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Toward a Unified Human Science

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Abstract: An organizing schema for human science is constructed, which consists of a hierarchical list of the phenomena of interest to human scientists, and the causal links (influences) among these phenomena. Such a schema has been suggested by previous scholars but never constructed. The schema can be justified in terms of both realist philosophy and (much) postmodern thought. It serves the task of interdisciplinarity much better than grand theory. The schema can encourage a broader world view among scholars and a more balanced scholarly effort, improve public policy advice, aid both integration and skill acquisition by students, provide answers to many modern critiques of liberal arts education, and facilitate curricular change.

I. Introduction

IMAGINE THE DIFFICULTY of teaching a course in North American geography without recourse to maps. A lecture or two could be devoted to each of the major regions of the continent and the students told where each was located with reference to a couple of other regions (e.g., the Great Lakes lie to the northwest of the Appalachians and south of the Canadian Shield). On the final exam, you ask the students to describe how to get from Chicago to the ocean and are disappointed when some of them wind up in Canada. If only they had a map from the outset, they would have found it so much easier to see how each topic in the course related to the others.

Interdisciplinary scholars have done much in recent decades to break down barriers among the disciplines in the social and behavioral sciences and humanities (hereafter human science). It is now widely recognized that no one discipline has all the answers to pressing public policy problems. Yet, in our efforts, both to research cross-disciplinary interactions and to teach our students about interdisciplinary linkages, we lack a cognitive map, which describes how the subject matter of human science fits together. Like the

imaginary geography student of the opening paragraph, both researchers and students have no easy way of seeing how the topic on which they are focused fits into a broader whole.

Conceptually, however, constructing such a map is far from impossible. Research in human science, almost without exception, involves describing how phenomena influence one another, leaving to one side for a moment the philosophical or methodological concerns of some scholars and the efforts of others to describe or measure phenomena. This broad similarity in approach may not be obvious simply because different scholars focus on different sets of phenomena. Moreover, they differ in the sorts of influence, which they perceive as important.[1]

However, an organizing schema for human science can be constructed by providing a list of the key phenomena of interest to human scientists and describing the types of influence which one phenomenon could exert on another. In a broad sense, philosophers of science have already performed the latter part of this task. Several scholars have suggested the first part of the task over the past decades, but none have been so bold as to propose a list (see Section VII). They have recognized, though, that such a list can and should be structured hierarchically with a small set of major categories disaggregated into a larger set of phenomena which in turn can be disaggregated, and so on.[2]

The next section of this article tackles definitional issues. How exactly do I define 'organizing schema,' 'phenomena,' or 'influence'? Though I believe that these terms become clearer in usage, it is helpful to provide precise definitions at the outset. I will argue that one advantage of our schema is that it provides precise definitions of phenomena.

In the third section, I will develop a hierarchical structure of phenomena. I will begin with a set of ten broad categories, which together exhaust the subject matter of human science. These will each be disaggregated, yielding a list of over one hundred 'second-level' and 'third-level' phenomena. While it turns out that the vast bulk of human science research can be understood in terms of these phenomena; I will, for many of them, describe how further disaggregation could proceed.

The organizing schema (cognitive map) requires more than a list of phenomena. In the fourth section of the article, I briefly review the sorts of influence which phenomena can exert on each other. To stop there, however, would risk leaving the impression that human science is a much less complex undertaking than it actually is. While there are only a few broad categories of influence (or causation), the precise mechanisms by which one phenomenon

affects another display a huge variety.

Only rarely, can we look at two phenomena and not see some way in which each affects the other.[3] Crime is a good example. While scholars in some disciplines emphasize the individual-level causes and scholars in other disciplines emphasize the societal causes, the scholarly community as a whole has shown how various aspects of our common genetic base, personality, culture, the natural environment, the economy, politics, social structure, technology, health and population, and even art have an effect on crime. Students exposed to this knowledge should be less susceptible to arguments that there is one solution to the problem of crime (even allowing for the fact that some influences are more important than others). Familiarity with the schema as a whole should encourage a similar healthy skepticism with respect to all major public policy issues.

While it is possible to sketch causal links between almost any two phenomena, it is obvious that scholarly attention has been lavished on some links while others have been virtually ignored. Nor can the relative scholarly attention devoted to particular links always be comprehended in terms of their importance (note also that even links which are of trivial importance at any point in time may still have a huge cumulative impact on the course of world history). Each discipline establishes incentives for its scholars to investigate certain areas and to employ particular methods which are more amenable to some questions than others are.[4] Economists, for example, have paid relatively little attention to economic growth in recent decades because its study requires interdisciplinarity and does not lend itself to mathematical modeling. Scholars who investigate questions on the fringes of their disciplines may find that any publications they achieve are soon forgotten because other scholars do not build on their insights. Later scholars, in consequence, often re-invent the wheel. An organizing schema, then, can serve to encourage a more balanced scholarly effort, and also serve as a structure on which to hang various insights so that these are not forgotten.

Is this the right schema? I can only claim that it has advantages. I have now read hundreds of works—monographs, works of synthesis, and texts—spanning the human sciences, and have found it straightforward to summarize the arguments contained therein as causal links among the phenomena listed in the third section. The schema is inherently flexible, such that as new phenomena are discovered—by my own reading in the first instance, or more generally by human science as an enterprise—these phenomena can be added to the schema. While I believe the ten broad categories with which our schema begins are exhaustive, I cannot claim that at lower levels of aggregation I

have listed all phenomena which human scientists have or should care about. I can claim, however, both that the existing schema copes with a vast amount of human science research, and that it can be extended easily to deal with advances in our (or my) understanding.

Recognizing that the schema I propose is likely to be imperfect in some respects, I would hope this article motivates scholarly discussion of how to delineate phenomena and place them within a hierarchical structure. I hope and suspect, that for most phenomena, consensus will not be difficult to achieve. Even if consensus proves elusive in some cases, the schema will still be able to provide a useful framework for interdisciplinary research and teaching. Further discussion along these lines would help to develop common definitions of a set of terms facilitating interdisciplinary dialogue, research, and teaching.

