary insights. They were, in fact, the starting point for a systematic and comparative study of total power. But no such study was undertaken. Why? Viewed alone, the social scientists' withdrawal from the problem of Oriental despotism is puzzling. But it is readily understandable when we consider the changes that occurred in the 19th century in the general circumstances of Western life. Absolutism prevailed in Europe when Bernier described his experiences in the Near East and Mogul India and when Montesquieu wrote *The Spirit of the Laws*. But by the middle of the 19th century representative governments were established in almost all industrially advanced countries. It was then that social science turned to what seemed to be more pressing problems.

2.

FORTUNATE AGE. Fortunate, despite the sufferings that an expanding industrial order imposed on masses of underprivileged men and women. Appalled by their lot, John Stuart Mill claimed in 1852 that "the restraints of Communism would be freedom in comparison with the present situation of the majority of the human race." [2] But he also declared that the modern property-based system of industry, outgrowing its dismal childhood, might well satisfy man's needs without grinding him down into "a tame uniformity of thoughts, feelings, and actions." [3]

Fortunate age. Its ever-critical children could combat the fragmented despotism of privilege and power, because they did not live under a system of "general slavery." [a] Indeed they were so far removed from the image of absolutist power that they felt no urge to study its substance. Some, such as Max Weber, did examine illuminatingly, if not too systematically, certain aspects of Oriental statecraft and bureaucracy. But by and large, what Bury said at the close of the period of liberalism was true: little effort was made to determine the peculiarities of absolutism through detailed comparative study.[4]

Fortunate age. Optimistic age. It confidently expected the rising sun of civilization to dispel the last vestiges of despotism that beclouded the path of progress.

3.

BUT the high noon has failed to fulfill the promises of the dawn. Political and social earthquakes more terrifying than any that previously shook the homelands of modern science make it painfully clear that what has been won so far is neither safe nor certain. Total power, far from meekly withering away, is spreading like a virulent and aggressive disease. It is this condition that recalls man's previous experience with extreme forms of despotic rule. It is this condition that suggests a new and deepened analysis of Oriental—or as I now prefer to call it, hydraulic—society.

4.

FOR three decades I studied the institutional settings of Oriental despotism; and for a considerable part of this time I was content to designate it "Oriental society." But the more my research advanced, the more I felt the need for a new nomenclature. Distinguishing as I do between a farming economy that involves small-scale irrigation (hydroagriculture) and one that involves large-scale and government-managed works of irrigation and flood control (hydraulic agriculture), I came to believe that the designations "hydraulic society" and "hydraulic civilization" express more appropriately than the traditional terms the peculiarities of the order under discussion. The new nomenclature, which stresses institutions rather than geography, facilitates comparison with "industrial society" and "feudal society." And it permits us, without circumstantial reasoning, to include in our investigation the higher agrarian civilizations of pre-Spanish America as well as certain hydraulic parallels in East Africa and the Pacific areas, especially in Hawaii. By underlining the prominent role of the government, the term "hydraulic," as I define it, draws attention to the agromanagerial and agrobureaucratic character of these civilizations.

a. Marx (1939: 395) applied this term to Oriental despotism without realizing that more comprehensive forms of state slavery might emerge under conditions of industry.

5.

THE present inquiry goes considerably beyond the findings of the early students of Oriental society. In the following pages I endeavor to describe systematically man's hydraulic response to arid, semiarid, and particular humid environments. I also indicate how the major aspects of hydraulic society interlock in a vigorously functioning institutional going concern.

This going concern constitutes a geo-institutional nexus which resembles industrial society in that a limited core area decisively affects conditions in large interstitial and peripheral areas. In many cases these marginal areas are politically connected with hydraulic core areas; but they also exist independently. Manifestly, the organizational and acquisitive institutions of the agrodespotic state can spread without the hydraulic institutions which, to judge from the available data, account for the genesis of all historically significant zones of agrarian despotism. An understanding of the relations between the core and the margin of hydraulic society—a phenomenon barely noted by the pioneer analysts—is crucially important for an understanding of Western Rome, later Byzantium, Maya civilization, and post-Mongol (Tsarist) Russia.

In the matter of private property the early institutionalists were satisfied to indicate that the Oriental state controlled the strategic means of production, and most importantly the cultivable land. The real situation is much more complicated and, from the standpoint of societal leadership, much more disturbing. History shows that in

many hydraulic societies there existed very considerable active (productive) private property; but it also shows that this development did not threaten the despotic regimes, since the property holders, as property holders, were kept disorganized and politically impotent.

Obviously, too much has been said about private property generally and too little about strong and weak property and about the conditions which promote these forms. The analysis of the varieties of private property in hydraulic society determines the limitations of nonbureaucratic (and of bureaucratic) private property under Oriental despotism. Its results contradict the belief that practically any form of avowedly benevolent state planning is preferable to the predominance of private property, a condition which modern sociological folklore deems most abhorrent.

And then there is the problem of class. Richard Jones and John Stuart Mill indicated that in Oriental society the officials enjoyed advantages of income which in the West accrued to the private owners of land and capital. Jones and Mill expressed a significant truth. But they did so only in passing and without stating clearly that under agrodespotic conditions the managerial bureaucracy was the ruling class. They therefore did not challenge the widely accepted concept of class which takes as its main criterion diversities in (active) private property.

The present inquiry analyzes the patterns of class in a society whose leaders are the holders of despotic state power and not private owners and entrepreneurs. This procedure, in addition to modifying the notion of what constitutes a ruling class, leads to a new evaluation of such phenomena as landlordism, capitalism, gentry, and guild. It explains why, in hydraulic society, there exists a *bureaucratic* landlordism, a *bureaucratic* capitalism, and a *bureaucratic* gentry. It explains why in such a society the professional organizations, although sharing certain features with the guilds of Medieval Europe, were societally quite unlike them. It also explains why in such a society supreme autocratic leadership is the rule.[5] While the law of diminishing administrative returns determines the lower limit of the bureaucratic pyramid, the cumulative tendency of unchecked power[6] determines the character of its top.

6.

THE PROPONENT of new scientific ideas unavoidably discards old ideas. Almost as unavoidably he will be criticized by those who defend the old position. Not infrequently such a controversy throws new light on the entire issue. This has certainly been the case with the theory of Oriental (or hydraulic) society.

The reader will not be surprised to learn that this theory has aroused the passionate hostility of the new total managerial bureaucracy that, in the name of Communism, today controls a large part of the world's population. The Soviet ideologists, who in 1931 declared the concept of Oriental society and a "functional" ruling bureaucracy politically impermissible, no matter what the "pure truth" might be,[7] cynically admitted that their objections were inspired by political interests and not by scientific considerations. In 1950 the leaders of Soviet Oriental studies designated as their most important accomplishment "the rout of the notorious theory of the 'Asiatic mode of production.' "[8]

The reference to the "Asiatic mode of production" is indicative of the kinds of difficulties that confront the Communist attack on the theory of Oriental society. To understand them, it must be remembered that Marx accepted many values of the Western world, whose modern private-property-based institutions he wished to see destroyed. In contrast to the Soviet conception of partisanship in art and science, Marx rejected as "shabby" and "a sin against science" any method that subordinated scientific objectivity to an outside interest, that of the workers included.[9] And following Richard Jones and John Stuart Mill, he began, in the early 1850's, to use the concept of a specific Asiatic or Oriental society. Stressing particularly the Asiatic system of economy, which he designated as the "Asiatic mode of production," Marx upheld the "Asiatic" concept until his death, that is, for the greater part of his adult life. Engels, despite some temporary inconsistencies, also upheld to the end Marx' version of the Asiatic concept. Neither Marx nor Engels clearly defined the phenomenon of a marginal Oriental society; but from 1853 on, they both emphasized the "semi-Asiatic" quality of Tsarist society and the Orientally despotic character of its government.

Lenin spoke approvingly of Marx' concept of a specific Asiatic mode of production, first in 1894 and last in 1914. Following Marx and Engels, he recognized the significance of "Asiatic" institutions for Tsarist Russia, whose society he viewed as "semi-Asiatic" and whose government he considered to be despotic.[10]

7.

I WAS UNAWARE of the political implications of a comparative study of total power when in the winter of 1922–23 and under the influence of Max Weber I began to investigate the peculiarities of hydraulic society and statecraft. I was unaware of it when, in 1924 and now with reference to Marx as well as Weber, I pointed to "Asiatic" society[11] as dominated by a bureaucratically despotic

state.[12] I was unaware of having drawn conclusions from Marx' version of the Asiatic concept, which Marx himself had avoided, when in 1926 and employing Marx' own socio-economic criteria, I wrote that Chinese developments in the second half of the first millennium B.C. made "the administrative officialdom—headed by the absolutist emperor—the ruling class" [13] and that this ruling class, in China as in Egypt and India, was a "mighty hydraulic [*Wasserbau*] bureaucracy." [14] I elaborated this thesis in 1926,[15] 1927,[16] 1929,[17] and 1931,[18] impressed by Marx' insistence on an unbiased pursuit of truth.[b] In 1932, a Soviet critic of my *Wirtschaft und Gesellschaft Chinas* denounced my belief in the objectivity of science.[19] It was at this time that the Soviet publishers ceased to print my analyses of Asiatic society in general and of Chinese society in particular.[c]

In the 1930's I gradually abandoned the hope that in the USSR the nationalization of all major means of production might initiate popular control over the government and the rise of a classless society. Deepened understanding of the character of Soviet society paved the way to further insights into the structure and ideology of bureaucratic despotism. Re-examination of the Marxist-Leninist view of Oriental society made it clear that Marx, far from originating the "Asiatic" concept, had found it ready-made in the writings of the classical economists. I further realized that although Marx accepted the classical view in many important essentials, he failed to draw a conclusion, which from the standpoint of his own theory seemed inescapable—namely, that under the conditions of the Asiatic mode of production the agromanagerial bureaucracy constituted the ruling class.

Lenin's ambivalence toward the "Asiatic system" is perhaps even more revealing. In 1906–07 Lenin admitted that the next Russian revolution, instead of initiating a socialist society, might lead to an

b. I cited Marx' statements on this point in 1927 (Wittfogel, 1927: 296) and again in 1929 (*ibid.*, 1929a: 581 and n. 60; see also 585).

c. My article, "Geopolitik, geographischer Materialismus und Marxismus," which argued the importance of the natural factor for societal growth in general and for Asiatic society in particular (see Wittfogel, 1929: 725–8) was published in *Unter dem Banner des Marxismus* without editorial comment, whereas in the Russian version of the same journal (*Pod znamenem marxizma*, 1929, Nos. 2/3, 6, 7/8) the editor indicated his disagreement with some of the author's views. In 1930, the journal refused to publish the continuation of my article, which carried farther the analysis of the natural foundations of Asiatic society (see Wittfogel, 1932: 593 ff., 597–608). For corrections of certain of my early views on the man-nature relationship see below, Chap. 1; cf. Chap. 9). My book *Wirtschaft und Gesellschaft Chinas* was translated into Russian, and the typewritten translation was circulated among a number of Soviet experts, who were asked to write a critical introduction. To my knowledge, such an introduction was never written. The translation was never published.

"Asiatic restoration." But when World War I opened up new possibilities for a revolutionary seizure of power, he completely dropped the Asiatic concept, which, with oscillations, he had upheld for twenty years. By discussing Marx' views of the state without reproducing Marx' ideas of the Asiatic state and the Oriental despotism of Tsarist Russia, Lenin wrote what probably is the most dishonest book of his political career: *State and Revolution*. The gradual rejection of the Asiatic concept in the USSR, which in 1938 was climaxed by Stalin's re-editing of Marx' outstanding reference to the Asiatic mode of production, logically followed Lenin's abandonment of the Asiatic concept on the eve of the Bolshevik revolution.

8.

THE CAMPAIGN against the Asiatic concept shows the master minds of the Communist camp unable to bolster their rejection with rational arguments. This in turn explains the oblique and primarily negative methods with which the friends of Communist totalitarianism in the non-Communist world oppose the outlawed concept. To the uninitiated these methods, which use distortion and de-emphasis rather than open discussion, are confusing. To the initiated they disclose once more the scientific weakness of the most powerful attack against the theory of Oriental (hydraulic) society.

