

SCIENCE, MATERIALISM, AND THE STUDY OF CULTURE

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Infrastructural Determinism

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IN A TIME WHEN THE IDEA OF A SCIENTIFIC anthropology is under attack and the analytic focus has shifted from cultural practices and institutions to symbols and texts, cultural materialism is an anomaly. Cultural materialism is an explicitly scientific and deliberately practical research strategy for discovering the causes of similarities and differences in sociocultural form. While in no way denying the validity and importance of efforts to understand or interpret the symbolic, meaningful world of "others," cultural materialism follows another anthropological tradition in seeking to explain culture. The goal is to develop a consistent set of propositions that can be tested cross-culturally in order to establish regularities of social existence. With better explanations how the world really works, we may be in a better position to ameliorate some of the most pressing human problems.

For many anthropologists, cultural materialism is associated with a few prominent theories espoused by Marvin Harris that reflect the ecological functionalism of the 1960s and early 1970s. His arguments that the sacred cow, Aztec cannibalism, or Yanomami warfare contributed to an adaptive balance of population to resources inspired heated debate. But cultural materialist theories have ranged far beyond that limited framework. Coercion and exploitation within states, for instance, has been a major focus of investigation. The polemics associated with adaptation arguments has diverted attention from what, in my opinion, is cultural materialism's main contribution, its developed epistemological and theoretical structure.

I disagree with many of Marvin Harris's hypotheses, and have argued against ecological functionalism (see Ferguson 1983; 1984a).¹ Nevertheless, I find a modified version of cultural materialism to be very useful in developing explanations of cultural variation and process. It enables me to approach a complex topic without stripping it down to a narrow

range of considerations; to categorize the different elements or aspects involved and hypothesize causal relationships between them; and to produce new insights into specific cases and issues that at the same time contribute to a broader comparative theory.

This chapter will describe that modified version of cultural materialism in relation to the existing formulations by Marvin Harris (1964a; 1968d; 1979a; 1987; 1991a; see Marvin Harris 1988, successive editions). Several years ago, I proposed a clarification of cultural materialist epistemology (Ferguson 1977), which resulted in the separation of the mental/behavioral distinction from the emic/etic distinction (Harris 1979a, 38; 1990, 60). This chapter proposes another programmatic modification, this time of cultural materialism's main theoretical principle, the principle of infrastructural determinism.

I will argue that Marvin Harris's formulations of the principle of infrastructural determinism are ambiguous: they admit both a strict and a broad interpretation. The strict interpretation holds that all sociocultural phenomena are to be explained with direct reference to the infrastructure; and the broad interpretation is that the infrastructure is the primary, general determinant of sociocultural form, but that other causal relationships must be sought to explain many sociocultural patterns. By settling explicitly on the broad interpretation, cultural materialism would enhance its theoretical rigor, yet at the same time become more serviceable as a general integrating framework for a wider range of research.

The essay will not consider alternative theoretical positions or critiques of cultural materialism. Critiques are plentiful, but few besides Marvin Harris have attempted to develop or improve the basic foundations of cultural materialist theory, with Barbara Price (1982) being the most notable exception. Nor will this chapter consider the relationship and possible convergence of cultural materialism and other approaches, such as "practice theory," which would be a good thing to do, but a major project in itself. The goal here is much more modest: to explicate the existing theory and its proposed modification in a way that will allow anthropologists to consider its potential merit as a research tool.

WHAT IS INFRASTRUCTURE AND HOW DOES IT DETERMINE?

Cultural materialism divides sociocultural systems into infrastructure, structure, and superstructure, each with its behavioral and mental domains, all approachable through etic and emic perspectives. These dis-

tinctions are conceptual means of sorting information as steps toward causal analysis. The concepts of causality and determinism will be used here as they are commonly understood, without going into the epistemological and ontological issues they raise. Marvin Harris's (1977, xi) simple definition is quite appropriate for present purposes: "By a deterministic relationship among cultural phenomena, I mean merely that similar variables under similar conditions tend to give rise to similar consequences."

Cultural materialism's infrastructure is conceptualized as a conjuncture of demographic, technological, ecological, and economic² factors that comprise the interface of a population with the physical world, a society's mode of production and reproduction. Structure encompasses domestic patterns, political organization, and economic relations (relations of production). Superstructure includes values, aesthetics, rules, beliefs, symbols, rituals, religions, philosophies, and science (Marvin Harris 1979a, 52-53, 58; 1987, 110).