While a detailed description of the causal links between hundreds of phenomena requires a book-length treatment, I will, in the fifth section, briefly describe how this could be done. At that time, I will also discuss previous attempts at delineating a list of such causal mechanisms. In the sixth section, I discuss how the schema can be visualized as a massive flow chart.

In section seven, I describe how my schema is related to previous scholarly suggestions regarding an organizing schema for human science. In section eight, I discuss the advantages of a schema such as this over attempts to unify human science by grand theory or ideology. In section nine, I argue that the schema fits well both with recent trends in the philosophy of science and with at least one key strand of postmodernist thought. The tenth section contains some concluding remarks about the value of such a schema: the schema can change the world view of scholars, aid both integration and skill acquisition by students, provide answers to many modern critiques of liberal arts education, facilitate curricular change, and improve public policy.

II. Definitional Issues

Our *organizing schema* consists of two components: a hierarchically structured list of the hundreds of *phenomena* of interest to human scientists and the thousands of *causal links* which operate among these phenomena.[5]

Alfred Kuhn's (1974) definition of the elements of his system could serve as a definition of our *phenomena*: any identifiable entities, concrete or abstract, individual or collective. Kuhn speaks, though, of events. Individual events would not be considered as phenomena in my schema, for my definition of phenomena has the important caveat that I am speaking of ongoing, indeed eternal, characteristics of human society. Individuals may differ in terms of

personality, but our personality dimensions are always with us. Genetic evolution may change our aggressiveness, but attitude to aggression remains a phenomenon worthy of study. Economic and political institutions evolve, but our categorization schema need not change to allow us to capture this diversity (societies lacking a particular institution fit as comfortably within our schema as those who differ in the details of institutional structure).[6] Neither the French Revolution nor the *Mona Lisa* are phenomena by my definition; nevertheless, we can, within our schema, discuss both the causes and effects of changes in political structure and acts of artistic genius, and we can test the value of our schema by how well it allows us to understand particular events.

The most precise definition of phenomena is provided by the Appendix, wherein I provide, a (hopefully, nearly complete) Table of Phenomena. What characteristics do these hundreds of phenomena share? They are, as noted above, enduring aspects of human existence. They are also of interest to human scientists and susceptible to scientific description and explanation. Indeed, they comprise the complete set of enduring aspects of human existence which are (or should be) of interest to human scientists.

Our definition of phenomena has important implications for our definition of *causal link*. In examining the link between two phenomena, we are asking either how a particular realization within one phenomenon affects the realization within another, or how a change in the one realization induces a change in the other. 'Attitude toward honesty' and 'economic output' are both phenomena within our schema. In looking at the link between the first and the second, we would wonder whether or not greater honesty tends to facilitate economic transactions and thus a higher rate of growth in output. It is thus not the phenomena themselves that change in our schema—they are defined so that they do not change—but rather particular realizations of those phenomena, which change.[7]

Scholars in different disciplines interpret the word *causal* differently. For some, to say that a change in A causes a change in B implies that only a change in A does so. Yet, we have seen that all phenomena are affected by many others. As the word *influence* captures this idea of multiple causal links better than the word *cause*, I have used it here. I have, however, stuck with *causal link* because there is no obvious alternative, and I dislike creating jargon unnecessarily.

As Barber (1993) has noted, the lack of a reliable set of definitions is a major obstacle to interdisciplinary research. Some (e.g., Shweder and Fiske, 1986) would argue that this is inevitable, that we as humans are inherently

unable to define any terms objectively, that definitions depend on points of view. Certainly, philosophers have long since abandoned the Platonic ideal whereby all terms could be defined precisely. Yet, we need not lose hope. A word like "democracy" hardly lends itself to easy definition, but that does not mean that most of us do not share a similar view of what it means.

Kuhn (1974) recognized that defining terms so that they had the same meaning across disciplines was a first step toward unifying human science. While space alone prevents me from attempting brief definitions of hundreds of phenomena, the very act of disaggregating serves us well. Whereas Wittgenstein suggested that words could at best be defined in terms of examples of usage, I strive for an exhaustive list of subsidiary phenomena. There are literally hundreds of definitions of the word "culture" in the literature; none is as precise as the disaggregation of the phenomenon below. Culture (as with all other phenomena) means all of the phenomena into which it is dissagregated, and only that. Scholars and students from varying disciplines, if conversant with this schema, could thus share very similar definitions of the key phenomena of interest to human scientists.

Having used the phrase *human science* a number of times, I should explain that. I follow what seems to be common practice in using the term to refer to the social sciences, including psychology, and the humanities (note that human science research is also undertaken by people outside these disciplines, notably in education, law, and medical faculties). Caws (1993) defines human science as the study of processes involving human agency. This provides a handy guide to our subject matter, for all of the causal links in our schema would involve some human action (or at least a reaction, as to an earthquake); as with *phenomena*, though, the lengthy list of phenomena below provides a more precise definition of our subject matter than any single sentence could.

III. Developing a List of Phenomena

In describing this project verbally to others, I have often used a convenient shorthand: my purpose is to show how the subjects of the several disciplines in the human sciences are related. While the statement is broadly true, I knew that it nevertheless gave a misleading impression of how the schema was constructed. The simple fact is that the human science disciplines have not carved up their collective subject matter according to any rules of logic. It was not logic but historical accident which decreed that sociology departments lump together criminologists, demographers, students of social divisions by family, race, gender, or class, and some of those intrigued by the idea of culture (the rest being housed in anthropology departments alongside students

of human evolution). Even the earliest disciplines to emerge—economics and political science—came over time to focus on some sub-areas of what might seem logical domains, while paying scant attention to others. In the humanities, too, individual departments combine specialists in language, literature, or culture with departmental divisions predicated on language spoken or region of concern rather than scholarly orientation.[8] Moreover, with the recent proliferation of departmental structures, there is considerable room for doubt as to what qualifies as a discipline. To take our modern disciplinary/departmental structure as the basis for the broadest categories would force me, then, into a depraved sort of intellectual gymnastics from which my project could hardly have been expected to emerge alive.

