

- Landau, *Amer. J. Public Health* 54, 85 (1964). If one accepted this evidence as conclusive, it would follow that the annual cost of air pollution, because of health effects, would run between \$14 billion and \$29 billion.
65. See J. H. Schulte, *Arch. Environ. Health* 7, 524 (1963); A. G. Cooper, "Carbon Monoxide," *U.S. Public Health Serv. Publ. No. 1503* (1966); *Effects of Chronic Exposure to Low Levels of Carbon Monoxide on Human Health, Behavior, and Performance* (National Academy of Sciences and National Academy of Engineering, Washington, D.C., 1969).
 66. Another way to estimate the cost of air pollution is to examine the effect of air pollution on property values. See R. J. Anderson, Jr., and T. D. Crocker, "Air Pollution and residential property values," paper presented at a meeting of the Econometric Society, New York, December 1969; H. O. Nourse, *Land Econ.* 43, 181 (1967); R. G. Ridker, *Economic Costs of Air Pollution* (Praeger, New York, 1967); R. G. Ridker and J. A. Henning, *Rev. Econ. Statist.* 49, 246 (1967); R. N. S. Harris, G. S. Tolley, C. Harrell, *ibid.* 50, 241 (1968).
 67. P. Buell, J. E. Dunn, Jr., L. Breslow, *Cancer* 20, 2139 (1967).
 68. E. C. Hammond and D. Horn, *J. Amer. Med. Ass.* 166, 1294 (1958).
 69. P. Stocks, "British Empire Cancer Campaign," supplement to "Cancer in North Wales and Liverpool Region," part 2 (Summerfield and Day, London, 1957).
 70. G. Dean, *Brit. Med. J.* 1, 1506 (1966).
 71. A. H. Golledge and A. J. Wicken, *Med. Officer* 112, 273 (1964).
 72. W. Haenszel, D. B. Loveland, M. G. Sirken, *J. Nat. Cancer Inst.* 28, 947 (1962).
 73. The research discussed in this article was supported by a grant from Resources for the Future, Inc. We thank Morton Corn, Allen Kneese, and John Goldsmith for helpful comments. Any opinions and remaining errors are ours.

A Theory of the Origin of the State

Traditional theories of state origins are considered
and rejected in favor of a new ecological hypothesis.

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For the first 2 million years of his existence, man lived in bands or villages which, as far as we can tell, were completely autonomous. Not until perhaps 5000 B.C. did villages begin to aggregate into larger political units. But, once this process of aggregation began, it continued at a progressively faster pace and led, around 4000 B.C., to the formation of the first state in history. (When I speak of a state I mean an autonomous political unit, encompassing many communities within its territory and having a centralized government with the power to collect taxes, draft men for work or war, and decree and enforce laws.)

Although it was by all odds the most far-reaching political development in human history, the origin of the state is still very imperfectly understood. Indeed, not one of the current theories of the rise of the state is entirely satisfactory. At one point or another, all of them fail. There is one theory, though, which I believe does provide a convincing explanation of how states began. It is a theory which I proposed once before (1), and which I present here more fully. Before doing so, however,

it seems desirable to discuss, if only briefly, a few of the traditional theories.

Explicit theories of the origin of the state are relatively modern. Classical writers like Aristotle, unfamiliar with other forms of political organization, tended to think of the state as "natural," and therefore as not requiring an explanation. However, the age of exploration, by making Europeans aware that many peoples throughout the world lived, not in states, but in independent villages or tribes, made the state seem less natural, and thus more in need of explanation.

Of the many modern theories of state origins that have been proposed, we can consider only a few. Those with a racial basis, for example, are now so thoroughly discredited that they need not be dealt with here. We can also reject the belief that the state is an expression of the "genius" of a people (2), or that it arose through a "historical accident." Such notions make the state appear to be something metaphysical or adventitious, and thus place it beyond scientific understanding. In my opinion, the origin of the state was neither mysterious nor fortuitous.

It was not the product of "genius" or the result of chance, but the outcome of a regular and determinate cultural process. Moreover, it was not a unique event but a recurring phenomenon: states arose independently in different places and at different times. Where the appropriate conditions existed, the state emerged.

Voluntaristic Theories

Serious theories of state origins are of two general types: *voluntaristic* and *coercive*. Voluntaristic theories hold that, at some point in their history, certain peoples spontaneously, rationally, and voluntarily gave up their individual sovereignties and united with other communities to form a larger political unit deserving to be called a state. Of such theories the best known is the old Social Contract theory, which was associated especially with the name of Rousseau. We now know that no such compact was ever subscribed to by human groups, and the Social Contract theory is today nothing more than a historical curiosity.

The most widely accepted of modern voluntaristic theories is the one I call the "automatic" theory. According to this theory, the invention of agriculture automatically brought into being a surplus of food, enabling some individuals to divorce themselves from food production and to become potters, weavers, smiths, masons, and so on, thus creating an extensive division of labor. Out of this occupational specialization there developed a political integration which united a number of previously independent communities into a state. This argument was set forth most frequently by the late British archeologist V. Gordon Childe (3).