The principle of infrastructural determinism begins with a simple premise: the physical world conforms to physical laws that must be accommodated by a society's infrastructural organization. This interface with nature is what gives the infrastructure causal priority within sociocultural systems (Marvin Harris 1979a, 57-58; 1987, 110; 1991a, 73; Barbara Price 1982, 719-22). In simplified form, the principle of infrastructural determinism holds that changes in the infrastructure probabilistically determine changes in the rest of the sociocultural system.³

Marvin Harris's formulation of the principle has changed over the years. Initially, he called it "the principle of techno-environmental and techno-economic determinism. This principle holds that similar technologies applied to similar environments tend to produce similar arrangements of labor in production and distribution, and that these in turn call forth similar kinds of social groupings, which justify and coordinate their activities by means of similar systems of values and beliefs" (Marvin Harris 1968d, 4).

A decade later this is rephrased in accord with the terminology of a more developed epistemology and theory: "The etic behavioral modes of production and reproduction probabilistically determine the etic behavioral domestic and political economy, which in turn probabilistically determine the behavioral and mental emic superstructures. For brevity's sake, this principle can be referred to as the principle of infrastructural determinism" (Marvin Harris 1979a, 55-56).

Most recently, the principle has been modified to include the "biopsychological givens" of "sex, hunger, thirst, sleep, nutrition, metabolism, digestion, vulnerability to mental and physical disease and to stress

by darkness, cold, heat, etc." (Marvin Harris 1987, 109; see 1979a, 63). In addition, "(a) [O]ptimizations of the cost/benefits of satisfying biogram needs probabilistically (i.e. with more than chance significance) determine (select for) changes in the etic behavioral infrastructure; (b) changes in the etic behavioral infrastructure probabilistically determine (select for) changes in the rest of the sociocultural system. The combination of a and b is the principle of infrastructural determinism" (Marvin Harris 1991a, 74; see 1987, 110-11).⁴

In its strict sense the principle holds that the explanation of all socio-cultural phenomena is to be sought in infrastructural variables. Thus, "Cultural materialists give the highest priority to the effort to formulate and test theories in which infrastructural variables are the primary causal factors" (Marvin Harris 1979a, 56). Or, cultural materialists require "every hypothesis worthy of research to implicate etic and behavioral demo- techno- econo-environmental variables" (1979a, 75). Or, "components of the etic behavioral infrastructure are treated as independent variables while components of structure and superstructure are treated as dependent variables" (1991a, 74).

Only if infrastructural causes cannot be found are investigators to seek other causes, first in structural and then in superstructural variables (Marvin Harris 1979a, 56). Moreover, investigators are expected to be tenacious in their search for infrastructural causes, even when these do not appear to be implicated. To do otherwise is to "quit early" (Marvin Harris 1987, 111; 1991a, 74). The question of possible autonomy of causal relationships independent of the infrastructure is not denied, but "postponed" until the possibility of infrastructural explanations is exhausted (Marvin Harris 1979a, 56, 65). It is this injunction that lies behind the charge that cultural materialism is a form of ecological reductionism.

In the proposed modification to a broad interpretation of the principle, rather than requiring that *every* effort to explain *any* cultural phenomenon begin with the infrastructure, I propose that we seek from the start to identify causal regularities throughout the sociocultural system. Thus, answers to certain kinds of questions would *regularly* be sought in structural or superstructural conditions. The principle of infrastructural determinism alone, in its strict sense, is too limited to deal with the range of deterministic relations that demonstrably exist.

Its inability to deal with all causality is illustrated in a recent discussion of the relationship between mode of production and mode of reproduction. After arguing for the causal priority of the infrastructure, Marvin Harris and Eric Ross (1987, 2) ask, "But if mode of production

is itself a component of infrastructure, how does the principle of infrastructural determinism apply? We are not prepared to make any categorical assertion that either mode of production or mode of reproduction is dominant over the other. Rather, we propose that both are mutually determinative, causally intertwined in the fabric of human social relations." Unraveling that fabric to discover regularities in their interaction will require a commitment to seek causal relationships that cannot be reduced to the principle of infrastructural determinism. There is no reason to believe that a similar task is not warranted for causal relationships within and between structure and superstructure.

A HIERARCHY OF CONSTRAINTS

I see the relationship between infrastructure, structure, and superstructure as a nested hierarchy of progressively more limiting constraints. The infrastructure establishes the major characteristics of any social formation. Its significance is most starkly evident in the major differences between societies, but it also establishes multiple parameters for social organization and process in any given society. Structural factors conform to the limitations imposed by the infrastructure but have substantial latitude within those constraints for autonomous determinism. The structure is the primary determinant of most process and change outside of periods of major sociocultural transformation. Superstructural variables operate within the possibilities established by the structure and infrastructure, but again with substantial autonomy. In addition, superstructural factors have a large effect on the perceptions and actions of individuals in a given context.