9.

THE PICTURE of hydraulic society given in this inquiry implies definite concepts of societal type and development. No doubt there is structure and cohesion in man's personal history. All individuals base their behavior on the conviction that the regularities of yesterday are necessarily linked to the regularities of today and tomorrow. And there is structure and cohesion in the history of mankind. Individuals and groups of individuals like to speak of institutional units which they see operating in the present and which they expect to operate, or to change recognizably, in the future. Agnostic withdrawal from the problem of development therefore ceases to be plausible as soon as it is clearly defined.

However, the absurdity of developmental agnosticism provides no excuse for a scheme of historical change that insists on a unilinear, irresistible, and necessarily progressive development of society. Marx' and Engels' acceptance of Asiatic society as a separate and stationary conformation shows the doctrinal insincerity of those who, in the name of Marx, peddle the unilinear construct. And the comparative study of societal conformations demonstrates the empirical un-

tenability of their position. Such a study brings to light a complex sociohistorical pattern, which includes stagnation as well as development and diversive change and regression as well as progress. By revealing the opportunities, and the pitfalls, of open historical situations, this concept assigns to man a profound moral responsibility, for which the unilinear scheme, with its ultimate fatalism, has no place.

10.

CONGRUENT with the arguments given above, I have started my inquiry with the societal order of which agromanagerial despotism is a part; and I have stressed the peculiarity of this order by calling it "hydraulic society." But I have no hesitancy in employing the traditional designations "Oriental society" and "Asiatic society" as synonyms for "hydraulic society" and "agromanagerial society"; and while using the terms "hydraulic," "agrobureaucratic," and "Oriental despotism" interchangeably, I have given preference to the older formulation, "Oriental despotism" in my title, partly to emphasize the historical depth of my central concept and partly because the majority of all great hydraulic civilizations existed in what is customarily called the Orient. Originally I had planned to publish this study under the title *Oriental Society*.

The preservation of the old nomenclature stands us in good stead when we examine recent developments. For while there are some traces of hydraulic society left in certain regions of Latin America, the heritage of the old order is still very conspicuous in many countries of the Orient proper. The problem of hydraulic society in transition is therefore primarily the problem of this area.

Under what influences and in what ways are the people of the East throwing off the conditions of hydraulic society which they maintained for millennia? The significance of this question becomes fully apparent only when we understand that Oriental despotism atomized those nonbureaucratic groups and strata which, in feudal Europe and Japan, spearheaded the rise of a commercial and industrial society. Nowhere, it seems, did hydraulic society, without outside aid, make a similar advance. It was for this reason that Marx called Asiatic society stationary and expected British rule in India to accomplish "the only *social* revolution ever heard of in Asia" by establishing there a property-based non-Asiatic society.[20]

Subsequent events indicate that Marx seriously overrated the transformative strength of capitalist economy. To be sure, Western rule in India and other Oriental countries provided new possibilities

for a nontotalitarian development; but at the end of the era of Western colonialism and despite the introduction of parliamentary governments of various kinds, the political leaders of the Orient are still greatly attracted by a bureaucratic-managerial policy which keeps the state supremely strong and the nonbureaucratic and private sector of society supremely weak.

11.

IN THIS CONTEXT, certain aspects of Russia's recent development deserve the most careful scrutiny. The marginally Oriental civilization of Tsarist Russia was greatly influenced by the West, though Russia did not become a Western colony or semi-colony. Russia's Westernization radically changed the country's political and economic climate, and in the spring of 1917 its antitotalitarian forces had a genuine opportunity to accomplish the anti-Asiatic social revolution which Marx, in 1853, had envisaged for India. But in the fall of 1917 these antitotalitarian forces were defeated by the Bolshevik champions of a new totalitarian order. They were defeated because they failed to utilize the democratic potential in a historical situation that was temporarily open. From the standpoint of individual freedom and social justice, 1917 is probably the most fateful year in modern history.

The intellectual and political leaders of non-Communist Asia, who profess to believe in democracy and who in their majority speak deferentially of Marx, will fulfill their historical responsibility only if they face the despotic heritage of the Oriental world not less but more clearly than did Marx. In the light of the Russian experience of 1917 they should be willing to consider the issue of an "Asiatic restoration" not only in relation to Russia but also to present-day Asia.

12.

THE MASTERS of the modern totalitarian superstate build big and integrated institutions, which, they say, we cannot emulate. And they display big and integrated ideas, which, they say, we cannot match. They are right in one respect. We do not maintain totalitarian systems of integrated power and ideology. Favorable constellations of historical events have permitted us to avoid these monstrous developments that paralyze the search for scientific truth and social improvement. But our opponents are wrong when they hold us incapable of voluntary association because we reject the disciplines of general (state) slavery. They are wrong when they hold us incapable

of producing big and structured ideas because we reject state-imposed dogma.

Political freedom is not identical with the absence of organized action, though our enemies would be happy if this were so. And intellectual freedom is not identical with the absence of integrated thought. It is only under the conditions of free discussion that comprehensive sets of ideas can be genuinely tested.

In the recent past, scholars often gave themselves to the study of details because they took the broad principles of life and thought for granted. Seeing these principles threatened, they today begin to recall that the trail blazers of modern thought viewed nature and society as integrated orders whose architecture they explored. The Newtons, Montesquieus, Adam Smiths, and Darwins provided new interpretations of the world that were as spontaneous as they were coherent, and as bold as they were competent.

You cannot fight something with nothing. In a crisis situation, any theoretical vacuum, like any power vacuum, invites disaster. There is no excuse for letting the enemy have things his way when our side possesses infinite reserves of superior strength. There is no excuse for letting the totalitarian strategists parade their contrived doctrines on ground that is legitimately ours. There is no excuse for letting them win the battle of ideas by default.

Scientific inquiry has its inner laws. But it earns the privilege of freedom only when, rooted in the heritage of the past, it alertly faces the threats of a conflict-torn present and boldly exhausts the possibilities of an open future.

CHAPTER 1

The natural setting of hydraulic society

A. CHANGING MAN IN CHANGING NATURE

CONTRARY to the popular belief that nature always remains the same—a belief that has led to static theories of environmentalism and to their equally static rejections—nature changes profoundly whenever man, in response to simple or complex historical causes, profoundly changes his technical equipment, his social organization, and his world outlook. Man never stops affecting his natural environment. He constantly *transforms* it; and he *actualizes*[a] new forces whenever his efforts carry him to a new level of operation. Whether a new level can be attained at all, or once attained, where it will lead, depends first on the institutional order[b] and second on the ultimate target of man's activity: the physical, chemical, and biological world accessible to him. Institutional conditions being equal, it is the difference in the natural setting that suggests and permits—or precludes—the development of new forms of technology, subsistence, and social control.

A waterfall interested primitive man little except as a landmark or an object of veneration. When sedentary man developed industry on a sophisticated mechanical level, he actualized the motive energy of water; and many new enterprises (mills) arose on the banks of rushing streams. The discovery of the technical potential inherent in coal made man geology conscious as never before, and the water mill became a romantic survival in the revolutionized industrial landscape dominated by the steam engine.

a. For the terms "transformation" and "actualization," as used here, see Wittfogel, 1932: 482.

b. This formulation differs from my earlier concept of the relation between man and nature (Wittfogel, 1932: 483 ff., 712 ff.) in its emphasis on the primary importance of institutional (and cultural) factors. From this premise follows the recognition of man's freedom to make a genuine choice in historically open situations, a point developed in the later part of the present chapter. Except for these corrections—which are essential also for my criticism of certain ideas of Marx that I had previously accepted—I am upholding the substance of my earlier views (see Wittfogel, 1931: 21 ff.; *ibid.*, 1932: 486 ff.).

In recent years man has uncovered the productive energies of electricity. Again he is turning his attention to falling water. But even when the engineer of the 20th century erects his power plant on the very spot that previously supported a textile mill, he actualizes new forces in the old setting. Nature acquires a new function; and gradually it also assumes a new appearance.

B. THE HISTORICAL PLACE OF HYDRAULIC SOCIETY

WHAT is true for the industrial scene is equally true for the agricultural landscape. The hydraulic potential of the earth's water-deficient regions is actualized only under specific historical circumstances. Primitive man has known water-deficient regions since time immemorial; but while he depended on gathering, hunting, and fishing, he had little need for planned water control. Only after he learned to utilize the reproductive processes of plant life did he begin to appreciate the agricultural possibilities of dry areas, which contained sources of water supply other than on-the-spot rainfall. Only then did he begin to manipulate the newly discovered qualities of the old setting through small-scale irrigation farming (hydroagriculture) and/or large-scale and government-directed farming (hydraulic agriculture). Only then did the opportunity arise for despotic patterns of government and society.

The opportunity, not the necessity. Large enterprises of water control will create no hydraulic order, if they are part of a wider nonhydraulic nexus. The water works of the Po Plain, of Venice, and of the Netherlands modified regional conditions; but neither Northern Italy nor Holland developed a hydraulic system of government and property. Even the Mormons, who established a flourishing hydraulic agriculture in the heart of arid North America, never succeeded in completely eliminating the political and cultural influence of their wider industrial environment. The history of the Latter-Day Saints illustrates both the organizational potential of large-scale irrigation and the limitations imposed on the development of hydraulic institutions by a dominant Western society.

Thus, too little or too much water does not necessarily lead to governmental water control; nor does governmental water control necessarily imply despotic methods of statecraft. It is only above the level of an extractive subsistence economy, beyond the influence of strong centers of rainfall agriculture, and below the level of a property-based industrial civilization that man, reacting specifically to the water-deficient landscape, moves toward a specific hydraulic order of life.

C. THE NATURAL SETTING

1. HISTORICAL CONDITIONS BEING EQUAL, A MAJOR NATURAL DIFFERENCE THE POSSIBLE CAUSE OF DECISIVE INSTITUTIONAL DIFFERENCES

MANY factors differentiated agrarian life prior to the industrial age, but none equaled in institutional significance the stimulating contradictions offered by arid areas possessing accessible sources of water supply other than on-the-spot rainfall. Under the just-defined conditions of preindustrial agriculture, this natural configuration decisively affected man's behavior as a provider of food and organizer of human relations. If he wanted to cultivate dry but potentially fertile lands permanently and rewardingly, he had to secure a reliable flow of moisture. Of all tasks imposed by the natural environment, it was the task imposed by a precarious water situation that stimulated man to develop hydraulic methods of social control.

2. SEVERAL NATURAL FACTORS ESSENTIAL TO FARMING

WATER is not the only natural factor essential for successful crop raising. Anyone wishing to farm must have at his disposal useful plants, an arable soil, adequate humidity, appropriate temperature (sufficient sun and a proper growing season), and a suitable lay of the land (relief, surface).[a]

All these elements are equally essential. The lack of any one of them destroys the agronomic value of all the others. Cultivation remains impossible unless human action can compensate for the total deficiency of any essential factor.

3. SOME ESSENTIAL FACTORS DEFY COMPENSATING ACTION; OTHERS RESPOND MORE READILY

THE effectiveness of man's compensating action depends on the ease with which a lacking natural factor can be replaced. Some factors must be considered constants because, under existing technological conditions, they are for all practical purposes beyond man's control. Others are more pliable. Man may manipulate or, if necessary, change them.

Temperature and surface are the outstanding constant elements of the agricultural landscape. This was true for the premachine age; and it is still essentially true today. Pre-industrial attempts to change

a. For similar attempts at defining the natural factors basic to agriculture see CM: 125; SM: 753; Widtsoe, 1928: 19 ff.; Buck, 1937: 101.

the temperature of farming areas have, for obvious reasons, met with no success; and even such achievements as central heating and air conditioning have wrought no major change. Still less has man succeeded in altering the cosmic circumstances which ultimately determine the temperature of the earth.