Therefore, I must begin by attempting to divide the subject matter of human science into logical categories.[9] These categories must cope both with individual characteristics and with societal characteristics. At the level of persons, I begin with our "genetic predisposition." As a species, we share a gene pool, which gives us all a set of basic abilities, motivations, and emotions. While our common gene pool guarantees a certain set of characteristics which define us as a species, differences in the precise genes which individuals possess, in concert with differences in environment, serve to guarantee that individuals differ from each other both physically and psychologically. This yields a second category of "individual differences."

All humans are necessarily part of a larger community, especially for the first few years of life (that is, one of our shared genetic characteristics is that we are born needing the help of others). I identify several distinct categories of collective behavior:

- "The economy"—how we interact with the non-human environment in order to create (and distribute) food, shelter, and other items of practical utility.

- "Art"—how we interact with the non-human environment to create items desired (primarily) for their aesthetic appeal rather than their utility. Note that works of art may serve further purposes through their aesthetic appeal, such as encouraging religious belief, which will be captured by causal links.

- "Social structure"—how the various sub-groups of society interact. Note that there are always at least two types of sub-groups, for the family is ubiquitous, albeit in different forms, and genders have never yet been

treated in precisely the same way.

- "Politics"—how power is distributed and exercised.

- "Culture"—how societies have employed a host of religious beliefs, customs, habits, etc. whose connection to the other realms is (at least potentially) tenuous. It is obvious that hierarchical economic, social, and political structures evolve (or at least attempts are made by those at the top to do so) beliefs in the correctness of those structures. Such beliefs thus logically belong to those categories. However, attitudes toward all categories except the economy, social structure, and politics are part of culture. (I will follow common usage here and treat "languages" as a subset of "culture.") The precise definition of culture will become clearer below.

- "Science and technology"—how we can best manipulate the non-human world to suit our various ends.

We must also perpetuate ourselves as a species, and thus must consider "population." Our ability to reproduce depends in turn on our ability to survive. We must also, then, consider the related matter of "health" which may not be a separate category, but deserves more attention than it usually receives from human scientists. I have mentioned the "non-human environment" more than once above. Since it both shapes and is shaped by us, it deserves its own role in our schema as another category.

We now have a list of ten (eleven if we were to treat health and population separately) logically distinct categories. I believe them also to be exhaustive, for they seem to subsume all human activities and characteristics, and I have found it straightforward to place all subsidiary phenomena within these categories. In other words, I have used both induction and deduction, and these categories seem to deductively exhaust the set of human science phenomena while having been found inductively to subsume all of the phenomena uncovered in my research. In several cases we must be careful to establish the boundaries between categories: for example we can distinguish "art" from certain aspects of "culture" by defining "art" as that which has an aesthetic appeal not limited to members of particular groups. These precise boundaries will become clearer as I disaggregate the categories in what follows.

Aristotle suggested four factors or criteria that could make a definition

exhaustive. We have focused on the 'material' nature of phenomena here. Yet in using deduction while disaggregating, we implicitly capture a second of Aristotle's criteria, "final cause," or "purpose"; that is, the role that a phenomenon plays. Aristotle's 'efficiency' criteria would be captured by our causal links. I have *tested* the list of phenomena by describing thousands of causal links in terms of this list (see below); we can in turn *define* each phenomenon by the type of effects it has. Aristotle's fourth criterion is "formal cause," in which he looks for principles or structure. This criterion we meet by placing each phenomenon within a hierarchical structure. As we proceed with our disaggregation, we will often emphasize one of Aristotle's criteria; all four are universally applicable, however.

Some readers may imagine a somewhat different logical division of human activity. I was a little queasy about including languages within the culture category. Yet, in practice, the choice of major categories is less important than at first it might appear. The causal links that interest human scientists are generally—though not always—found at lower levels of aggregation. Even scholars who talk of cultural influences usually have in mind a subset of what I will subsume under the heading "culture." Indeed, I have referred to our ten categories as "categories" rather than simply "major phenomena" or "higher-level phenomena" in part to signal the fact that they are not in general the focus of causal analysis.[10] As we disaggregate our categories into subsidiary phenomena, we can examine how these phenomena influence other phenomena within their category as well as in other categories. In this way, we can see, for example, if language is closely linked with other cultural phenomena. This can help us to determine whether we feel comfortable including language within the "culture" category.

In disaggregating, we are identifying subsidiary phenomena, which together comprise a category. For example, within our social structure category we can identify societal divisions by gender, class, and ethnicity. If we succeed in identifying all such social divisions, we will have a list, which comprises (and thus defines) what we have called social structure. In most, but not all, cases we will wish to disaggregate further: classes, for example, are composites of various occupations. I have termed phenomena such as class to be second-level phenomena, and phenomena at the yet lower level of disaggregation to be third-level phenomena (and will note where further disaggregation to a fourth-level is possible and desirable). This is done to identify their place in the schema; there is no value judgment in the terminology. Scholars are free to decide at which level of disaggregation they wish to focus. Note further, that causal links are not constrained to act only within a particular level:

second-level phenomena can influence third-level and vice versa.

A mixture of deduction and induction was used to arrive at the lists of subsidiary phenomena.[11] The reader can readily produce a list of such phenomena, especially if they take some time to contemplate the sorts of questions which scholars regularly ask. Yet, the list which is provided below (and in the Appendix) nevertheless grew in length as I read widely across all fields. In all cases, second-level phenomena are underlined and third-level phenomena italicised.