The constraints imposed by infrastructure can be diverse and thus determinative in many ways. Infrastructural constraints should not be visualized as an empty bracket into which any number of social formations could be slotted; but rather as a topographic field, extending into and shaping structural and superstructural relations at numerous critical points. The same goes for structural conditioning of superstructure. This is consistent with the idea of "systems causality," which rejects single-factor "prime movers" and sees sociocultural systems as networks of interacting, reciprocally determining variables (Barbara Price 1982, 722). The multiple and interconnected inputs of infrastructure to structure mean that autonomy of structural processes exists within a fairly limited range of possibilities. The same applies to superstructure.⁵

How can one reconcile the idea of a high degree of determinism with

substantial latitude for autonomous processes? The answer is that there is a lot of determinism to go around. To get from the broadest characteristics of a sociocultural formation to specific activities or beliefs, more and more factors must be brought in. A complete explanation of anything would be an enormous, perhaps impossible task.

As with the existing formulations of the principle of infrastructural determinism (Marvin Harris 1987, 120–22; 1991a, 74), feedback relations from structure and superstructure to infrastructure are recognized. However, greater attention to causal relations throughout the social system would make it possible to clarify the nature of feedback. It would also enable us to identify more precisely those areas of indeterminacy or multiple possibilities, where human agency may be able to modify the trajectory of history; and thus enable us to identify where deliberate efforts to solve societal problems in conformity with societal values can make the most difference. To demonstrate the extent and character of infrastructural or structural determinism is, at the same time, to demonstrate the limits of that determinism, and to elucidate the possibilities for change.

Explicitly reformulating the principle of infrastructural determinism in this way would clarify that cultural materialism actually is compatible with a broad range of existing research approaches that are committed to scientific procedures, but which focus on relationships above the infrastructural level. (As noted below, Marvin Harris follows this broader interpretation in practice.) These findings can be assimilated and anchored within the deductive linkages of the larger theoretical framework (Barbara Price 1982, 710–13). I have attempted to do just that for contemporary theories on warfare (Ferguson 1990b; and for applications, see Ferguson 1989a, 1992a, 1994). To illustrate what I am proposing, I will summarize that synthetic theory.

My model is developed with primary reference to relatively egalitarian societies, and substantial adjustments are necessary for its application to stratified societies. In relatively egalitarian societies, conflicting interests in critical resources or material products are usually the root causes of wars, the reasons why war does or does not occur.⁶ Other infrastructural conditions, including population numbers and distribution, terrain, and technology, impose many direct constraints on the practice of war, thus determining general parameters of strategy and tactics. In that, they determine what kinds of war can be waged and the broad characteristics that distinguish the forms of warfare practiced in different cultures, for example, the emphasis on ambush and surprise in

Amazonian warfare, in contrast to the open-field, battle-line confrontations common in highland New Guinea.

In my model structural considerations are divided into the conventional headings of social organization, economics, and politics. Regarding war, they all operate within the infrastructural constraints just discussed, and each also has direct connections to infrastructural exigencies of production and reproduction. That still leaves substantial autonomy for the internal dynamics of these domains and for the interactions between them (see Ferguson 1988c).

Postmarital residence and institutions such as age grades provide the organization for military forces, and thus strongly affect military capabilities, such as the ability to wage war locally or at long distances. Domestic structure can provide relationships that are transferable to combat, such as the authority of a father-in-law. Economics give content to the structure of kinship, with patterns of distribution and consumption defining communities of interest and antagonism. This determines if and how a scarcity will be transformed into a cause addressable through military action. Political organization provides the ways and means for producing that action, and factors such as authority and decisionmaking patterns impart their own characteristics to any act of war.

All these structural domains also shape intergroup relations. Good alliances are crucial for survival and success in war. Although possibilities for alliance respond to infrastructural factors such as the distribution of resources, this usually leaves substantial room for variation. Actual possibilities are more directly affected by existing ties of trade, intermarriage, and diplomacy. Also, with increasing sociocultural evolution, structural factors come to assume more significance as causes of war. As social organization grades from kinship to class, structural economics becomes more determinative of demand and scarcity, and politics takes on a military life of its own.