The lay of the land has equally defied human effort. Man has made many minor adjustments such as leveling or terracing—most frequently, it would seem, in connection with operations of hydro-agriculture. But before modern power machines and high explosives were invented, the globe's relief remained fundamentally unaltered. Even machine-promoted agriculture, like the technically less advanced forms of farming, prospers on the even surfaces of lowlands and high plateaus or on gently graded slopes and hills, and not in rugged mountainous terrain.

Vegetation and soil do not resist human action to any comparable degree. The farmer professionally manipulates plants and soils. He may transfer useful plants to regions lacking them, and he frequently does so. However, such action is sporadic and temporary; it ceases when the limited objective is achieved. In a given agricultural area the operations of crop breeding are repeated again and again; but the plants cover the ground discontinuously, and although under certain circumstances farm labor may be coordinated in work teams, there is nothing in the nature of the individual plants or plant aggregates which necessitates large-scale cooperation as a prerequisite for successful cultivation. Before the machine age the greater part of all agriculture proceeded most effectively when individual husbandmen or small groups of husbandmen attended to the crops.

The second variable factor, soil, follows a similar pattern, with special limitations dictated by the relative heaviness of pulverized mineral substance. While seeds or plants have frequently been transferred to deficient areas, soil has rarely been moved to barren regions. No doubt, poor or useless fields have been improved by bringing better soil from a distance. But such action is of little consequence for the character of any major farming area.[1] Man's efforts seek primarily to adjust the existing soil to the needs of the crops by hoeing, digging, or plowing, and on occasion by improving its chemical composition through the application of fertilizers.

Thus soil is susceptible to manipulation, but to a type of manipulation that requires work groups no larger than are necessary for the cultivation of the plants. Even when, under primitive conditions, the clearing of the ground and the gathering of the harvest are undertaken by large teams, the actual task of tilling the fields is usually left to one or a few individuals.

4. The Specific Qualities of Water

Compared with all other essential natural prerequisites of agriculture, water is *specific*. Temperature and surface, because of their respective cosmic and geological dimensions, have completely precluded or strikingly limited human action throughout the preindustrial era and afterward. In contrast, water is neither too remote nor too massive to permit manipulation by man. In this regard it resembles two other variables, vegetation and soil. But it differs greatly from both in its susceptibility to movement and in the techniques required to handle it.

Water is heavier than most plants. It can nevertheless be much more conveniently managed. Unhampered by the cohesiveness of solid matter and following the law of gravity, water flows automatically to the lowest accessible point in its environment. Within a given agricultural landscape, water is the natural variable *par excellence*.

And this is not all. Flowing automatically, water appears unevenly in the landscape, gathering either below the surface as ground water, or above the surface in separate cavities (holes, ponds, lakes), or continuous beds (streams, rivers). Such formations are of minor significance in an agricultural area enjoying ample precipitation, but they become immensely important in the water-deficient landscape. The human operator who has to handle water deals with a substance that is not only more mobile than other agronomic variables, but also more bulky.

This last quality presents special difficulties whenever man tries to utilize large agglomerations of moisture; and this he is prone to do whenever natural and technological conditions permit. No operational necessity compels him to manipulate either soil or plants in cooperation with many others. But the bulkiness of all except the smallest sources of water supply creates a technical task which is solved either by mass labor or not at all.

D. Must the Hydraulic Potential Be Actualized?

1. An Open Historical Situation—but Recognizable Patterns of Response

The stimulating contradiction inherent in a potentially hydraulic landscape is manifest. Such a landscape has an insufficient rainfall or none at all; but it possesses other accessible sources of water supply. If man decides to utilize them, he may transform dry lands

into fertile fields and gardens. He may, but will he? What makes him engage in a venture which involves great effort and which is fraught with highly problematic institutional consequences?

Historical evidence reveals that numerous groups of persons have made this decision. Yet it also reveals that many others have failed to do so. Over millennia, tribal gatherers, hunters, fishermen, and pastoralists inhabited potentially hydraulic regions, often in close proximity to irrigation farmers, but few abandoned their traditional occupations for a hydroagricultural way of life.

Manifestly, no irresistible necessity compelled man to utilize the new natural opportunities. The situation was open, and the hydroagricultural course was only one of several possible choices. Nevertheless, man took this course so frequently and in so many separate areas that we may assume regularity in evaluation as well as in procedure.

Man pursues recognized advantage. Whenever internal or external causes suggest a change in technology, material production, or social relations, he compares the merits of the existing situation with the advantages—and disadvantages—that may accrue from the contemplated change. Special effort is required to attain the new objective; and this effort may involve not only increased work and a shift from pleasant to unpleasant operations, but also social and cultural adjustments, including a more or less serious loss of personal and political independence.

When the sum total of the accruing benefits clearly and convincingly exceeds the required sacrifices, man is willing to make the change; but problematic advantage usually leaves him cool. Here, as elsewhere, the human budget is compounded of material and nonmaterial items; any attempt to formulate it exclusively in terms of smaller or larger quantities of things (goods) will prove unsatisfactory. To be sure, the material factor weighs heavily, but its relative importance can be reasonably defined only when full recognition is given to such other values as personal safety, absence of oppression, and time-honored patterns of thought and action.

Culture historians have made much of the fact that during the "recent" epoch of geozoology [1] clusters of persons adopted agriculture, either as a supplementary occupation or, and increasingly, as their main subsistence economy. No doubt this transition profoundly affected the fate of mankind; but any reference to the law of recognized advantage must take into account the many primitive groups that did not turn to crop-raising either during the days of incipient agriculture or after the rise of powerful and stratified agrarian civilizations.

The agrarian alternative had a limited—and very diverse—appeal

to nonfarming groups when cultivation was primitive and leadership not overly demanding. After the emergence of stratified agricultural societies, choice became even more serious. The authority wielded by the governments and wealthy landowners of nearby agrarian states acted as a deterrent, for under these conditions a shift might involve submission to distasteful methods of political and proprietary control. Often women, children, and war captives tilled some few fields close to a camp site; but the dominant members of the tribe, the adult males, stubbornly refused to abandon their hunting, fishing, or herding activities. The many primitive peoples who endured lean years and even long periods of famine without making the crucial changeover to agriculture demonstrate the immense attraction of nonmaterial values, when increased material security can be attained only at the price of political, economic, and cultural submission.

2. The Recognized Advantages of Irrigation Agriculture

The transition to irrigation farming poses the problem of choice in a still more complex form. The primary choice—whether or not to start hydroagriculture where it had not been known previously—was generally, though perhaps not exclusively, made by groups familiar with the techniques of primitive rainfall farming.

The secondary (derivative) choice—whether or not to emulate an established irrigation economy—confronts the traditional rainfall farmer as well as the nonagricultural tribesman. But the nonagriculturist is much less prepared technically and culturally to make this shift; and in both cases decision becomes more precarious when acceptance of a materially attractive irrigation economy involves reduction to an abjectly low social and political status.

It is obviously for this reason that a number of communities practicing rainfall farming in Southwest China, India, and Meso-America as well as many tribal hunters, fishermen, and herders on the fringe of the hydroagricultural world failed to make the change. The fate of those who rejected the ambivalent opportunity varied greatly; but whatever their subsequent fortunes, history offered most of them a genuine choice, and man proceeded not as the passive instrument of an irresistible and unilinear developmental force but as a discriminating being, actively participating in shaping his future.

a. If . . . , then . . .

Irrigation farming always requires more physical effort than rainfall farming performed under comparable conditions. But it requires

radical social and political adjustments only in a special geohistorical setting. Strictly local tasks of digging, damming, and water distribution can be performed by a single husbandman, a single family, or a small group of neighbors, and in this case no far-reaching organizational steps are necessary. Hydroagriculture, farming based on small-scale irrigation, increases the food supply, but it does not involve the patterns of organization and social control that characterize hydraulic agriculture and Oriental despotism.

These patterns come into being when an experimenting community of farmers or protofarmers finds large sources of moisture in a dry but potentially fertile area. If irrigation farming depends on the effective handling of a major supply of water, the distinctive quality of water—its tendency to gather in bulk—becomes institutionally decisive. A large quantity of water can be channeled and kept within bounds only by the use of mass labor; and this mass labor must be coordinated, disciplined, and led. Thus a number of farmers eager to conquer arid lowlands and plains are forced to invoke the organizational devices which—on the basis of premachine technology—offer the one chance of success: they must work in cooperation with their fellows and subordinate themselves to a directing authority.

Again history followed no unilinear course dictated by unavoidable necessity. There were recognized alternatives; and those who were faced with them were able to make a genuine choice. But whatever their decisions, they were made within a framework that offered only a limited number of workable possibilities.

Thus the changeover to hydraulic agriculture, or its rejection, was not without order or direction. The various decisions displayed regularities in conditioning and motivation. But the relative equality of the original choices did not imply a relative equality in the final results. The majority of all hunters, fishermen, and rainfall farmers who preserved their traditional way of life were reduced to insignificance, if they were not completely annihilated. Some groups, practicing a mixed economy with little or no hydroagriculture, were strong enough to impose their will on adjacent hydraulic civilizations.

The herders came into their own at a relatively late time and in a special geohistorical setting. Often they maintained themselves against all manner of agriculturists, and in a number of instances they engaged in sweeping offensives, accomplishing conquests that profoundly modified the political and social structure of the subdued agrarian civilizations.

The representatives of rainfall farming made history in certain areas of the West, which was uniquely suited to this type of economy.

But the hydraulic agriculturists outgrew and outfought the majority of all neighboring peoples wherever local conditions and international circumstances one-sidedly favored an agromanagerial economy and statecraft.

The pioneers of hydraulic agriculture, like the pioneers of rainfall farming, were unaware of the ultimate consequences of their choice. Pursuing recognized advantage, they initiated an institutional development which led far beyond the starting point. Their heirs and successors built colossal political and social structures; but they did so at the cost of many of those freedoms which the conservative dissenters endeavored and, in part, were able to preserve.

b. Arid, Semi-arid, and Humid Areas: Hypothetical Patterns of Interaction and Growth

IN THEIR PURSUIT of recognized advantage, rainfall farmers experimented with hydroagriculture not only in desert-like areas of full aridity and steppe-like areas of semi-aridity, but also in humid areas suitable to the cultivation of useful aquatic plants, above all rice.

The first two types of landscapes, taken together, cover almost three-fifths [2]—and all three possibly something like two-thirds—of the globe's surface. Within this area each of the three types of potentially hydraulic landscapes may have played a specific role, particularly in the formative period of a hydraulic economy. In a major sector comprising all three types, the semi-arid regions are highly suitable to small and gradually growing enterprises of water control. The arid regions provide an ultimate testing ground for the new techniques. And the semi-arid and humid regions profit further from the technical and organizational experience gained in man's victory over the desert.

This may well have been the sequence in the spread of hydraulic agriculture in such widely separated areas as ancient Mesopotamia, India, and the western zone of South America. A different order of development is probable for landscapes that are homogeneously arid, and still another for those that are predominantly semi-arid.

In each case, the presence or absence of adjacent humid regions complicated the pattern of growth. In Egypt, gatherers, hunters, and fishermen seem to have practiced agriculture as a subsidiary occupation on the naturally flooded banks of the Nile long before farming became the primary pursuit. In Meso-America [a] and in

a. Some twenty years ago I considered Aztec Mexico, like pre-Tokugawa Japan, a feudal society with small-scale irrigation (Wittfogel, 1932: 587 ff.). On the basis of a

China diffusion (from South America and Inner or South Asia respectively) cannot be excluded. But such external stimulation need not have occurred; if it did, it was effective only because the rainfall farmers in the "stimulated" areas were ready to recognize the advantages of the new technique.