Genetic Predisposition

We are at an exciting stage in our understanding of human genes. The next generation will likely yield a great mass of information about the characteristics of individual genes. We already know, however, that our genes generally work in concert. It is thus a mistake, for example, to speak of a 'gene for altruism.' Rather, several genes likely combine to create any particular characteristic.

While we are only beginning to understand the characteristics of individual genes, there are several ways we can supplement our genetic understanding in order to identify common genetic characteristics. The most obvious is by searching for universal characteristics. The fact everyone is born with two arms, legs, and eyes is powerful evidence of a common genetic predisposition. When speaking of common psychological characteristics we must be careful that these are not socially determined; observation across a wide range of times and places is thus of great importance.[12] Neurological science is also of help here, though again we are in the early stages of describing psychological functioning in physiological terms. Finally, we can turn to the insights of evolutionary psychology: what sorts of characteristics would have been selected during the millennia in which humanity hunted and gathered?[13] Most of the phenomena outlined here have been identified by more than one method.[14]

We can consider genetic predispositions of three distinct types: <u>abilities</u>, <u>motivations</u>, and <u>emotions</u>. Among abilities, I identify *consciousness, subconsciousness, vocalization, perception* (five senses, all subject to distortion), *toolmaking, learning* (which involves a need and ability to form conceptual schemas concerning ourselves and our world, and may well be grounded in the 'hard-wiring' of certain concepts/approaches in our brains), *decision-making*, and various *other physical attributes* (locomotion, eating, breathing, etc.).

We are all aware of certain basic motivations: *food* (we share various

preferences), *clothing, shelter, safety,* and *sex* (again, we arguably share certain mate preferences with respect to age, appearance, etc.). These various drives may well have yielded a more general *drive to better ourselves* (which some would call self-actualization). *Aggression* is another shared motivation. Yet, we are also endowed with motivations that support group cohesion: *altruism, fairness,* and a *desire to identify with (and be accepted/respected by) a larger group.*

Our emotions serve as reward or punishment (as with guilt for lying), and/or as an incentive to act (as when fear encourages flight). Among emotions, I distinguish *love, anger, jealousy, fear, joy, grief, disgust, guilt, empathy, anxiety,* and *fatigue. Humor* is an emotional reaction shared by all. We also all take pleasure from nature and art, which is grounded in a common *aesthetic sense.* Perhaps most important of all, we *display our emotions physically*, even when we try to hide them.

Time preference, by which we willingly trade off present pleasure for future gain, does not fit easily in our three subcategories, but is, nevertheless, an important human characteristic. This characteristic changes as we age, as do our abilities, motivations, and emotions; a point which must be remembered when looking at causal links.

Another point which must be emphasized is that our motivations are often in conflict; and our brain is best perceived as a loose, refereeing mechanism among competing drives and emotions, rather than an all-knowing, utility-maximization program. Finally, I should note that the existence of a small minority who are blind, deaf, or psychotic (i.e., incapable of guilt) should not prevent us from speaking of seeing, hearing, and feeling guilt as universal traits. Differences in abilities, motivations, and emotions across individuals will be captured under "individual differences."

At a lower-level of aggregation, we can, at least potentially, speak of the role of individual genes. Likewise, we can refer to individual fetal hormones, which, while not technically genes, have a similar effect on individuals.

Individual Differences

We can begin with individual differences in ability. Physical abilities could be described in terms of *speed, strength of various muscle groups,* and *endurance,* or in terms of various physical competitions. I also include physical appearance here, even though it stretches the definition of the word ability, to reflect the fact that various attributes such as *height, weight,* and *facial symmetry*, affect how others treat us. People also appear to differ in their *physical* and/or *mental* energy level. In terms of mental ability, I distinguish

various sorts of intelligence(s), including *musical, spatial, mathematical, verbal, kinesthetic* (physical movement), and *interpersonal*.[15]

Psychologists feel that differences in motivation and emotion across individuals, in combination with differences in intellectual style (which is distinct from intellectual ability, but nevertheless reflective of our genetic inheritance of intellectual capabilities) determine individual personality. Psychologists also recognize that we best describe personality in terms of continua: a person is not either an extrovert or not, but can be described as extroverted to a particular degree. While there is not complete consensus on a typology of major personality dimensions, there is widespread consensus that a handful of such dimensions exist and that these can be disaggregated into hundreds of more detailed personality dimensions (Pervin, 1990). More precisely, the handful of major dimensions has been constructed from the observation of strong but imperfect correlations among these lesser dimensions.

Drawing on the work of various psychologists, I propose five major personality dimensions: sociability (extroversion/introversion) which subsumes *talkative, assertive, adventurous,* and *enthusiastic* versus *reserved, withdrawn*, etc.; emotionality (stable versus moody) which encompasses *contentment, composure* versus *anxiety, self-pity*, etc.; conscientiousness which embodies *thoroughness, precision, foresight, organization,* and *perseverance* versus *carelessness, disorderliness, frivolousness*, etc.; affection (selfishness/agreeableness) which includes *sympathetic, kind, appreciative,* and *generous* versus *cruel, quarrelsome, fault-finding*, etc.; and intellectual orientation (holistic versus analytical) which aggregates such traits as *openness to innovation, imagination, curiosity,* and *artistic sensitivity* versus *close-mindedness*.

The words used by psychologists to describe these continua betray an unfortunate tendency to identify one end of the dimension as 'good' and another as 'bad.' I would make two points. First, Aristotle was undoubtedly correct in suggesting that the 'best' outcome would not be an extreme but some intermediate 'Golden Mean.' Second, there is room for flexibility such that both societies and individuals can differ in the points they prefer along these and other continua.

Many scholars have suggested that certain personality continua, including *dominant/submissive, independent/dependent, strong-willed/weak,* and *future versus present-oriented* (time preference), are poorly captured by this categorization schema. It could be that these, like humor—which seems to reflect both holistic thinking and *selflessness-aggression*, and *happiness*, are

combined effects of more than one of the traits discussed above.