No war occurs without a great deal of thought, and superstructural factors shape the deliberations that precede violence. Information about enemies and allies is necessary for any decision, and the fog of war is at least as thick in tribal wars as our own. Information is processed through mental constructs with their own connections to structural and infrastructural organization. Cognitive orientations, religious beliefs, values, personality types, and other factors provide meaning and orientation within the constraints already described. They affect the readiness of people to take up arms, and the expectations associated with a "state of war."

Superstructural factors have a major effect at the level of the individual. Although my position is that expected material costs and benefits within given sociocultural and situational contexts largely determine decisions on war (see Ferguson 1984a, 37–42; 1990b, 30; 1995), these interests are converted into a moral idiom for individual and group deliberations. “Wants” and “needs” become “rights,” and thus all wars are morally justified for those who initiate them; but the moral principles themselves, and their application to a given situation, are highly constrained by infrastructural and structural factors.

The conjuncture of superstructural variables in play (for example, information, values, norms, worldview, and personality) has its own logic, and that logic obviously shapes decisions. Even individual variations in their expression can tip the balance for or against war in a specific case. Here then is a definite and specific role for agency. There is a tightly circumscribed moment before war, where more or less violent options are situationally realistic possibilities. In these moments individuals make choices in what could be legitimately described as an exercise in free will and personal responsibility. Avoiding war is not always a realistic possibility. But it may be so, and agency may make the difference between war and peace. Since even single acts of war can have wide-ranging sociocultural repercussions, this is a very significant difference. Thus, commitment to the modified principle of infrastructural determinism in the analysis of war does not contradict hope for purposeful action to overcome war. On the contrary, by offering more precise specification of the processual role of the responsible individual, it may encourage action in favor of peace (see Ferguson 1988b; 1989a).

This summary of my synthetic theory of warfare hopefully makes a general point: by explicitly opening up the research strategy with a revised principle of infrastructural determinism, cultural materialism could become more of a general frame of reference for those who seek to understand how the different components of sociocultural systems fit together. This cultural materialism would be able to address a broader range of questions, while preserving the basic principle of the causal priority of the infrastructure. Arguments about causation would persist within the framework, but would become potentially resolvable, rather than remaining as ships passing in the night.

ECLECTICISM

A possible objection to this modification, from a cultural materialist perspective, is that it is eclectic. Harris has defined eclecticism in different

ways, some of which apply to my proposed modification, some of which do not. In any case, he identifies two problems associated with eclecticism. The first is that as a “middle-range, piecemeal approach” (Marvin Harris 1968d, 3), it prevents the development of a broad, unified theory, and thus it does not address the big questions about how society works. “Eclecticism results in theories that do not link up with or interpenetrate each other and which are often mutually exclusive” (Marvin Harris 1979a, 290). “By picking and choosing epistemological and theoretical principles to suit the convenience of each puzzle, eclecticism guarantees that its solutions will remain unrelated to each other by any coherent set of principles” (Marvin Harris 1979, 287–88; also see Marvin Harris 1990, 17, 20; Barbara Price 1982, 710–13).

This is not an expected consequence of the proposed modification, which operates within the epistemological and theoretical principles of cultural materialism, but which is intended to go even further in specifying the causal relations involved in specific questions, and drawing those middle range theories into a rigorous, unified general theory.⁷

Harris sees a second problem with eclecticism: because it does not mandate thorough investigation of infrastructural variables, these will not be given sufficient attention. Researchers will “quit early” (Marvin Harris 1979a, 304, 308; 1987, 111, 122; 1991a, 74). In other words, the strict principle is to encourage important research regarding the determinative role of the infrastructure. But the practical results of this injunction have been decidedly mixed. It appears that one major consequence has been to make those investigators who are not already concerned with infrastructural matters steer clear of the entire scientific edifice of cultural materialism, which otherwise they might find useful. Their research interests and middle-range hypotheses might benefit from being related to a larger theoretical structure, which suggests causal pathways to a wide range of other sociocultural phenomena.

Harris follows scientific precedent in stating “Paradigms can be compared with each other and evaluated from two standpoints: one, their logical structure and internal coherence; and two, their respective abilities to produce scientific theories in conformity with the criteria . . . of predictability, testability, parsimony, scope, and integratability” (Marvin Harris 1991a, 71, order reversed). By these standards a research strategy or paradigm that integrates diverse middle-range theories within a larger framework in a logically and theoretically coherent manner must be considered superior to one that excludes such theories because they do not, in themselves, implicate infrastructural variables.