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The principal difficulty with this theory is that agriculture does *not* automatically create a food surplus. We know this because many agricultural peoples of the world produce no such surplus. Virtually all Amazonian Indians, for example, were agricultural, but in aboriginal times they did not produce a food surplus. That it was *technically feasible* for them to produce such a surplus is shown by the fact that, under the stimulus of European settlers' desire for food, a number of tribes did raise manioc in amounts well above their own needs, for the purpose of trading (4). Thus the technical means for generating a food surplus were there; it was the social mechanisms needed to actualize it that were lacking.

Another current voluntaristic theory of state origins is Karl Wittfogel's "hydraulic hypothesis." As I understand him, Wittfogel sees the state arising in the following way. In certain arid and semiarid areas of the world, where village farmers had to struggle to support themselves by means of small-scale irrigation, a time arrived when they saw that it would be to the advantage of all concerned to set aside their individual autonomies and merge their villages into a single large political unit capable of carrying out irrigation on a broad scale. The body of officials they created to devise and administer such extensive irrigation works brought the state into being (5).

This theory has recently run into difficulties. Archeological evidence now makes it appear that in at least three of the areas that Wittfogel cites as exemplifying his "hydraulic hypothesis"—Mesopotamia, China, and Mexico—full-fledged states developed well before large-scale irrigation (6). Thus, irrigation did not play the causal role in the rise of the state that Wittfogel appears to attribute to it (7).

This and all other voluntaristic theories of the rise of the state founder on the same rock: the demonstrated inability of autonomous political units to relinquish their sovereignty in the absence of overriding external constraints. We see this inability manifested again and again by political units ranging from tiny villages to great empires. Indeed, one can scan the pages of history without finding a single genuine exception to this rule. Thus, in order to account for the origin of the state we must set aside voluntaristic theories and look elsewhere.

Coercive Theories

A close examination of history indicates that only a coercive theory can account for the rise of the state. Force, and not enlightened self-interest, is the mechanism by which political evolution has led, step by step, from autonomous villages to the state.

The view that war lies at the root of the state is by no means new. Twenty-five hundred years ago Heraclitus wrote that "war is the father of all things." The first careful study of the role of warfare in the rise of the state, however, was made less than a hundred years ago, by Herbert Spencer in his *Principles of Sociology* (8). Perhaps better known than Spencer's writings on war and the state are the conquest theories of continental writers such as Ludwig Gumplowicz (9), Gustav Ratzenhofer (10), and Franz Oppenheimer (11).

Oppenheimer, for example, argued that the state emerged when the productive capacity of settled agriculturists was combined with the energy of pastoral nomads through the conquest of the former by the latter (11, pp. 51-55). This theory, however, has two serious defects. First, it fails to account for the rise of states in aboriginal America, where pastoral nomadism was unknown. Second, it is now well established that pastoral nomadism did not arise in the Old World until after the earliest states had emerged.

Regardless of deficiencies in particular coercive theories, however, there is little question that, in one way or another, war played a decisive role in the rise of the state. Historical or archeological evidence of war is found in the early stages of state formation in Mesopotamia, Egypt, India, China, Japan, Greece, Rome, northern Europe, central Africa, Polynesia, Middle America, Peru, and Colombia, to name only the most prominent examples.

Thus, with the Germanic kingdoms of northern Europe especially in mind, Edward Jenks observed that, "historically speaking, there is not the slightest difficulty in proving that all political communities of the modern type [that is, states] owe their existence to successful warfare" (12). And in reading Jan Vansina's *Kingdoms of the Savanna* (13), a book with no theoretical axe to grind, one finds that state after state in central Africa arose in the same manner.

But is it really true that there is no

exception to this rule? Might there not be, somewhere in the world, an example of a state which arose without the agency of war?

Until a few years ago, anthropologists generally believed that the Classic Maya provided such an instance. The archeological evidence then available gave no hint of warfare among the early Maya and led scholars to regard them as a peace-loving theocratic state which had arisen entirely without war (14). However, this view is no longer tenable. Recent archeological discoveries have placed the Classic Maya in a very different light. First came the discovery of the Bonampak murals, showing the early Maya at war and reveling in the torture of war captives. Then, excavations around Tikal revealed large earthworks partly surrounding that Classic Maya city, pointing clearly to a military rivalry with the neighboring city of Uaxactún (15). Summarizing present thinking on the subject, Michael D. Coe has observed that "the ancient Maya were just as warlike as the . . . bloodthirsty states of the Post-Classic" (16).

Yet, though warfare is surely a prime mover in the origin of the state, it cannot be the only factor. After all, wars have been fought in many parts of the world where the state never emerged. Thus, while warfare may be a necessary condition for the rise of the state, it is not a sufficient one. Or, to put it another way, while we can identify war as the *mechanism* of state formation, we need also to specify the *conditions* under which it gave rise to the state.

Environmental Circumscription

How are we to determine these conditions? One promising approach is to look for those factors common to areas of the world in which states arose indigenously—areas such as the Nile, Tigris-Euphrates, and Indus valleys in the Old World and the Valley of Mexico and the mountain and coastal valleys of Peru in the New. These areas differ from one another in many ways—in altitude, temperature, rainfall, soil type, drainage pattern, and many other features. They do, however, have one thing in common: *they are all areas of circumscribed agricultural land*. Each of them is set off by mountains, seas, or deserts, and these environmental features sharply delimit the area that simple