Personality disorders likely reflect extreme positions along one or more personality dimensions. Many scholars (e.g., Miller, 1990) have attempted to describe how particular disorders can be defined in this way. Still, since cultural attitudes and scientific judgment will determine how extreme one must be before being judged to have a disorder, individual disorders could be viewed as distinct phenomena. Certainly, those disorders, which are hard to categorize according to personality dimensions, such as *schizophrenia* and *psychoticism*, must be given special treatment.

Sexual orientation, despite popular stereotypes, appears to be poorly comprehensible in terms of, or even strongly correlated with, other characteristics and must be given separate treatment.

We are distinguished as individuals by more than the differences in personality and ability listed above. While intellectual orientation tells us about how we think and intellectual ability describes how well we think, our schema so far has no place for what we think. Yet, individuals surely differ markedly in what they think. We capture these differences with the phenomenon of schemas, by which individuals organize their thoughts. Like our organizing schema, these schemas involve definitions of phenomena and/or understandings of relationships among them. Our understanding of the world comprises a large number of schemas comprising relationships among different sets of phenomena. While we strive for consistency among our schemas, we are also capable of ignoring some inconsistencies. We are also capable of ignoring certain questions, or organizing our schemas so that only particular approaches to questions are possible. We can distinguish various types of schema. Arguably, the most important schema is *view-of-self*. Recent scholarship suggests that this is formed like other schemas, and involves a loose combination of beliefs about different abilities and personality characteristics we possess, along with estimates of how others perceive us. We also have *views-of-others*. We tend to perceive others, at least when we do not know them well, as group members, and can conceive of hierarchical systems of stereotypes: blacks, black men, black basketball players, black men on the home team. Individuals can be analysed within the same categories as ourselves. Note that positive views of individuals can be maintained along with negative views of their group by judging the individual as special. The largest category of schemas deals with *causal relationships*. On a daily basis, we must depend on our understanding of how umbrellas deflect rain, cars slow down for pedestrians, and strangers react to rudeness, so we require a large number of separate causal schemas.

It may be that personality and schemas are two sides of the same coin: the conscientious individual is one with schemas that suggest such behavior is rewarded; the selfless person is one whose schemas of others are very positive. Personality may be nothing more than how and why certain schemas are chosen. While strong links between personality and schemas undoubtedly exist, we are not at a stage of understanding where we can omit one of these from our organizing schema. Moreover, the frequency with which we all do things that we know to be bad for us leads me to suspect that even as knowledge advances, we would need both in our organizing schema.

Interpersonal relationships are not properly a subset of individual differences, but fit here more comfortably than anywhere else in our schema (they may well deserve treatment as a separate category). Kuhn (1974) devotes much of his book to discussing the common elements in all human relationships. He would approve of disaggregating this category in terms of type of relationships: *parent/child, sibling, employer/employee, romance, friendship,* and *casual* being some of the more important types. These can generally be further disaggregated, notably by gender of participants.

The Economy

A single phenomenon, total output, because of the dynamic framework we use, will allow us to analyse both economic growth and economic fluctuations. Two closely linked phenomena are thus *price level* and *unemployment rates*.[16] And we can disaggregate total output into the output of *individual goods and services*. This allows us to look at technological effects on the economy and the wider effects of individual goods and services, not only industrial structure (e.g., the effect of violence on television).

We must also discuss how the output is shared, or income distribution. Societal stability requires some economic ideology, which justifies this distribution.

The functioning of the economy depends on a variety of economic institutions where institutions are defined as codified rules or laws such that sanctions can be potentially imposed on transgressors. The chief sorts of institutions govern *ownership, production, exchange, trade, finance,* and *labor relations*. All can be disaggregated to the level of individual rules. Note that since institutions depend on the possibility of sanction, they must be embodied in some form of *organization*. Organizations are also properly a subset of institutions; key organizations include firms, unions, employer groups, and non-profit organizations. Organizations, economic and political, can be categorized in four types, depending on purpose: profit, cooperation, service,

and pressure.

Art

Art can be divided into non-reproducible art, which includes *painting* (collage, drawing, etc.), *sculpture, architecture,* and reproducible art, including *prose, poetry*, *theatre, film, photography, music,* and *dance*. The border between reproducible and non-reproducible can be blurred (that is, the distinction is one of degree, not an absolute); the same blueprint could be used for more than one building, while individual performances of a play or dance are necessarily unique. At times, it is useful also to distinguish fine from popular art, and to speak of particular schools of art.

Social Structure

I use the term social structure to refer to the subgroups into which a society will be divided.[17] Gender is a ubiquitous social division; the two genders have never been treated exactly the same way (we should also be open to at least a third 'ambiguous' gender, which, while only occasionally observed physiologically, has been recognized in certain societies). Family also divides all societies, though both the internal structure of families (*nuclear, extended, one-parent*) and the relationships between families vary markedly. Division by kinship is common, though not universal (and the absence of kinship divisions is noteworthy). While some small societies may have no occupational differentiation, these are at present exceedingly rare; division by *occupation* is thus, at least at present, an almost universal. In many societies, it makes sense to aggregate certain occupational groups into classes. The most attractive typology includes an *upper class*, *professionals*, *small businesspeople, middle managers* (the previous three categories could be subdivided into upper and lower), *white-collar workers, blue-collar workers* (the last two could be *skilled* or *unskilled*), and an *underclass* (Sanderson, 1995). Some would identify further subclasses, such as an intellectual subclass of the professional class. While there is scholarly debate over, for example, whether class boundaries are too blurred in the present-day United States to be meaningful units of analysis, this very observation is worthy of note. We can leave it as an empirical question for particular societies as to whether class-based analysis adds anything to occupational-based analysis.