Beyond these defenses against a charge of eclecticism it can be argued that the proposed modification is totally consistent with the actual

practice of cultural materialism, and that brings us to the broad interpretation of infrastructural determinism. Several statements by Harris refer to the infrastructure as establishing "limitations and possibilities," within which structural and superstructural factors operate. "[C]ultural materialist theories may invoke different degrees of infrastructural causation ranging from virtual certainty to virtual indeterminacy. Along this entire range, structural and superstructural commitments appear to shape the final outcome through negative and positive feedback processes, in inverse relationship to the ability of existing theories to identify the infrastructural determinants" (Marvin Harris 1979a, 74-75).⁸ Other statements identify infrastructural determinism as being particularly important for explaining the origins of major types, dimensions,⁹ or transformations of societies;¹⁰ thus implying that infrastructural causality applies most to the biggest questions, the broadest parameters (see Marvin Harris 1992). The possibility of integrating structural and superstructural variables into explanations is also consistent with Harris's regular emphasis on the probabilistic nature of infrastructural determinism (Marvin Harris 1968d, 667; 1979a, 55; 1987, 110-11; 1991a, 74; see Magnarella 1982). Finally, Harris regularly observes that structural patterns, such as state organization¹¹ or warfare,¹² while themselves grounded in the infrastructure, in turn initiate long causal chains affecting numerous aspects of society. All these statements express the basic idea that I propose now to elevate to explicit theoretical principle.

EVOLUTIONARY TIME AND HISTORICAL TIME

I agree that the causal significance of the infrastructure supplants other considerations in the big, macroevolutionary questions, in which time is measured in centuries or even millennia. This is the type of question most frequently asked by cultural materialists.¹³ But many of the pressing questions facing anthropology today concern historical change. In contrast to evolutionary time, historical time frames usually are measured in decades, years, or even shorter spans. Cultural materialist theory is weak here. Indeed, in discussing short-run, historical time frames, Harris and Ross seem to practically concede the field to eclecticism.

When sociocultural differences and similarities including demographic variables are examined synchronically, causal relationships rapidly dissolve into an incoherent corpus of

middle-range eclectic correlations linking infrastructural, structural, and superstructural components in infinite arrays. It then appears empirically demonstrable that there are no overall asymmetries in the causal nexus. This error cannot be resolved simply by adding short-run time frames. Indeed, dependence on short time frames compounds the problem and leads to the impression that in certain historical moments and societies, structure and/or superstructure dominate infrastructure. (Harris and Ross 1987, 2-3)

Their solution is to lengthen the time frame to include the major transformations of society in which infrastructure is reasserted. But I see no reason to abandon the quest for causal regularity in normal historical process. *That* is "quitting early." A perspective on infrastructural causality that employs the idea of a nested hierarchy of progressively more limiting constraints is eminently applicable to short-term process.¹⁴

The historical application of the concept of partially autonomous structural processes operating within infrastructural constraints is illustrated in my work on indigenous warfare in the New World in relation to Western contact. I argue (Ferguson 1984b; 1990a; 1992a; 1992b; 1995; see Ferguson and Whitehead 1992) that contact-related infrastructural changes involving introduced industrial technology (such as steel tools and firearms), demographic disruption (through disease and slave raiding), altered work regimes related to new commodity production, and a variety of ecological stresses (involving depletions, geographic displacements and constrictions, and exogenous plants and animals), all set off major sociocultural responses that—filtered through indigenous structures and superstructures, themselves directly affected by contact—lead to the transformation, intensification, or even generation of war patterns.

The concept of structural autonomy within multiple infrastructural constraints is applied to more "normal" historical process in my research on sociocultural transformations in Puerto Rico over the past century (Ferguson 1988a), based on fieldwork in the village of Jauca in Santa Isabel, previously studied by Sidney Mintz as part of the People of Puerto Rico project (Mintz 1974; Steward and others 1956). To integrate the diverse factors at work, I developed a causal model showing the decade-by-decade interaction of economic, social, and political subsystems; and, simultaneously, the interaction of processes occurring at local, insular, and colonial levels of organization.¹⁵ Most attention goes

to variables that cultural materialism would assign to the structure.¹⁶ These operate within a definite infrastructural context, which begins with factors such as industrial society's demand for food energy (sugar), climate and geography, population trends, and general levels of technological development. Such factors go far to answer many questions, but they have little ability to explain the course of short-term historical process.