In ancient China the semi-arid North and the rice-growing South established noteworthy forms of interaction. The ancient Yangtze states developed early and perhaps under the influence of the rice culture of Southeast Asia; but it was the semi-arid North which,

growing familiarity with the early sources I came to recognize the hydraulic character of the core areas of pre-Spanish Mexico; and the recent work of Mexican archaeologists and historians fortifies me in my conclusion (see Armillas, 1948: 109; *ibid.*, 1951: 24 ff.; Palerm, 1952: 184 ff.). I quote particularly from a study by Palerm which provides a wealth of historical data on irrigation in both pre-Spanish and early Spanish Meso-America:

> 4. The majority of the irrigation systems seem to have been only of local importance and did not require large hydraulic undertakings. Nevertheless, important works were undertaken in the Valley of Mexico, and irrigation appears in concentrated form in the headwaters of the rivers Tula, Lerma and Atlixco, and in the contiguous area of Colima-Jalisco.
>
> 5. The largest concentrations and most important works of irrigation coincide, generally, with the greatest density of population, with the distribution of the most important urban centers, and with the nuclei of political power and military expansion [Palerm, 1954: 71].

How far back can we trace hydraulic activities in Meso-America? Armillas believes that the great cultural advance in the Hohokam civilization of Arizona (A.D. 500–900) was probably due to the construction of irrigation canals, a fact which is archaeologically established. And since the remains point to relations between Hohokam and Meso-America, he believes that "the same factor may underlie the cultural development in certain areas of western Meso-America during this period" (Armillas, 1948: 107). The Hohokam data tie in with the "classical" period of Meso-American history, which, in the Mexican lake area, probably began in the early centuries of the first millennium A.D. Armillas' assumption is reinforced by a recent pollen analysis, which suggests that aridity increased during the late "archaic" period (Sears, 1951: 59 ff.). Palerm has stated that this climatic change may have caused "the emergence or extension of irrigation" in Meso-America (1955: 35). Such a hypothesis, and it seems an eminently plausible one, would go far to explain the beginnings of a "classical" period of concentrated populations and monumental building, not only in the highlands but also in the marginal hydraulic Maya civilization.

If a vigorous hydraulic development occurred in Meso-America at the end of the first millennium B.C. or shortly thereafter, subsequent oscillations in hydraulic operation present no basic theoretical difficulties. Recent investigations by Palerm and Wolf indicate a rather late date for the comprehensive waterworks undertaken by the territorial state of Texcoco, which, when the Spaniards arrived, was second only to Mexico. The relative lateness of this development does not necessarily indicate that originally Texcoco was outside the hydraulic pale. More likely, the Texcocan government moved gradually from marginal to more central hydraulic conditions. (For the problem of changing hydraulic density, see below, Chap. 6.)

over a long period of time, constituted the dominant center of power and cultural advance in Eastern Asia. In India the arid, semi-arid, and humid regions of the North became historically prominent before the excessively humid area of Bengal.

These developmental sequences are presented as hypotheses. Their validity, or lack of validity, is of no consequence to our analysis of societal structure. They are worth noting, in the main, because on the basis of our present archaeological and prehistorical knowledge they suggest a highly dynamic interplay between the various types of landscapes which combine to form the larger areas of hydraulic civilization.

CHAPTER 2

Hydraulic economy—a managerial and genuinely political economy

THE CHARACTERISTICS of hydraulic economy are many, but three are paramount. Hydraulic agriculture involves a specific type of division of labor. It intensifies cultivation. And it necessitates cooperation on a large scale. The third characteristic has been described by a number of students of Oriental farming. The second has been frequently noted, but rarely analyzed. The first has been given practically no attention. This neglect is particularly unfortunate, since the hydraulic patterns of organization and operation have decisively affected the managerial role of the hydraulic state.

Economists generally consider the division of labor and cooperation key prerequisites of modern industry, but they find them almost completely lacking in farming.[a] Their claim reflects the conditions of Western rainfall agriculture. For this type of agriculture it is indeed by and large correct.

However, the economists do not as a rule so limit themselves. Speaking of agriculture without any geographical or institutional qualification, they give the impression that their thesis, being universally valid, applies to hydraulic as well as to hydroagriculture and rainfall farming. Comparative examination of the facts quickly discloses the fallacy of this contention.

a. For early formulations of this view see Smith, 1937: 6; Mill, 1909: 131, 144; Marx, DK, I: 300, 322 ff. Modern economists have perpetuated and even sharpened them. Writes Seligman (1914: 350): "In the immense domain of agricultural production the possibility of combination is almost entirely eliminated." And Marshall (1946: 290): "In agriculture there is not much division of labour, and there is no production on a very large scale."

A. DIVISION OF LABOR IN HYDRAULIC AGRICULTURE

1. Preparatory and Protective Operations Separated from Farming Proper

WHAT is true for modern industry—that production proper depends on a variety of preparatory and protective operations [b]—has been true for hydraulic agriculture since its beginnings. The peculiarity of the preparatory and protective hydraulic operations is an essential aspect of the peculiarity of hydraulic agriculture.

a. Large-scale Preparatory Operations (Purpose: Irrigation)

THE combined agricultural activities of an irrigation farmer are comparable to the combined agricultural activities of a rainfall farmer. But the operations of the former include types of labor (on-the-spot ditching, damming, and watering) that are absent in the operations of the latter. The magnitude of this special type of labor can be judged from the fact that in a Chinese village a peasant may spend from 20 to over 50 per cent of his work time irrigating, and that in many Indian villages irrigation is the most time-consuming single item in the farmer's budget.[1]

Hydroagriculture (small-scale irrigation farming) involves a high intensity of cultivation on irrigated fields—and often also on non-irrigated fields.[2] But it does not involve a division of labor on a communal, territorial, or national level. Such a work pattern occurs only when large quantities of water have to be manipulated. Wherever, in pre-industrial civilizations, man gathered, stored, and conducted water on a large scale, we find the conspicuous division between preparatory (feeding) and ultimate labor characteristic of all hydraulic agriculture.

b. Large-scale Protective Operations (Purpose: Flood Control)

BUT the fight against the disastrous consequences of too little water may involve a fight against the disastrous consequences of too much water. The potentially most rewarding areas of hydraulic farming

b. For the concept of "previous or preparatory labor" see Mill 1909: 29, 31. The general principle was already indicated by Smith (1937), who, when discussing the division of operations in industry, pointed to the "growers of the flax and the wool" and the miners as providers of raw material (5 ff., 11), to the spinners and weavers as engaged in special processing operations (6), and to the makers of tools as combining elements of both procedures (11). Mill (1909: 36 ff.) also includes, in the category of previous labor, activities aimed at protecting industrial production proper.

are arid and semi-arid plains and humid regions suitable for aquatic crops, such as rice, that are sufficiently low-lying to permit watering from nearby rivers. These rivers usually have their sources in remote mountains, and they rise substantially as the summer sun melts part of the snow accumulated there.

Upstream developments of this kind cause annual inundations in Egypt, Mesopotamia, Turkestan, India, China, and in the Andean and Mexican zones of America. In semi-arid areas on-the-spot rains create additional dangers when they are overconcentrated (convectional) or irregular. This condition prevails in North China, northern Mesopotamia (Assyria), and the Mexican lake region. Thus a hydraulic community that resorts to preparatory labor to safeguard the productive use of water may also have to resort to protective labor to safeguard its crops from periodic and excessive inundations.

When, in protohistorical times, the Chinese began to cultivate the great plains of North China, they quickly recognized that the centers of greatest potential fertility were also the centers of greatest potential destruction. To quote John Lossing Buck: "Geologically speaking, man has settled these plains thousands of years before they were ready for occupation. . . ." [3] The Chinese built huge embankments which, although unable to remove entirely the risk inhering in the ambivalent situation, matched and even surpassed in magnitude the area's preparatory (feeding) works.[4]

In India enormous problems of flood control are posed by the Indus River [5] and, in a particularly one-sided way, by the Ganges and Brahmaputra Rivers, which in Bengal create optimal conditions for the cultivation of rice and maximal dangers from floods. By 1900 Bengal boasted ninety-seven miles of larger irrigation canals and 1,298 miles of embankments.[6]

In ancient Mesopotamia even watchful rulers could not completely prevent the inundations from damaging the densely settled plains.[7] In Turkestan excessive floods periodically threatened the Zarafshan River Valley.[8] In Upper Egypt the Nile, in very high flood, rises one meter above the level of the settled countryside, in Middle Egypt two meters, and in the Delta area up to three and a half meters.[9] The inhabitants of the lake area of Mexico could benefit from its fertility only if they accepted the periodic overflow of its short, irregular, narrow streams,[10] which they sought to control through a variety of protective works. Thus in virtually all major hydraulic civilizations, preparatory (feeding) works for the purpose of irrigation are supplemented by and interlocked with protective works for the purpose of flood control.

2. Cooperation

A study of the hydraulic patterns of China (especially North China), India, Turkestan, Mesopotamia (especially Assyria), Egypt, or Meso-America (especially the Mexican lake region) must therefore consider both forms of agrohydraulic activities. Only by proceeding in such a way can we hope to determine realistically the dimension and character of their organizational key device: cooperation.

a. Dimension

When a hydraulic society covers only a single locality, all adult males may be assigned to one or a few communal work teams. Varying needs and circumstances modify the size of the mobilized labor force. In hydraulic countries having several independent sources of water supply, the task of controlling the moisture is performed by a number of separated work teams.

Among the Suk of Northeastern Africa, "every male must assist in making the ditches." [11] In almost all Pueblos "irrigation or cleaning a spring is work for all." [12] Among the Chagga, the maintenance of a relatively elaborate irrigation system is assured by "the participation of the entire people." [13] In Bali the peasants are obliged to render labor service for the hydraulic regional unit, the *subak,* to which they belong.[14] The masters of the Sumerian temple economy expected every adult male within their jurisdiction "to participate in the digging and cleaning of the canals." [15] Most inscriptions of Pharaonic Egypt take this work pattern for granted. Only occasionally does a text specify the character of the universally demanded activities, among which lifting and digging are outstanding.[16]

In imperial China every commoner family was expected on demand to provide labor for hydraulic and other public services. The political and legal writings of India indicate a similar claim on corviable labor.[17] The laws of Inca Peru obliged all able-bodied men to render *corvée* service.[18] In ancient Mexico both commoner and upper-class adolescents were instructed in the techniques of digging and damming.[19] At times the masters of this hydraulic area levied the manpower of several territorial states for their gigantic hydraulic enterprises.[20]

In 19th-century Egypt "the whole corviable population" worked in four huge shifts on Mehmed Ali's hydraulic installations. Each group labored on the canals for forty-five days until, after 180 days, the job was completed.[21] From 1881 on, at a time of decay and disintegration, "the *whole* of the corvée fell on the poorest classes," [22] the smaller number being compensated for by an increase in the

labor-time to ninety days. In some regions the conscripts were kept busy "for 180 days." [23]

b. Integration

ORDERLY cooperation involves planned integration. Such integration is especially necessary when the objectives are elaborate and the cooperating teams large.

Above the tribal level, hydraulic activities are usually comprehensive. Most writers who mention the cooperative aspect of hydraulic agriculture think in the main of digging, dredging, and damming; and the organizational tasks involved in these labors is certainly considerable. But the planners of a major hydraulic enterprise are confronted with problems of a much more complex kind. How many persons are needed? And where can such persons be found? On the basis of previously made registers, the planners must determine the quota and criteria of selection. Notification follows selection, and mobilization notification. The assembled groups frequently proceed in quasimilitary columns. Having reached their destination, the buck privates of the hydraulic army must be distributed in proper numbers and according to whatever division of operations (spading, carrying of mud, etc.) is customary. If raw materials such as straw, fagots, lumber, or stone have to be procured, auxiliary operations are organized; and if the work teams—*in toto* or in part—must be provided with food and drink, still other ways of appropriation, transport, and distribution have to be developed. Even in its simplest form, agrohydraulic operations necessitate substantial integrative action. In their more elaborate variations, they involve extensive and complex organizational planning.

c. Leadership

ALL TEAMWORK requires team leaders; and the work of large integrated teams requires on-the-spot leaders and disciplinarians as well as over-all organizers and planners. The great enterprises of hydraulic agriculture involve both types of direction. The foreman usually performs no menial work at all; and except for a few engineering specialists the sergeants and officers of the labor force are essentially organizers.