Ethnic/racial divisions also characterize most modern societies. Differences by age are also important, but will be captured within the population category below. Differences by height and weight and appearance have been captured under individual differences above. A case could be made for treatment of

sexual orientation here, as well as in individual differences (to the extent that the gay community operates as a group).

Sociologists speak at length of the roles people are expected to play because of their membership in various groups, and of the status differences inherent in social divisions. These concerns will be reflected in our analysis of each of the social divisions listed above: how does membership in a particular subgroup affect the status and behavioral expectations of individuals? As with differences in income and power, status differentials will be justified by some sort of social ideology. (NB: sociological concern with the networks of personal relationships in which we are all embedded will be captured by causal links within our schema.)

Politics

Institutions loom large in our discussion of politics as well. In some cases (e.g., government regulatory agencies), particular institutions may serve both economic and political purposes. In such cases, we would classify them under the most appropriate heading and capture the dual influences with causal links.

Political institutions can be captured under three main headings (Frey, 1992). *Decision-making systems* can be autocratic (including such variations as monarchy, oligarchy, military dictatorship, one-party state, and religious state) or democratic (with wide differences in electoral and legislative rules and role of referenda; see Elster, 1993, Finer, 1997).

Rules include both the laws of various levels of government and the rules which operate within organizations. In both cases it is often valuable to distinguish constitutions from more easily changed rules.

Organizations include the state itself, and subsidiary organizations, especially the police and military, but also bureaucracy more generally. Schools and hospitals also belong here. So too do political parties, interest groups, clubs, churches, and associations, indeed any organization not primarily economic in nature.

As with the economy, so the distribution of power in society will require some sort of supportive political ideology. We need to distinguish this support of political institutions from nationalism—the support for the collective group embodied in the state—though the two may be closely linked. I have defined ideology differently from common parlance, where it is generally used to refer to attitudes toward a range of political choices. We capture these under public opinion, or attitudes toward public policy choices, which can be disaggregated by *issue.* (Note that a general preference for honesty qualifies

as part of culture, while views about the punishment to be meted out for various types of dishonesty are public opinion.)

Finally, crime must be considered a political activity of a peculiar type. Activities are defined as criminal because they violate political institutions. The criminal usurps the role of the state as the only legitimate agent of physical force and/or ignores institutional protection of personal liberty and personal or collective property. Major types of crime are *crimes against people* (including violent crimes such as murder, political crimes such as treason, and public order crimes such as vagrancy) and *crimes against property,* which can be further disaggregated according to the explicit use of violence, or directly to the level of individual crimes.[18]

Culture

I have mentioned one component of culture, languages, already. Languages can be classified in terms of line of descent. Such a classification ignores the extensive cross-fertilization of vocabulary which has occurred. Moreover, there is little evidence that such divisions have major causal significance. And all languages share important structural and grammatical elements, such that disaggregation along those lines is of limited utility.

Religion is a second component. Religious dogma can be distinguished under the subheadings *providence* (godly intervention versus cosmic order), *revelation* (past or present; may involve prophecy), *salvation* (various afterlives, paths to entry), and *miracles* (almost a universal feature). Religious *doctrine* comprises the arguments used to support dogma.[19]

Stories can be classified as *myths, fairy tales*, *legends, family sagas, fables,* or *jokes and riddles*, though their causal function tends to be similar.

There are also a number of expressions of culture: *rituals, dance, song, cuisine, attire* (including fashion), *ornamentation of buildings*, and *games*.[20]

The broadest cultural subcategory I term values. I confess, though, that I have stretched this term to cover not just what sociologists normally refer to under the headings of value or norm, but several other attitudes and practices which fit here better than anywhere else in the schema.

I begin with a number of values which concern the goals group members should pursue: *ambition, time preference, optimism/pessimism,* and *attitudes toward wealth, power, knowledge, prestige, beauty, honor, recognition, love, friendship, sex, incest, marriage, physical well-being*, and *psychological well-being*.

I then list a number of values broadly concerned with the means group members should use to pursue their goals: *honesty, ethics, righteousness,*

belief in fate versus individual initiative (justice)*, work valued intrinsically, attitudes toward violence and vengeance, curiosity, openness to innovation,* and *attitude toward nature*.[21]

While all communities encourage some *sense of identity*, they differ in *relative value of family versus community, openness to outsiders, egalitarianism versus competitiveness, attitude toward young and old, responsibility for others, trust, authoritarianism versus cooperation,* and *respect for the individual*.

A number of everyday norms serve to facilitate interaction among group members while minimizing misunderstanding: *courtesy, manners, proxemics* (e.g., how close we stand while conversing), *tidiness, cleanliness, punctuality, conversational rules* (interrupting, shouting, eye contact, acceptability of gossip), *locomotion rules* (walk on right, face front in elevator), *tipping*.

Technology and Science

Though technology and science are definitionally distinct—the former involving understanding of the world which is applied in the production of goods or services, the latter referring to theoretical knowledge—they are not only closely related but can be disaggregated in the same manner. We can most obviously disaggregate in terms of field (military technology, chemistry, etc.) and then by *individual innovation*. In explaining scientific and technological innovation it is useful to think in terms of five distinct steps: recognizing the problem (this may be subconscious, and very rarely occurs simultaneously with recognition of a potential solution), setting the stage (gathering information, often through trial-and-error experimentation), the act of insight, and critical revision (in which the insight is tested and refined), followed by diffusion and/or transmission (the domestic or international spread of the technology). This latter step can be further disaggregated into two steps: *communication of an innovation*, and *decisions to adapt* (Szostak, 1991). We have considered these steps to be first- or second-level phenomena because they can be analysed in both general and innovation-specific contexts.

Health and Population

While closely connected, these two phenomena are best disaggregated separately. As genetic determinants of health were captured earlier in our schema, health matters of interest here are nutrition and disease. Nutrition can be disaggregated in terms of the *diverse nutritional needs* of the human body. Diseases can be considered in terms of major categories such as *viral, bacterial,* and *environmental*, and these disaggregated to the level of thousands

of individual diseases.