The main lines of argument revolve around the role of sugar production. The acquisition of sources of tropical agricultural products was a major incentive in the U.S. annexation of Puerto Rico, and large-scale capital investment soon followed. Within Puerto Rico, the south coastal plain where Santa Isabel is located is one of the best areas for industrial sugarcane production: fertile, flat, and well watered. These characteristics, combined with the availability of large numbers of (low-paid) laborers experienced in cane work, attracted local investment by the North American-owned Central Aguirre corporation. By the early 1920s Aguirre, the most technologically advanced sugar operation on the island, controlled the land, jobs, and politics of Santa Isabel. As Mintz demonstrates, this control was the fundamental context for shaping the social organization and ideology of the rural proletariat.

In 1948-49 Mintz's fellow students in the project did similar research in other ecological contexts, with different productive regimes, and so different subcultures. The social relations developed in the different production regimes throughout Puerto Rico structured the insular political economy, and that, in interaction with U.S. political and economic interests, shaped the colonial relationship. Mintz also demonstrated that the introduction of new technologies and modified work regimes by Aguirre from the 1920s had multiple direct and indirect ramifications in the life, organization, and attitudes of the people of Jauca. Considering these ecological, demographic, technological, and economic factors, it is clear that the infrastructure established major parameters of local and insular sociocultural process. But these cannot explain the actual course of history.

With reference to the Santa Isabel region, Mintz showed that the application of technology followed the (structural) logic of a large capitalist enterprise. What could not be discerned looking at Puerto Rico alone, however, was that there existed different possibilities for actualizing that logic. I studied the larger organization of the U.S. sugar industry, and of the other producers within it. These were fitfully bound together in a changing cartel that aimed at maintaining sale prices. The cartel supported a virtually unstoppable lobby in the U.S. Congress. As a result of

being within this structured marketing system, Aguirre's capital investment aimed at input minimization rather than output maximization, on a premise of continuing subsistence wages. Even so, developments within this larger structure in the early 1930s forced Aguirre to restrict its sugar output.

At that time, competition among producers turned the cartel and its allies in the U.S. Congress against large Puerto Rican producers, creating opportunities for insular political reform in the late 1930s and 1940s. The manner in which those opportunities were utilized reflected island social class arrangements and political party maneuvering. Union strength and the electoral power of the sugar proletariat led to wage increases from the 1940s on. This and other regulation of the sugar corporations' excesses undermined the profitability of corporate sugar production in Puerto Rico, which fell behind other U.S. producers. Political uncertainty at both the island and national levels precluded major retooling of the industry, and Puerto Rican sugar became gradually less competitive on the U.S. market. Production declined through the 1950s and collapsed after the mid-1960s. At present, the fields around Jauca grow mostly weeds.

This represents one focus in a larger analysis. In a similar way a range of structural factors must be examined to explain historical developments within the local community. For example, peculiarities in the local relationship between union and political officials fed a factionalism that meant that the rural proletariat of Santa Isabel was weaker and more disorganized than in nearby areas. Many other local and insular developments could be cited, but there is already enough to make the point: at the local, insular, and colonial levels the infrastructure set the stage, establishing possibilities and several major trends. But, within those constraints, structural factors dominated the historical process and ultimately had major consequences for infrastructural organization. Superstructural variables are less investigated in my work. But it is clear that while they are very much shaped by infrastructure and structure, autonomous superstructural factors—such as the controlled availability of knowledge about supralocal political developments or the ideologies of labor organizations and political parties—played a very significant role in developments.

DISCUSSION

As the preceding discussion suggests, the proposed modification brings cultural materialism closer to contemporary research in political

economy. That is where it belongs. The theoretical wellsprings of cultural materialism—Marx, White, and Steward—represent three distinct but compatible traditions of materialist social theory: political economy, evolutionism, and cultural ecology. Stripped of the ahistorical and functionalist orientation often associated with it in the past, cultural materialism offers political economists useful theoretical tools, enabling them to bring ecological, demographic, and technological factors into better focus. At the same time a rapprochement of materialisms would open new fields for the application of political economic concepts. For example, my work on the Yanomami (Ferguson 1992a; 1995) begins with contact-related infrastructural change, but goes on to explain their patterns of war and alliance, with reference to such concepts as control of the means of production, unbalanced terms of trade, and the extraction of the value of labor. Yanomami warfare thus becomes intelligible as a permutation of relationships that in other sociocultural contexts give rise to class conflict.