To be sure, the physical element—including threats of punishment and actual coercion—is never absent. But here, if anywhere, recorded experience and calculated foresight are crucial. It is the circumspection, resourcefulness, and integrative skill of the supreme leader and his aides which play the decisive role in initiating, accomplishing, and perpetuating the major works of hydraulic economy.

d. Hydraulic Leadership—Political Leadership

THE effective management of these works involves an organizational web which covers either the whole, or at least the dynamic core, of the country's population. In consequence, those who control this network are uniquely prepared to wield supreme political power.

From the standpoint of the historical effect, it makes no difference whether the heads of a hydraulic government were originally peace chiefs, war leaders, priests, priest-chiefs, or hydraulic officials *sans phrase*. Among the Chagga, the hydraulic corvée is called into action by the same horn that traditionally rallied the tribesmen for war.[24] Among the Pueblo Indians the war chiefs (or priests), although subordinated to the *cacique* (the supreme chief), direct and supervise the communal activities.[25] The early hydraulic city states of Mesopotamia seem to have been for the most part ruled by priest-kings. In China the legendary trail blazer of governmental water control, the Great Yü, is said to have risen from the rank of a supreme hydraulic functionary to that of king, becoming, according to protohistorical records, the founder of the first hereditary dynasty, Hsia.

No matter whether traditionally nonhydraulic leaders initiated or seized the incipient hydraulic "apparatus," or whether the masters of this apparatus became the motive force behind all important public functions,[c] there can be no doubt that in all these cases the resulting regime was decisively shaped by the leadership and social control required by hydraulic agriculture.

B. HEAVY WATER WORKS AND HEAVY INDUSTRY

WITH regard to operational form, hydraulic agriculture exhibits important similarities to heavy industry. Both types of economic activities are preparatory to the ultimate processes of production. Both

c. Rüstow, who in general accepts Kern's view concerning the correlation between large-scale and government-directed water control and the centralized and despotic character of the state in ancient Egypt and Mesopotamia, assumes that in these areas nomadic conquerors developed the hydraulic works *after* establishing conquest empires (Rüstow, OG, I: 306).

Patterns of leadership and discipline traditional to conquering groups could be, and probably were, invoked in establishing certain hydraulic governments; but Pueblo, Chagga, and Hawaiian society show that such formative patterns could also be endogenous. In any case, the ethnographic and historical facts point to a multiple rather than a single origin for hydraulic societies.

provide the workers with essential material for these ultimate processes. And both tend to be comprehensive, "heavy." For these reasons the large enterprises of hydraulic agriculture may be designated as "heavy water works."

But the dissimilarities are as illuminating as the similarities. The heavy water works of hydraulic agriculture and the heavy industry of modern economy are distinguished by a number of basic differences, which, properly defined, may aid us in more clearly recognizing the peculiarities of hydraulic society.

Heavy water works feed the ultimate agrarian producer one crucial auxiliary material: water; heavy industry provides auxiliary and raw materials of various kinds, including tools for finishing and heavy industry. Heavy water works fulfill important protective functions for the country at large; the protective installations (buildings, etc.) of industry do not. Heavy water works cover at their inception a relatively large area; and with the development of the hydraulic order they are usually spread still further. The operations of heavy industry are spatially much more restricted. At first, and for a number of preliminary processes, they may depend on small and dispersed shops; with the growth of the industrial order they tend to merge into one, or a few, major establishments.

The character of the labor force varies with these spatial and operational differences. Heavy water works are best served by a widely distributed personnel, whereas heavy industry requires the workers to reside near the locally restricted "big" enterprises which employ them. The hydraulic demand is satisfied by adult peasant males, who continue to reside in their respective villages; whereas the industrial demand is satisfied by a geographically concentrated labor force.

The bulk of the hydraulic workers are expected to remain peasants, and in most cases they are mobilized for a relatively short period only—at best for a few days, at worst for any time that will not destroy their agricultural usefulness. Thus division of agrohydraulic labor is not accompanied by a corresponding division of laborers.

The contrast to the labor policy of heavy industry is manifest. Different from heavy water works, which may be created and maintained during a fraction of the year, heavy industry operates most effectively when it operates continuously. The industrial employers prefer to occupy their personnel throughout the year; and with the growth of the industrial system full-time labor became the rule. Thus division of industrial labor moves toward a more or less complete division of laborers.

The two sectors are also differently administered. In the main,

modern heavy industry is directed by private owners or managers. The heavy water works of hydraulic agriculture are directed essentially by the government. The government also engages in certain other large enterprises, which, in varying combinations, supplement the agrohydraulic economy proper.

C. CALENDAR MAKING AND ASTRONOMY—IMPORTANT FUNCTIONS OF THE HYDRAULIC REGIME

AMONG the intellectual functions fulfilled by the leaders of agrohydraulic activities, some are only indirectly connected with the organization of men and material; but the relation is highly significant nevertheless. Time keeping and calendar making are essential for the success of all hydraulic economies; and under special conditions special operations of measuring and calculating may be urgently needed.[1] The way in which these tasks are executed affect both the political and the cultural development of hydraulic society.

To be sure, man is deeply concerned about the swing of the seasons under all forms of extractive economy and throughout the agrarian world. But in most cases he is content to determine in a general way when spring or summer begin, when cold will set in, when rain or snow will fall. In hydraulic civilizations such general knowledge is insufficient. In areas of full aridity it is crucial to be prepared for the rise of the rivers whose overflow, properly handled, brings fertility and life and whose unchecked waters leave death and devastation in their wake. The dikes have to be repaired in the proper season so that they will hold in times of inundation; and the canals have to be cleaned so that the moisture will be satisfactorily distributed. In semi-arid areas receiving a limited or uneven rainfall an accurate calendar is similarly important. Only when the embankments, canals, and reservoirs are ready and in good condition can the scanty precipitation be fully utilized.

The need for reallocating the periodically flooded fields and determining the dimension and bulk of hydraulic and other structures provide continual stimulation for developments in geometry and arithmetic. Herodotus ascribes the beginnings of geometry in Egypt to the need for annually remeasuring the inundated land.[2]

No matter whether the earliest scientific steps in this direction were made in the Nile Valley or in Mesopotamia, the basic correlation is eminently plausible. Obviously the pioneers and masters of hydraulic civilization were singularly well equipped to lay the foundations for two major and interrelated sciences: astronomy and mathematics.

As a rule, the operations of time keeping and scientific measuring

and counting were performed by official dignitaries or by priestly (or secular) specialists attached to the hydraulic regime. Wrapped in a cloak of magic and astrology and hedged with profound secrecy, these mathematical and astronomical operations became the means both for improving hydraulic production and bulwarking the superior power of the hydraulic leaders.

D. FURTHER CONSTRUCTION ACTIVITIES CUSTOMARY IN HYDRAULIC SOCIETIES

THE masters of the hydraulic state did not confine their activities to matters immediately connected with agriculture. The methods of cooperation which were so effective in the sphere of crop-raising were easily applied to a variety of other large tasks.

Certain types of works are likely to precede others. Generally speaking, the irrigation canal is older than the navigation canal; and hydraulic digging and damming occurred prior to the building of highways. But often derivative steps were taken before the original activities had progressed far, and different regional conditions favored different evolutionary sequences. Thus the divergencies of interaction and growth are great. They include many constructional activities above and beyond the sphere of hydraulic agriculture.[a]

1. NONAGRARIAN HYDRAULIC WORKS

a. Aqueducts and Reservoirs Providing Drinking Water

A COMMONWEALTH able to transfer water for purposes of irrigation readily applies its hydraulic know-how to the providing of drinking water. The need for such action was slight in the greater part of Medieval Europe, where the annual precipitation furnished sufficient ground water for the wells on which most towns depended for their water supply.[1]

Even in the hydraulic world, drinking water is not necessarily an issue. Wherever rivers, streams, or springs carry enough moisture

a. Anyone interested in studying the technical and organizational details of a major hydraulic order may consult Willcocks' admirable description of irrigation and flood control in 19th-century Egypt (Willcocks, 1889: *passim*). A comprehensive survey of the hydraulic conditions in India at the close of the 19th century has been made by the Indian Irrigation Commission (RRCAI). In my study of Chinese economics and society I have systematically analyzed the ecological foundations and the various aspects of China's traditional hydraulic order (Wittfogel, 1931: 61–93, 188–300, and 410–56). Today we also have an archaeological account of the growth of hydraulic and other constructions over time and for a limited, but evidently, representative area: the Virú Valley in Perú (see Willey, 1953: 344–89).

to satisfy the drinking needs of the population throughout the year, no major problem arises. The inhabitants of the Nile and Ganges Valleys and of many similar areas did not have to construct elaborate aqueducts for this purpose.

The irregular flow of rivers or streams or the relatively easy access to fresh and clear mountain water has stimulated in many hydraulic landscapes the construction of comprehensive installations for the storage and distribution of drinking water. In America great aqueducts were built by the hydraulic civilizations of the Andean zone and Meso-America.[2] The many reservoirs (tanks) of Southern India frequently serve several uses; but near the large residential centers the providing of drinking water is usually paramount. In certain areas of the Near East, such as Syria and Assyria, brilliantly designed aqueducts have satisfied the water needs of many famous cities, Tyre,[3] Antioch,[4] and Nineveh [5] among them. In the Western world of rainfall agriculture, aqueducts were built primarily by such Mediterranean peoples as the Greeks and the Romans, who since the dawn of history maintained contact with—and learned from—the technically advanced countries of Western Asia and North Africa. No doubt the Greeks and Romans would have been able to solve their drinking-water problem without inspiration from the outside; but the form of their answer strongly suggests the influence of Oriental engineering.[6]

b. Navigation Canals

AMONG the great agrarian conformations of history, only hydraulic society has constructed navigation canals of any major size. The seafaring Greeks, making the Mediterranean their highway, avoided an issue which the ancient city states were poorly equipped to handle. The not-too-numerous Roman canals were apparently all dug at a time when the growing Orientalization of the governmental apparatus stimulated, among other things, a growing interest in all kinds of public works.[7]

The rainfall farmers of Medieval Europe, like their counterparts elsewhere, shunned rather than sought the marshy river lowlands. And their feudal masters paid little attention to the condition of the watercourses, for which they had no use. Still less did they feel obliged to construct additional and artificial rivers—canals. Few if any important canals were built during the Middle Ages,[8] and medieval trade and transport were seriously handicapped by the state of the navigable rivers.[9]

It was in connection with the rise of a governmentally encouraged

commercial and industrial capitalism that the West began to build canals on a conspicuous scale. The "pioneer of the canals of modern Europe," the French Canal du Midi, was completed only in the second half of the 17th century, in 1681,[10] that is, little more than a century before the end of the absolutist regime. And in the classical country of inland navigation, England,[11] "little . . . was done in making canals . . . until the middle of the eighteenth century" [12]—that is, until a time well after the close of England's absolutist period and immediately prior to the beginning of the machine age.

As stated above, the members of a hydraulic commonwealth felt quite differently about the management of natural and artificial watercourses. They approached the fertility-bearing rivers as closely as possible, and in doing so they had to find ways of draining the lowland marshes and strengthening and reshaping the river banks. Naturally the question of inland navigation did not arise everywhere. Existing rivers and streams might be suitable for irrigation, but not for shipping (Pueblos, Chagga, Highland Peru); or the ocean might prove an ideal means of transportation (Hawaii, Coastal Peru). In certain localities inland navigation was satisfactorily served by man-managed rivers (Egypt, India) and lakes (Mexico) plus whatever irrigation canals were large enough to accommodate boats (Mesopotamia).

But when supplementary watercourses were not only possible but desirable, the organizers of agrohydraulic works had little difficulty in utilizing their cooperative "apparatus" to make them available. The new canals might be only minor additions to the existing watercourses. The ancient Egyptians constructed canals in order to circumnavigate impassable cataracts, and they temporarily connected the Nile and the Red Sea; [13] but these enterprises had little effect on the over-all pattern of the country's hydraulic economy. In other instances, navigation canals assumed great importance. They satisfied the needs of the masters of the hydraulic state: the transfer of parts of the agrarian surplus to the administrative centers and the transport of messengers and troops.