Population divides logically into three phenomena: fertility, mortality, and migration (which combine to influence a fourth, age distribution). Fertility can be considered in terms of *fecundity,* the biological capacity to reproduce, and a measure of a society's *deviation* from the biological maximum level of reproduction. Migration can be disaggregated by *distance, international versus internal*, and *temporary versus permanent* (Hornsby and Jones, 1993).

The Non-Human Environment

Of course, one can envisage a super-schema in which the non-human environment is disaggregated in the same careful detail as human activity, and thus the natural and human sciences are joined together in one huge conceptual schema. And some of the most exciting interdisciplinary research and teaching occurs in areas such as environmental studies where natural and human science are synthesized. Given the scope of our present project, however, I will not disaggregate through to the sub-atomic level here.[22]

Geographers generally focus on soil, topography, climate, flora, and fauna, and can further disaggregate these phenomena in terms of categorization schema for *soil type*, *landforms, climate pattern,* and *species*. Resource availability also deserves separate treatment. Water (availability and quality), depending as it does on soil, topography, and climate, deserves separate treatment. Natural disasters (*flood, tornado, hurricane, earthquake, volcano*) could be left as subsets of climate and topography, but possess common and special characteristics. While the effects of humanity on the environment in terms of pollution, species extinction, and resource depletion can easily be captured with reference to the above phenomena, three other phenomena are required to reflect human shaping of the environment: transport infrastructure (which can be disaggregated by *mode*), built environments (*offices, houses, fences*, etc.), and population density.

IV. Causal Links

While there is still philosophical debate about whether a cause must always precede its result (some relationships in physics may involve reverse temporal causation), this is certainly the general case. Moreover, influence (causation) does not usually occur at a distance: proximity in time and space is required. That said, events could have a worldwide impact as long as there are worldwide communication links. Similarly, in time, Plato can still affect us both because we can still read him, and because previous readings of him have shaped our culture and institutions. Thus, with recourse to a more complex chain of

causation, we can have causation at a distance (Lambert and Brittan, 1992).

We are often able to define causal links in the human sciences only in a probabilistic sense: a change in one phenomenon increases the probability of a change in the other. In some instances, this reflects the limits on our understanding: if we understood cancer better, we might be able to specify under what conditions smoking will cause it, rather than just speaking of increased risk. In other instances, it reflects the fact that human decisions are not perfectly predictable. We would hardly agonize so much over decisions if it were always clear which choice we would make.[23]

We cannot just assume that correlation implies causation; the observation that A and B tend to occur together could mean that either causes the other, or that some other unobserved phenomenon causes both, or could be the result of chance (decreasingly likely as the number of observations increases). Even if A is observed to precede B, we would not be comfortable arguing that A causes B unless there was some (one or more) theoretical argument as to why this should be the case (possibly involving intervening phenomena). We would then look for various sorts of evidence by which to test whether the theory appears to approximate reality.

In studying causation (influence), we can often distinguish between making a result possible and acting on such potential. Some chemical reactions occur only in the presence of a catalyst; the catalyst can be said to cause the reaction by making it possible. Likewise, a speeding car reflects both the decision of the driver and the mechanical capability of the car.

We can identify five types of causation: strict causation, intentional causation, semiotic or hermeneutic causation, functionalist (structuralist) causation, and evolutionary causation.

Strict Causation

This is the direct action of one entity on another, such as when a batter hits a baseball or when sodium and chlorine react. In some cases, strict causation is entirely predictable, at least theoretically: if we know the acceleration of the baseball and bat, the precise nature and shape of these, the angle of impact, and air pressure, we can calculate where the ball will land. In other cases, such as quantum mechanics, only probabilistic prediction is possible.

Intentional Causation

Considered by some a subset of strict causation, intentional causation occurs when some sentient being, or group thereof, purposely acts in a particular

way. This often will involve present suffering for future gain. Humans, at least, are also capable of collective action that only aids individuals if adopted by all.

For our purposes, the key characteristic of intentional acts is that they have unforeseen consequences, because none of us completely understands how the world works (Merton, 1996). If not for this, explaining human behavior would be much easier, for we could assume that people must have wanted the result they achieved. Rather, we must try to understand action in terms of people's desires, schemas, and environment, and then analyze the effects of these actions.

Semiotic or Hermeneutic Causation

Considered by some a subset of intentional causation, we are concerned here with the meanings we impose on the world. While many of those primarily concerned with symbolism shy away from explicit discussions of causation, they, and we, are nevertheless concerned with how symbols emerge, and how such symbols shape behavior. Note that the effects may be quite different from those originally intended.

Functionalist (Structuralist) Causation

A functional explanation involves arguing that A is necessary for B to exist (e.g., one might argue that a police force or army is essential to the maintenance of a state). Functional relationships are too easily assumed (Why are police needed? What happens without them?), and are often key elements in hypotheses of stable subsystems of phenomena; we must both empirically and theoretically describe how the functional relationship came into being: for example, how do states find the resources for army/police (Vromen, 1995, Elster, 1983)? By doing so, functional explanations come to bear a strong similarity to intentional, though with an added element: those that do not create armies will not be able to create states.