This brings me to my final topic. I realize that the reaction of many anthropologists to this entire argument will be a reflexive dismissal. Talk of science or causality, we are told, is old-fashioned, antique. Why should we persist in these interests? The answer is this: the world. Every day in this world, wars are being fought, political dissidents are being arrested, poverty is deepening, and the air and water are becoming more toxic. Every day close to 30,000 children die from easily preventable illnesses (*New York Times* 1990c). Every day the prison population of the United States reaches a new record (*New York Times* 1990b). Conditions in much of the underdeveloped world, devastated by the “lost decade” of the 1980s, show only limited signs of improvement. Although the global cold war has ended, the very hot wars of specific regions have not (see Ferguson n.d. (a); n.d. (b); Whitehead and Ferguson 1993). The newspapers do not tell the whole story, but they tell enough: the poor and powerless of the world—anthropology’s professional “others”—are all too frequently being malnourished, evicted, imprisoned, tortured, shot, and quite generally deprived of what both we and they consider to be basic necessities of life.

The problems of the world are matters of fact, not just of text. They are reality to millions, not just discourses. For anyone who wishes to do something about them, questions of causality are inescapable, because to change things one must make some estimate of how it is that things change. And if one seeks better ways of dealing with these problems, a scientific methodology provides the means of evaluating different options.

From the beginning Harris has consistently argued that the compelling reason for developing a science of culture is to provide guidelines for action directed at fundamental social problems, and to discover effective and humane alternatives to the brutal and dehumanizing consequences of systems taking their own course (Marvin Harris 1968d, 3; 1974, 262–66; 1977, xii, 195–96; 1981, 15–16, 182–83; 1987, 123; 1992, 302; Harris and Ross 1987, 181–83). As he once said to me, “I’m the worst idealist of all, because I think ideas make a difference.” The continuing interest in theory as it can be applied to current problems is manifested in several of the chapters in this volume. If our science is still rudimentary, that is all the more reason to try harder.

NOTES

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1. Much of the perceived functionalism of cultural materialism is the result of its wholesale assimilation of the avowedly functionalist ecology of the 1960s and early 1970s. But functional ecological concepts such as “adaptation” or “homeostasis” do not appear in the abstract formulations of cultural materialist theory, which is the reason I am able to offer a nonfunctionalist reformulation of that theory. (Although I too see ecological relationships as crucial for understanding culture, I think of them in historical rather than equilibrational terms.)
2. Marvin Harris (1991b, 106–7) distinguishes infrastructural and structural aspects of economies. Infrastructural economics encompasses “the way in which a given technology is applied to a specific environment to produce the energy on which social life depends.” Structural economics includes “division of labor, exchange and distribution of products and services, control over labor, and ownership or differential access to technology and natural resources.”
3. “Simplification” here has specific meaning. Technically, Marvin Harris (1987, 110) notes that we should not speak of entities such as “infrastructure.” To be more precise, we should refer to “etic behavioral infrastructure,” and so on. But this, he observes, would be too cumbersome (see Marvin Harris 1979a, 51–54).

What is involved here is not just a matter of convenience. Significant issues are raised by the subdivision of infrastructure, structure, and superstructure into emic and etic, mental and behavioral. One may question whether it is possible to have a purely emic approach to, say, the mental

- structural domain, because the domain itself is an etic construct. It is also questionable whether the mental dimension of infrastructural factors—e.g., knowledge about using technology—should be lumped, as Marvin Harris (1979a, 54) does, with all other beliefs as part of the “mental and emic superstructure.” But these issues are not essential ones for this essay.
4. Barbara Price (1982, 723) takes a slightly different approach. She argues that structural or superstructural factors “will be of analytical importance to the extent that they are demonstrably involved in the overall energetic system,” which is itself primarily infrastructural. But analytic importance in her essay is related to explaining evolutionary trajectories. I will argue later that cultural materialism can also address other questions and, for these, relation to societal energetics is not essential.
 5. Following the oral presentation of this paper at the New Orleans meetings, one commentator suggested that I was confusing “cause” and “constraint,” the former making reference to a specific outcome, the latter to a range of possibilities. In my view, infrastructural, structural, and superstructural constraints will produce a range of possible outcomes that can be very specific.
 6. It should be noted that I differ greatly from Marvin Harris in the conclusions I draw about warfare (see Ferguson 1989b; 1989c; 1990a; 1992a; 1994; Ferguson and Whitehead 1992), specifically in rejecting a functional ecological explanation of war for a historical one.
 7. My approach here is strongly influenced by Robert Merton (1968) on “sociological theories of the middle range,” which he defines as “theories that lie between the minor but necessary working hypotheses that evolve in abundance during day-to-day research and the all-inclusive systematic efforts to develop a unified theory that will explain all the observed uniformities of social behavior, social organization and social change” (Merton 1968, 39). Merton’s “disciplined eclecticism” shows how middle-range theories can be consolidated within a larger unified theory.
 8. Two other examples are given here. “Superstructure affects structure and infrastructure, but it does so in conformity with the limitations and opportunities imposed on it by infrastructure” (Marvin Harris 1987, 120). “Structure and superstructure are not mere passive, epiphenomenal products; rather they actively contribute both to the continuity and change of infrastructures. But they do so within the limitations and possibilities inherent in a given set of demo- techno- econo-environmental conditions” (Marvin Harris 1991a, 74–75).
 9. “At the heart of the cultural materialist theoretical corpus is a set of theories dealing with the origin of the principal varieties of pre-state societies, the origin of sexism, classes, castes, and the state, and the origin of the principal varieties of state level systems” (Marvin Harris 1979a, 78).
 10. “During these major transformations [between types of sociocultural systems] it can be shown logically and empirically that changes in infrastruc-