In Thailand (Siam) the different hydraulic tasks overlapped. In addition to the various types of productive and protective hydraulic installations, the government constructed in the centers of rice production and state power a number of canals, which essentially served as "waterways," that is, as a means for transporting the rice surplus to the capital.[14]

The corresponding development in China is particularly well documented. In the large plains of North China the beginnings of navigation canals go back to the days of the territorial states—that

is, to the period prior to 221 B.C., when the various regional governments were still administered by officials who were given office lands in payment for their services. The difference between the state-centered system of land grants as it prevailed in early China and the knighthood feudalism of Medieval Europe is spectacularly demonstrated by the almost complete absence of public works in feudal Europe and the enormous development of such works—hydraulic and otherwise—in the territorial states of China.[b]

The geographical and administrative unification of China which vastly increased the political need for navigation canals also increased the state's organizational power to build them. The first centuries of the empire saw a great advance not only in the construction of irrigation canals,[15] reservoirs, and protective river dikes but also in the digging of long canals for administrative and fiscal purposes.[16]

When, after several centuries of political fragmentation, the Sui rulers at the end of the 6th century again unified "all-under-heaven," they bulwarked the new political structure by creating out of earlier and substantial beginnings the gigantic Imperial Canal, significantly known in China as Yün Ho, "the Transport Canal." This canal extends today for about 800 miles, its length equaling the distance from the American-Canadian Great Lakes to the Gulf of Mexico or

b. Previously I viewed Chou China as a feudal society exhibiting Oriental features, which appeared early and became increasingly conspicuous until, at the close of the period, they prevailed completely (Wittfogel, 1931: 278 ff.; *ibid.*, 1935: 40 ff.). The idea of a society that crosses the institutional divide is entirely compatible with the findings of the present inquiry (see below, Chap. 6); and by interpreting Chou society in this way, I would not have had to change a long-held position. But intensified comparative studies compel me to change. The arid and semi-arid settings of North China (17 inches annual rainfall in the old Chou domain and 24 inches in the domain of the pre-Chou dynasty, Shang) suggest hydraulic agriculture for the ancient core areas. The lay of the land, the summer floods, and the periodic silting-up of the rivers necessitated comprehensive measures of flood control especially in the heartland of Shang power. A realistic interpretation of legends and protohistorical sources (cf. Wittfogel and Goldfrank, 1943: *passim*) points to the rise of a hydraulic way of life long before the Shang dynasty, whose artifacts (bronzes) and inscriptions reflect a highly developed agrarian civilization with refined techniques of record keeping, calculations, and astronomy. The recognizable institutions of early Chou are those of a hydraulic society, which gradually intensified its managerial and bureaucratic "density" (for this concept see below, Chap. 6). The Chou sovereigns behaved toward the territorial rulers not as the first among equals but as supreme masters responsible only to Heaven. It was not their fault that their despotic claims, which possibly imitated Shang precedents, were realized imperfectly and with decreasing effect. In contrast, the rulers of the territorial states were strong enough to proceed absolutistically within their respective realms. The lands that they assigned were given not in a contractual way and to independently organized (corporated) knights and barons, but to office holders and persons permitted to enjoy sinecures. They were not fiefs but office lands (see below, Chaps. 6–8).

—in European terms—the distance from Berlin to Bordeaux or from Hamburg to Rome. For labor on part of this gigantic water work the Sui government mobilized in the regions north of the Yellow River alone "more than a million of men and women," [17] that is, almost one-half of the total population which England is said to have had from the 14th to the 16th century.[18]

The gigantic effort involved in banking the rivers and building the canals of China is indicated by the American agronomist, F. H. King, who conservatively estimates the combined lengths of the man-managed watercourses of China, Korea, and Japan at some 200,000 miles. "Forty canals across the United States from east to west and sixty from north to south would not equal in number of miles those in these three countries today. Indeed, it is probable that this estimate is not too large for China alone." [19]

2. Large Nonhydraulic Constructions

a. Huge Defense Structures

The need for comprehensive works of defense arises almost as soon as hydraulic agriculture is practiced. Contrary to the rainfall farmer, who may shift his fields with relative ease, the irrigation farmer finds himself depending on an unmovable, if highly rewarding, source of fertility. In the early days of hydraulic cultivation reliance on a fixed system of water supply must in many cases have driven the agrarian community to build strong defenses around its homes and fields.

For this purpose hydraulic agriculture proved suggestive in two ways: it taught man how to handle all kinds of building materials, earth, stone, timber, etc., and it trained him to manipulate these materials in an organized way. The builders of canals and dams easily became the builders of trenches, towers, palisades, and extended defense walls.

In this, as in all corresponding cases, the character and magnitude of the operations were determined by internal and external circumstances. Surrounded by aggressive neighbors, the Pueblo Indians ingeniously utilized whatever building material was at hand to protect their settlements, which rarely comprised more than a few hundred inhabitants.[c] The fortress-like quality of their villages is manifest to the present-day anthropologist; it struck the Spanish

c. Castañeda, 1896: 512. Bandelier upholds Castañeda's figures against divergent statements made in other early Spanish sources (Bandelier, FR, I: 120 ff. and nn.; cf. *ibid.*, DH: 312, 46 ff., 171–3).

conquistadores, who were forced at times to besiege a single settlement for days and weeks before they could take it.[d] Rigid cooperation assured security of residence, just as it assured success in farming. An early observer stresses this aspect of Pueblo life: "They all work together to build the villages." [e]

d. Castañeda, who was the official chronicler of the first Spanish expedition, notes (1896: 494) that the defense towers of a large Zuni settlement were equipped with "embrassures and loopholes . . . for defending the roofs of the different stories." He adds, "The roofs have to be reached first, and these upper houses are the means of defending them." The experiences of the second expedition confirmed and supplemented the initial observations. Gallegos concludes his remarks concerning Pueblo building by referring to the movable wooden ladders "by means of which they climb to their quarters." At night "they lift them up since they wage war with one another" (Gallegos, 1927: 265). Obregon also stresses the military value of the ladders; in addition, he explains how the edifices themselves served to protect the community: "These houses have walls and loopholes from which they defend themselves and attack their enemies in their battles" (Obregon, 1928: 293).

One of Coronado's lieutenants, approaching certain Tigua settlements, "found the villages closed by palisades." The Pueblos, whose inhabitants had been subjected to various forms of extortion and insult "were all ready for fighting. Nothing could be done, because they would not come down onto the plain and the villages are so strong that the Spaniards could not dislodge them." Attacking a hostile village, the Spanish soldiers reached the upper story by surprise tactics. They remained in this dangerous position for a whole day, unable to prevail until the Mexican Indians, who accompanied them, approached the Pueblo from below, digging their way in and smoking out the defenders (Castañeda, 1896: 496). For a discussion of Castañeda's report see Bandelier, DH: 38 ff.)

Besieging a large Tigua settlement, Coronado's men had an opportunity to test thoroughly the defense potential of a Pueblo which was not taken by surprise: "As the enemy had had several days to provide themselves with stores, they threw down such quantities of rocks upon our men that many of them were laid down, and they wounded nearly a hundred with arrows." The siege lasted for seven weeks. During this time, the Spaniards made several assaults; but they were unable to take the Pueblo. The villagers eventually abandoned their fortress-like bulwark, not because the aggressors had penetrated their defenses, but because of lack of water (Castañeda, 1896: 498 ff.; cf. RDS: 576). Bandelier supplements Castañeda's report of this significant event by an account given by Mota Padilla, an 18th-century author, who claims to have had access to the original writings of still another member of Coronado's staff (Bandelier, DH: 323). Mota Padilla's version contains a number of details which reveal the techniques of attack as well as the strength and ingenuity of the defense. Some of the Spaniards "reached the top of the wall, but there they found that the natives had removed the roofs of many (upper) rooms, so that there was no communication between them, and as there were little towers at short distances from each other, from which missiles were showered upon the assailants on the top, the Spaniards had more than sixty of their number hurt, three of whom died of their wounds" (*ibid.*, 48).

e. Castañeda (1896: 520) qualifies this general statement by saying that the women were "engaged in making the [adobe] mixture and the walls, while the men bring the wood and put it in place." Modern reports assign the above duties to the men and credit them in addition with erecting the walls, the construction labors of the women being confined to plastering (White, 1932: 33; cf. Parsons, 1932: 212). The

The Chagga were equally effective in the transfer of their hydraulic work patterns to military constructions. Their great chieftain, Horombo (*fl.* 1830), used "thousands of people" to build great fortifications, which in part still stand today.[20] "The walls of these fortifications are some six feet high, and in length 305 yards on the south side, 443 yards on the north, 277 yards on the east side, and 137 yards on the west side." [21] Tunnels, extended trenches, and dugouts added to the defense of the walled settlements, which appeared early in the history of the Chagga.[22] "Deep dugouts excavated under the huts and often leading into underground passages with outlets at some distance, were used for refuge. Almost every country was secured with great war trenches, which are everywhere to be seen at the present day and are often still of great depth." [23]

These instances show what even primitive hydraulic societies could achieve in the field of defense construction, when they strained their cooperative resources to the full. Higher hydraulic societies employed and varied the basic principle in accordance with technical and institutional circumstances.

In pre-Columbian Mexico the absence of suitable labor animals placed a limitation on transport, and while this restricted siege craft, it did not preclude the struggle for or the defense of the cities. In emergencies many government-built hydraulic works in the main lake area fulfilled military functions, just as the monster palaces and temples served as bastions against an invading enemy.[24] Recent research draws attention to various types of Mexican forts and defense walls.[25] Because of their size and importance, they may safely be adjudged as state-directed enterprises. The colossal fortresses and walls of pre-Inca Peru, which astonished early and recent observers,[26] are known to have been built at the order of the government and by "incredibly" large teams of corvée laborers.[27]

Many texts and pictorial representations have portrayed the walls, gates, and towers of ancient Egypt, Sumer, Babylonia, Assyria, and Syria. The *Arthashāstra* indicates the systematic manner in which the rulers of the first great Indian empire treated problems of fortification and defense.[28] At the dawn of Chinese history new capitals were created at the ruler's command, and during the last centuries of the Chou period the territorial states used their corviable manpower to wall entire frontier regions, not only against the tribal barbarians but also against each other. In the 3d century B.C. the unifier of China, Ch'in Shih Huang-ti, linked together and elaborated older territorial structures to form the longest unbroken defense installation ever made by man.[29] The periodic reconstruction of the Chinese Great Wall expresses the continued effectiveness of hydraulic economy and government-directed mass labor.

divergence between the early and recent descriptions may reflect an actual institutional change or merely a difference in the accuracy of observation. While interesting to the anthropologist, this discrepancy does not affect our basic conclusions regarding the communal character of large-scale building in the American Pueblos.

b. Roads

THE existence of government-made highways is suggested for the Babylonian period; [30] it is documented for Assyria.[31] And the relationship between these early constructions and the roads of Persia, the Hellenistic states, and Rome seems "beyond doubt." *f* The great Persian "royal road" deeply impressed the contemporary Greeks; [32] it served as a model for the Hellenistic rulers,[33] whose efforts in turn inspired the official road builders of the Roman empire.[34] According to Mez, the Arabs inherited "the type of 'governmental road,' like its name, from the Persian 'Royal Road.' " [35] Beyond this, however, they showed little interest in maintaining good roads, probably because they continued to rely in the main on camel caravans for purposes of transport. The later Muslim regimes of the Near East used highways, but they never restored them to the state of technical perfection which characterized the pre-Arab period.[36]

Roads were a serious concern of India's vigorous Maurya kings.[37] A "royal road" of 10,000 *stadia,* which is said to have led from the capital to the northwestern border, had a system of marking distances which, in a modified form, was again employed by the Mogul emperors.[38] In Southern India, where Hindu civilization was perpetuated for centuries after the north had been conquered, government-made roads are mentioned in the inscriptions; and "some of them are called king's highways." [39] The Muslim rulers of India continued the Indian rather than the West Asian pattern in their effort to maintain a network of state roads.[40] Sher Shāh (*d.* 1545) built four great roads, one of which ran from Bengal to Agra, Delhi, and Lahore.[41] Akbar is said to have been inspired by Sher Shāh when he built a new "king's highway," called the Long Walk, which for four hundred miles was "shaded by great trees on both sides." [42]

In China, a gigantic network of highways was constructed immediately after the establishment of the empire in 221 B.C. But in this case, as in the cases of the irrigation and navigation canals or

f. Meissner, BA, I: 341. The term "royal road" was used in an Assyrian inscription (Olmstead, 1923: 334). The operational pattern of the Roman state post, the *cursus publicus,* can be traced back through the Hellenistic period to Persia and perhaps even to Babylonia (Wilcken, 1912: 372 and n. 2).

the long defense walls, the imperial engineers systematized and elaborated only what their territorial predecessors had initiated. Long before the 3d century B.C. an efficient territorial state was expected to have well kept overland highways, supervised by central and local officials, lined with trees, and provided with stations and guest houses.[43] Under the empire, great state roads connected all the important centers of the northern core area with the capital. According to the official *History of the Han Dynasty,* the First Emperor

> built the Imperial Road throughout the empire. To the east it stretched to Yen and Ch'i and to the south it reached Wu and Ch'u. The banks and the shore of the Chiang [the Yangtze River] and the lakes and the littoral along the sea coast were all made accessible. The highway was fifty paces wide. A space three *chang* [approximately twenty-two feet] wide in the center was set apart by trees. The two sides were firmly built, and metal bars were used to reinforce them. Green pine trees were planted along it. He constructed the Imperial Highway with such a degree of elegance that later generations were even unable to find a crooked path upon which to place their feet.[44]

In the subsequent dynasties the building and maintenance of the great trunk roads and their many regional branches remained a standard task of China's central and local administration.

The rugged terrain of Meso-America and the absence of fully coordinated empires seems to have discouraged the construction of highways during the pre-Columbian period, at least on the high plateau. But the Andean area was the scene of extraordinary road building. The Spanish conquerors described in detail the fine highways which crossed both the coastal plain and the highlands and which formed connecting links between them.[45] Commenting on the Andean roads, Hernando Pizarro writes he never saw their like in similar terrain "within the entire Christian world."[46] In fact the only parallel he could think of was the system of highways built by the Romans. The similarity is telling. As we shall discuss below, the extensive Roman roads were the fruits of a fateful transformation that made the Roman Empire a Hellenistically (Orientally) despotic state.

The efforts required to build all these great highways have attracted much less attention than the finished products. But what evidence we have indicates that like most other major government enterprises, they were mainly executed through the cooperative effort of state-levied corvée laborers. Under the Inca empire supervisory

officials marked off the land and informed the local inhabitants "that they should make these roads." And this was done with little cost to the government. The commandeered men "come with their food and tools to make them."[g]

The highways of imperial China required an enormous labor force for their construction and a very sizable one for their maintenance. A Han inscription notes that the construction of a certain highway in the years A.D. 63–66 occupied 766,800 men. Of this great number only 2,690 were convicts.[47]

c. Palaces, Capital Cities, and Tombs

A GOVERNMENTAL apparatus capable of executing all these hydraulic and nonhydraulic works could easily be used in building palaces and pleasure grounds for the ruler and his court, palace-like government edifices for his aides, and monuments and tombs for the distinguished dead. It could be used wherever the equalitarian conditions of a primitive tribal society yielded to tribal or no-longer tribal forms of autocracy.

The head chief of a Pueblo community had his fields worked for him by the villagers. But apparently his dwelling did not differ from the houses of other tribesmen, except perhaps that it was better and more securely located. The Chagga chieftains had veritable palaces erected for their personal use; and the corvée labor involved in their construction was substantial.[48]

The colossal palaces of the rulers of ancient Peru were erected by the integrated manpower of many laborers. In pre-Columbian Mexico, Nezahualcoyotzin, the king of Tezcuco, the second largest country in the Aztec Federation, is said to have employed more than 200,000 workers each day for the building of his magnificent palace and park.[49]

Unlimited control over the labor power of their subjects enabled the rulers of Sumer, Babylon, and Egypt to build their spectacular palaces, gardens, and tombs. The same work pattern prevailed in the many smaller states that shaped their government on the Mesopotamian or Egyptian model. According to the biblical records, King Solomon built his beautiful temple with labor teams that, like those of Babylonia, were kept at work for four months of the year.[50]

g. Cieza, 1943: 95. The regional organization and the repair work on the roads had already been noted by a member of the conquering army (Estete, 1938: 246). The lack of payment for services rendered in the road corvée is also recorded by Blas Valeras, who states that similar conditions prevailed with regard to work on the bridges and irrigation canals (Garcilaso, 1945, I: 258).

The great edifices of Mogul India have been frequently described. Less known but equally worthy of mention are the constructions of the earlier periods. The third ruler of the Tughluq, Fīrūs Shāh (*ca.* 1308–88), dug several important irrigation canals, the famous "Old Jumna Canal" among them. He built forts, palaces, and palace-cities, mosques, and tombs. The palace-fort of Koṭla Fīrūs Shāh, which rose in his new capital of Fīrūsābād (Delhi), faithfully preserved the grand style of pre-Islamic Indian and Eastern architecture.[51]

The Chinese variant of the general agromanagerial building trend is revealed in many elaborate works. The First Emperor of China, Ch'in Shih Huang-ti, began to build great hydraulic works in the early days of his power; and in the course of his reign he completed colossal works of the nonhydraulic public and semiprivate types. Having destroyed all his territorial rivals, he constructed the previously mentioned network of highways which gave his officials, messengers, and troops easy access to all regions of his far-flung empire. Later he defended himself against the northern pastoralists by consolidating the Great Wall. Palaces for his personal use had been built in the early days of his reign; but it was only in 213 B.C. that work was begun on his superpalace. This monster project, together with the construction of his enormous tomb,[52] is said to have occupied work teams numbering over 700,000 persons.[53]

Eight hundred years later the second monarch of a reunified China, Emperor Yang (604–17) of the Sui Dynasty, mobilized a still larger labor force for the execution of similar monster enterprises. In addition to the more than one million persons—men and women—levied for the making of the Grand Canal,[54] he dispatched huge corvée teams to extend the imperial roads[55] and to work on the Great Wall. According to the *History of the Sui Dynasty*, over a million persons toiled at the Great Wall.[h] According to the same official source, the construction of the new eastern capital, which included a gigantic new imperial palace, involved no less than two million people "every month."[56]

d. Temples

THE position, fate, and prestige of the secular masters of hydraulic society were closely interlinked with that of their divine protectors. Without exception, the political rulers were eager to confirm and bulwark their own legitimacy and majesty by underlining the greatness of their supernatural supporters. Whether the government was

h. Over a million in 607; an additional 200,000 persons were employed in 608 (*Sui Shu* 3. 10b, 12a).

headed by secular monarchs or priest-kings, the commanding center made every effort to provide the supreme gods and their earthly functionaries with adequate surroundings for worship and residence.

Government-directed work teams, which erected gigantic palaces, were equally fitted to erect gigantic temples. Ancient inscriptions note the many temples built by the Mesopotamian rulers.[57] Usually the sovereign speaks as if these achievements resulted solely from his personal efforts. But occasional remarks indicate the presence of "the people" who toiled "according to the established plan."[i] Similarly, most Pharaonic texts refer to the final achievement[j] or to the greatness of the directing sovereign;[58] but again a number of texts refer to the government-led labor forces, "the people."[k]

In the agromanagerial cultures of pre-Columbian America, buildings for religious purposes were particularly conspicuous. Native tradition as well as the early Spanish accounts emphasize the tremendous labor required to construct and maintain the sacred houses and pyramids. The Mexicans coordinated their communal energies to erect the first temple for the newly established island city, the later Aztec capital;[59] and their increasingly powerful descendants mobilized the manpower of many subjugated countries for the construction of increasingly huge temples.[m] The city-like palace of the famous King of Tezcuco, Nezahualcoyotzin, contained no less than forty temples.[60] The great number of laborers engaged in building this palace- and temple-city has already been cited. Like the monster work teams of Mexico, those of Tezcuco could draw upon the entire corviable population.[n] In another country of the main lake region, Cuauhtitlan, the construction of large-scale hydraulic works[61] was followed by the building of a great temple. It took thirteen years to complete the second task.[62]

In the Andean zone, as in most other areas of the hydraulic world, the attachment of the priesthood to the government is beyond doubt. The Incas made heavy levies on their empire's material wealth in

i. Price, 1927: 24; cf. Thureau-Dangin, 1907: 111, and Barton, 1929: 225. Schneider (1920: 46) and Deimel (1931: 101 ff.) deplore the scarcity of concrete data concerning the Sumerian construction industry.

j. Thus in one of the oldest inscriptions of Egypt extant, the Palermo Stone (Breasted, 1927, I: 64).

k. "I have commanded those who work, to do according as thou shalt exact" (Breasted, 1927, I: 245). The "people" bring the stone for the Amon Temple; and the "people" also do the building. Among the workmen are several types of artisans (*ibid.*, II: 294, 295).

m. Tezozomoc, 1944: 79 (the Temple of Huitzilopochtli) and 157 (the great Cu edifice of the same god).

n. Ixtlilxochitl, OH, II: 173 ff. The *Annals of Cuauhtitlan* also refer to this construction (Chimalpópoca, 1945: 52), without, however, discussing the labor aspect.

order to beautify their temples and pyramids.[63] They called up whatever manpower was needed to collect the raw material, transport it, and do the actual work of construction.[64]

E. THE MASTERS OF HYDRAULIC SOCIETY—GREAT BUILDERS

EVIDENTLY the masters of hydraulic society, whether they ruled in the Near East, India, China, or pre-Conquest America, were great builders. The formula is usually invoked for both the aesthetic and the technical aspect of the matter; and these two aspects are indeed closely interrelated. We shall briefly discuss both of them with regard to the following types of hydraulic and nonhydraulic construction works:

I. Hydraulic works
  A. Productive installations
     (Canals, aqueducts, reservoirs, sluices, and dikes for the purpose of irrigation)
  B. Protective installations
     (Drainage canals and dikes for flood control)
  C. Aqueducts providing drinking water
  D. Navigation canals

II. Nonhydraulic works
  A. Works of defense and communication
     1. Walls and other structures of defense
     2. Highways
  B. Edifices serving the public and personal needs of the secular and religious masters of hydraulic society
     1. Palaces and capital cities
     2. Tombs
     3. Temples

1. THE AESTHETIC ASPECT

a. Uneven Conspicuousness

THE majority of persons who have commented on the great builders of Asia and ancient America are far more articulate on the nonhydraulic than on the hydraulic achievements. Within the hydraulic sphere more attention is again given to the aqueducts for drinking water and the navigation canals than to the productive and protective installations of hydraulic agriculture. In fact, these last are frequently overlooked altogether. Among the nonhydraulic works, the "big houses" of power and worship and the tombs of the great are much more carefully investigated than are the large installations of communication and defense.

This uneven treatment of the monster constructions of hydraulic society is no accident. For functional, aesthetic, and social reasons the hydraulic works are usually less impressive than the nonhydraulic constructions. And similar reasons encourage uneven treatment also within each of the two main categories.

Functionally speaking, irrigation canals and protective embankments are widely and monotonously spread over the landscape, whereas the palaces, tombs, and temples are spatially concentrated. Aesthetically speaking, most of the hydraulic works are undertaken primarily for utilitarian purposes, whereas the residences of the rulers and priests, the houses of worship, and the tombs of the great are meant to be beautiful. Socially speaking, those who organize the distribution of manpower and material are the same persons who particularly and directly enjoy the benefits of many nonhydraulic structures. In consequence they are eager to invest a maximum of aesthetic effort in these structures (palaces, temples, and capital cities) and a minimum of such effort in all other works.

Of course, the contrast is not absolute. Some irrigation works, dikes, aqueducts, navigation canals, highways, and defense walls do achieve considerable functional beauty. And closeness to the centers of power may lead the officials in charge to construct embankments, aqueducts, highways, bridges, walls, gates, and towers with as much care for aesthetic detail as material and labor permit.