- ture dominate changes in other sectors and that therefore a proper understanding of history and prehistory cannot be achieved by reading arbitrary slices of time, but only by reading forward from the paleolithic or from the junction between major types of social transformations” (Harris and Ross 1987, 4). “The initial task of any truly anthropological study of sociocultural evolution is to situate sociocultural systems within the grand sweep of infrastructural changes that have led to the emergence of hunter-collector, agricultural, pastoral, and industrial societies and to the specific demotechno- econo-environmental conditions that have selected for the myriad types and sub-types of these culturo-phyletic categories. In this macroerspective, the asymmetry of sociocultural feedback processes reasserts itself at the junction between all major transformations, and the subsequent histories of events must then be read forward to the next major transformation” (Marvin Harris 1991a, 94; see 1987, 119).
11. “Once the state becomes a functional reality, its components resonate within a single gigantic amplifier. The more powerful the ruling class, the more it can intensify production, increase population, wage war, expand territory, mystify the peasants, and increase its power still further” (Marvin Harris 1979a, 102).
 12. “Warfare in turn initiates and sustains lengthy theoretical causal chains which partially or wholly account for many features of domestic and political economy and the emic superstructure of village peoples” (Marvin Harris 1979a, 91).
 13. Barbara Price (1982) presents a detailed theoretical exposition on the relationship between infrastructural determinism and evolutionary change. At this point it is appropriate to address what appears to be a major difference between her understanding of cultural materialism and mine.

Barbara Price identifies the two primary antecedents of cultural materialism as Marx and Darwin, and argues for the uniform application of “natural selection” to both biology and culture. In contrast, I do not relate the theory to Darwin, although I do invoke selection (Ferguson 1990b, 28–29). Similarly, Marvin Harris (1984b, 130–33) has explicitly rejected the application of models of biological evolution to cultural process: “On the contrary, infrastructural determinism resembles the principle of natural selection only to the extent that both are examples of selection by consequences” (Marvin Harris 1991a, 93).

One reason for this difference is time scale. With her focus on long-term trajectories in evolutionary time, the great differences between cultural and genetic processes of innovation and transmission are less significant than they are for research directed at observable peoples and processes. Another reason is semantic. Barbara Price (1982, 715–18) abstracts the essence of natural selection, and so the Darwinian mechanism, from any reference to biology (remembering that Darwin himself had no knowledge of genetics). But invoking “Darwinian natural selection” evokes

inherently biological models for many, as when sociobiologists assert that cultural materialists must consider recent biological theory because of their reliance on Darwinism. I seek to avoid that possible confusion.

14. I wish to clarify that this contrast of evolutionary time and historical time should not be read as an implied criticism of studies that employ the former time frame. These are complementary approaches. Any apparent contradiction is actually anticipated by Harris's discussion of the compatibility of different forms of evolutionism: those focusing on long-term global sequences, and those dealing with shorter-term, local sequences (1968d, 646-53). In both cases, he argues, the crucial issue is what kinds of variables will be invoked to explain processes of convergence and divergence. Reading "evolution" thus, as a "temporal sequence of forms" (White quoted in Marvin Harris 1968d, 647), the demonstration of regularity in historical change is another form of evolutionism.
15. This point merits clarification. I hold that the deterministic relations discussed in this chapter are applicable at different levels of sociocultural integration. The question of causal relationships between levels, as often raised in debates about the world system, is itself very significant and complex—but that is a topic for another work.
16. A similar structural focus is found in *America Now* (Marvin Harris 1981).