But these secondary tendencies do not alter the two basic facts that the majority of all hydraulic and nonhydraulic public works are aesthetically less conspicuous than the royal and official palaces, temples, and tombs, and that the most important of all hydraulic works—the canals and dikes—from the standpoint of art and artistry are the least spectacular of all.

b. The Monumental Style

SUCH discrepancies notwithstanding, the palaces, government buildings, temples, and tombs share one feature with the "public" works proper: they, too, tend to be large. The architectural style of hydraulic society is monumental.

This style is apparent in the fortress-like settlements of the Pueblo Indians. It is conspicuous in the palaces, temple cities, and fortresses of ancient Middle and South America. It characterizes the tombs,

palace-cities, temples, and royal monuments of Pharaonic Egypt and ancient Mesopotamia. No one who has ever observed the city gates and walls of a Chinese capital, such as Peking, or who has walked through the immense palace gates and squares of the Forbidden City to enter its equally immense court buildings, ancestral temples, and private residences can fail to be awed by their monumental design.

Pyramids and dome-shaped tombs manifest most consistently the monumental style of hydraulic building. They achieve their aesthetic effect with a minimum of ideas and a maximum of material. The pyramid is little more than a huge pile of symmetrically arranged stones.

The property-based and increasingly individualistic society of ancient Greece loosened up the massive architecture, which had emerged in the quasihydraulic Mycenaean period.[1] During the later part of the first millennium B.C., when Alexander and his successors ruled the entire Near East, the architectural concepts of Hellas transformed and refined the hydraulic style without, however, destroying its monumental quality.

In Islamic architecture the two styles blended to create a third. The products of this development were as spectacular in the westernmost outpost of Islamic culture—Moorish Spain—as they were in the great eastern centers: Cairo, Baghdad, Bukhara, Samarkand, and Istanbul. The Taj Mahal of Agra and kindred buildings show the same forces at work in India, a subcontinent which, before the Islamic invasion, had evolved a rich monumental architecture of its own.

c. The Institutional Meaning

IT hardly needs to be said that other agrarian civilizations also combined architectural beauty with magnitude. But the hydraulic rulers differed from the secular and priestly lords of the ancient and medieval West, first because their constructional operations penetrated more spheres of life, and second because control over the entire country's labor power and material enabled them to attain much more monumental results.

The scattered operations of rainfall farming did not involve the establishment of national patterns of cooperation, as did hydraulic agriculture. The many manorial centers of Europe's knighthood society gave rise to as many fortified residences (castles); and their size was limited by the number of the attached serfs. The king, being little more than the most important feudal lord, had to build his castles with whatever labor force his personal domain provided.

The concentration of revenue in the regional or territorial centers

of ecclesiastical authority permitted the creation of the largest individual medieval edifices: churches, abbeys, and cathedrals. It may be noted that these buildings were erected by an institution which, in contrast to all other prominent Western bodies, combined feudal with quasihydraulic patterns of organization and acquisition.

With regard to social control and natural resources, however, the master builders of the hydraulic state had no equal in the nonhydraulic world. The modest Tower of London and the dispersed castles of Medieval Europe express the balanced baronial society of the Magna Carta as clearly as the huge administrative cities and colossal palaces, temples, and tombs of Asia, Egypt, and ancient America express the organizational coordination and the mobilization potential of hydraulic economy and statecraft.[a]

F. THE BULK OF ALL LARGE NONCONSTRUCTIONAL INDUSTRIAL ENTERPRISES MANAGED ALSO BY THE HYDRAULIC GOVERNMENT

1. A Comparative View

A GOVERNMENT capable of handling all major hydraulic and nonhydraulic construction may, if it desires, play a leading role also in the nonconstructional branches of industry. There are "feeding" industries, such as mining, quarrying, salt gathering, etc.; and there are finishing industries, such as the manufacture of weapons, textiles, chariots, furniture, etc. Insofar as the activities in these two spheres proceeded on a large scale, they were for the most part either directly managed or monopolistically controlled by the hydraulic governments. Under the conditions of Pharaonic Egypt and Inca Peru, direct management prevailed. Under more differentiated social conditions, the government tended to leave part of mining, salt gathering, etc. to heavily taxed and carefully supervised entrepreneurs, while it continued to manage directly most of the large manufacturing workshops.

By combining these facts with what we know of the hydraulic and nonhydraulic constructional operations of the state, we may in the following table indicate the managerial position of the hydraulic state both in agriculture and industry. For purposes of comparison, we include corresponding data from two other agrarian societies and from mercantilist Europe.

a. For another peculiarity of hydraulic architecture, the "introvert" character of most of the residential buildings, with the exception of those of the ruler, see below, p. 86, n. *b*.

TABLE 1. *Government Management in the Spheres of Agriculture and Industry*

	AGRICULTURE		INDUSTRY			
					Manufacturing	
INSTITUTIONAL CONFORMATIONS	*Heavy Waterworks*	*Farming*	*Mining, etc.*	*Construction Industry*	*Large Shops*	*Small Shops*
Hydraulic society	+	–	(+)[1]	+[2]	+	–
Coastal city states of classical Greece	–	–	–	–	–	–
Medieval Europe	–	(+)[3]	–	(+)[3]	(+)[3]	–
Mercantilist Europe	–	–	(–)	–	–	–

Key
+ Predominant
+ Outstandingly significant
– Irrelevant or absent
( ) Trend limited or modified by factors indicated in the text

1. Simpler conditions.
2. On a national scale.
3. On a manorial scale.

In ancient Greece, mining was mainly in the hands of licensed businessmen. As long as the concessionaire delivered a fixed part of his output to the state, he enjoyed "very extensive" rights; he "was said to 'buy' the mine, he organized the working as he pleased, the ore was his, and he could cede his concession to a third party." [1] In Medieval Europe mining was also essentially left to private entrepreneurs, who, having obtained a concession from the royal or territorial authorities, proceeded independently and mostly through craft cooperatives.[2] The mercantilist governments of Europe operated some mines directly; but the majority was managed by strictly supervised private owners.[3]

All these arrangements differ profoundly from the system of government mining prevailing in Pharaonic Egypt and Inca Peru. Mercantilist usage resembles in form, but not in institutional substance, the policy pursued in certain of the more differentiated hydraulic societies, where government operation of some mines was combined with private, but government-licensed, handling of others.[4]

Except for mining, Oriental and Occidental absolutism are less similar in the industrial sphere than has been claimed, whereas a resemblance of sorts does exist between hydraulic society and feudal Europe. In hydraulic society, the majority of the not-too-many larger industrial workshops was government managed. In the mercantilist Occident they were, under varying forms of state supervision, predominantly owned and run by private entrepreneurs. In the coastal city-states of classical Greece the government was neither equipped nor inclined to engage in industrial activities. The rulers of Medieval Europe, faced with a different situation, proceeded differently. In

their manorial workshops they employed a number of serf-artisans, who were kept busy satisfying the needs of their masters. The feudal lords also summoned serf labor for the construction of "big houses" —castles. The similarity between this manorial system of cooperative work and the hydraulic pattern is evident. But again the functional similarity is limited by the differences in the societal setting. The medieval kings and barons could dispose only over the labor force of their own domains and estates, while the hydraulic rulers could draw on the unskilled and skilled labor of large territories, and ultimately on that of the whole country.

The decisive difference, however, between hydraulic society and the three civilizations with which we compare it lies, insofar as industry is concerned, in the sphere of construction. It is this sphere which more than any other sector of industry demonstrates the organizational power of hydraulic society. And it is this sphere which achieved results never attained by any other agrarian or mercantilist society.

The full institutional significance of this fact becomes apparent as soon as we connect it with the corresponding agrarian development. Government-managed heavy water works place the large-scale feeding apparatus of agriculture in the hands of the state. Government-managed construction works make the state the undisputed master of the most comprehensive sector of large-scale industry. In the two main spheres of production the state occupied an unrivaled position of operational leadership and organizational control.

2. The Power of the Hydraulic State over Labor Greater than That of Capitalist Enterprises

In both spheres the hydraulic state levied and controlled the needed labor forces by coercive methods that were invocable by a feudal lord only within a restricted area, and that were altogether different from the methods customary under capitalist conditions. The hydraulic rulers were sufficiently strong to do on a national scale what a feudal sovereign or lord could accomplish only within the borders of his domain. They compelled able-bodied commoners to work for them through the agency of the corvée.

Corvée labor is forced labor. But unlike slave labor, which is demanded permanently, corvée labor is conscripted on a temporary, although recurring, basis. After the corvée service is completed, the worker is expected to go home and continue with his own business.

Thus the corvée laborer is freer than the slave. But he is less free than a wage laborer. He does not enjoy the bargaining advantages

of the labor market, and this is the case even if the state gives him food (in the ancient Near East often "bread and beer") or some cash. In areas with a highly developed money economy the hydraulic government may levy a corvée tax and hire rather than conscript the needed labor. This was done largely in China at the close of the Ming dynasty and during the greater part of Ch'ing rule.

But there as elsewhere the government arbitrarily fixed the wage. And it always kept the workers under quasimilitary discipline.[5] Except in times of open political crisis, the hydraulic state could always muster the labor forces it required; and this whether the workers were levied or hired. It has been said that the Mogul ruler Akbar, "by his *firmān* (order) could collect any number of men he liked. There was no limit to his massing of labourers, save the number of people in his Empire." [6] *Mutatis mutandis,* this statement is valid for all hydraulic civilizations.

G. A GENUINE AND SPECIFIC TYPE OF MANAGERIAL REGIME

THUS the hydraulic state fulfilled a variety of important managerial functions.[a] In most instances it maintained crucial hydraulic works, appearing in the agrarian sphere as the sole operator of large preparatory and protective enterprises. And usually it also controlled the major nonhydraulic industrial enterprises, especially large constructions. This was the case even in certain "marginal" areas,[1] where the hydraulic works were insignificant.

The hydraulic state differs from the modern total managerial states in that it is based on agriculture and operates only part of the country's economy. It differs from the laissez-faire states of a private-property-based industrial society in that, in its core form, it fulfills crucial economic functions by means of commandeered (forced) labor.

a. Social science is indebted to James Burnham for pointing to the power potential inherent in managerial control. The present inquiry stresses the importance of the general (political) organizer as compared not only to the technical specialist (see Veblen, 1945: 441 ff.), but also to the economic manager. This, however, does not diminish the author's appreciation of the contribution made by Burnham through his concept of managerial leadership.

CHAPTER 3

A state stronger than society

A. NONGOVERNMENTAL FORCES COMPETING WITH THE STATE FOR SOCIETAL LEADERSHIP

THE hydraulic state is a genuinely managerial state. This fact has far-reaching societal implications. As manager of hydraulic and other mammoth constructions, the hydraulic state prevents the nongovernmental forces of society from crystallizing into independent bodies strong enough to counterbalance and control the political machine.

The relations between the governmental and nongovernmental forces of society are as manifold as the patterns of society itself. All governments are concerned with the protection of the commonwealth against external enemies (through the organization of military action) and with the maintenance of internal order (through jurisdiction and policing methods of one kind or another). The extent to which a government executes these and other tasks depends on the way in which the societal order encourages, or restricts, governmental activities on the one hand and the development of rival nongovernmental forces on the other.

The nongovernmental forces aiming at social and political leadership include kin groups (particularly under primitive conditions); representatives of autonomous religious organizations (customary in certain primitive civilizations but, as the history of the Christian Church shows, by no means confined to them); independent or semi-independent leaders of military groups (such as tribal bands, armies of feudal lords); and owners of various forms of property (such as money, land, industrial equipment, and capacity to work).

In some cases the rise of hydraulic despotism was probably contested by the heads of powerful clans or by religious groups eager to preserve their traditional autonomy. In others, semi-independent military leaders may have tried to prevent the masters of the hydraulic apparatus from attaining total control. But the rival forces lacked the proprietary and organizational strength that in Greek and Roman antiquity, as well as in Medieval Europe, bulwarked the nongovernmental forces of society. In hydraulic civilizations the men of the