Evolutionary Causation

Evolutionary explanations involve a dynamic process consisting of some source(s) of variation and some sort of selection mechanism. In biological evolution, for example, genetic mutation is the source of variation, and genes are selected on the basis of whether they enhance fitness (the probability of having offspring, and they in turn, and their heirs, having offspring) in the organism's environment. It is noteworthy that evolutionary explanations were

applied to other phenomena before genes: Darwin borrowed from ideas of the evolution of state forms. Many, though not all, of our phenomena are subject to evolution, with other phenomena serving as the selection environment. We can speak of cultural, institutional, technological, scientific, and artistic evolution, in addition to genetic evolution.[24]

Genetic mutation is random; genes cannot achieve some *desired* improvement purposely. All other forms of evolution of interest to us differ in this important respect: they depend for the most part on individuals or groups purposely striving to improve their institutions or technology (accidental advances are possible too, perhaps especially in the realm of culture). This allows scope for superior explanation. We can hope to explain not only why the relevant environment selected particular changes, but also why people would have introduced such changes in the first place. We must be careful, though, not to assume that people always foresaw the particular effects of their innovations.

Following Durham (1991), we can think of five key questions in the study of evolutionary mechanisms. First, what units should we use for studying evolution? In biology, scholars focus on genes, and in technology on techniques. There is considerable debate over the course of cultural evolution; I would suggest that culture evolves through changes in individual cultural traits. Second, what are the sources of variation? Mutation, innovation, and cross-cultural contact are among the possibilities here. Third, what are the mechanisms of transmission? If genes, culture, or technology were not passed from generation to generation, we could not speak of evolution, for each generation would start from scratch. If, however, transmission were perfect, then random mutation would be impossible. Fourth, what is the selection mechanism? What other phenomena are most important in determining whether a mutation survives? Fifth, what causes different groups to evolve differently? An explanation of why a particular institution or cultural trait exists in one society must include some explanation of why it does or does not exist elsewhere.

V. The Schema in Operation

I have described the schema above in terms of one-way causal links between two phenomena. In the real world that I hope to capture, though, phenomena often combine in exerting influence on other phenomena; causal links often affect more than one phenomena at a time; and effects in one direction often elicit some sort of feedback response. Yet if we were to conceive of the schema as a (very messy; see next section) flow chart with arrows denoting causal

links among phenomena, feedback effects could be captured with two-way arrows, and multiple causation could be captured by arrows joining and/or splitting between phenomena. In other words, the schema is flexible enough to incorporate the multiple causation and feedback effects which characterize the real world.

In describing the links between phenomena, it is often useful to discuss several links together, even when these can be logically separated. For example, a general discussion of how personality characteristics influence leadership capabilities or human creativity can be followed by more focused discussions of how leaders are chosen and act within particular institutional settings (recognizing that being chosen a leader tends to affect one's personality), or of the particular creative requirements of technological innovation, entrepreneurship, or various arts. In this way, the tremendous insights of Alfred Kuhn (1974) are easily incorporated within the schema. He proffers a detailed examination of three types of human interaction: communication, transactions, and organizations. He develops, first, some general characteristics of these three and then shows how, with additional sorts of qualifications, his analysis can be narrowed to particular examples of human interaction of interest to scholars in different fields. I can discuss his general observations when the phenomena of interpersonal relationships and organizations are first introduced, and relate these to more particular discussions elsewhere.

Kuhn's objective was even more ambitious than my own. He wanted to develop an axiomatic system for human science. Even in a very lengthy book, he was only able to proceed from the general to the particular in a handful of cases, spanning just a couple of disciplines. Our present approach is quite different, though compatible. By first delineating the causal relationships we need to understand and then noting similarities where these exist, we can at once sketch the big picture while pointing the way to further integrative research. Nevertheless, the very complexity of our schema highlights the difficulty of fully implementing Kuhn's vision.

More recently, Kontopolous (1994) has suggested a lengthy list of 'logics' (causal mechanisms). Game theory, sorting rules, matching rules, fractals, cascades, and thresholds are among the logics he discusses (and he recognizes that his list is not exhaustive). Many of these, such as the observation that the diffusion of any innovation tends to occur slowly at first, and then more rapidly, before slowing again as saturation is approached (the S-shaped diffusion curve), do indeed have a wide applicability. In explicating the schema, it naturally pays to elucidate such mechanisms only once (though

for students there are advantages in repetition). Rarely if ever, though, does discussion of how one phenomenon influences another revolve around any one single mechanism.

We discussed in the third section the five major types of causation. Now we have seen some more detailed 'logics.' Likewise, different logics are important for different links. Moreover, feedback effects and multiple causation are more important in some cases than others. While I naturally note similarities across causal links when these exist, as, for example, in the way that various genetic predispositions constrain variability in various cultural attributes, the overwhelming result of my research is that it is uniqueness rather than similarity which best describes individual causal links between phenomena.

VI. Visualizing the Schema

We can reproduce the list of phenomena derived in the third section in tabular form (Appendix). Remember, though, that third-level phenomena could generally be subjected to yet further disaggregation.

The causal links can be represented as arrows joining one or more phenomena in our table with one or more others. If we wished to visualize one causal link, such as the effect of a particular personality dimension on crime, this can easily be done by drawing a line between these phenomena. If we wished to visualize the *major* causes of crime, as identified by diverse scholars, we might find ourselves with a manageable set of such lines. If, however, we asked ourselves to draw in every plausible cause of crime, and especially if we allowed indirect causation via intermediate phenomena, we would find our table covered in lines. If we moved back yet further to consider all the causal links of interest to human scientists, even the most skilled draftsperson would drown our table in ink. While it is useful to think of our schema as a set of arrows between phenomena, we must remember that we can only actually draw in the arrows for particular, narrowly defined questions.

VII. Relationship to Previous Schemas

My research as an economic historian and economic methodologist had caused me to explore phenomena within each of our ten major categories. Thus, when the idea of designing an organizing schema first came to me, the broad shape of that schema was relatively clear in my mind. When I became aware of previous efforts in this area these served as a scientific check on my thinking.

Talcott Parsons (1966) developed an organizing schema with four main components: the human organism (similar to our genetic predisposition),

personality, culture, and social structure. Social structure for Parsons referred to the interaction among the previous three components. These interactions are what I have called causal links. Parsons recognized the non-human environment (in which he included the non-behavioral elements of our genetic predisposition) as a background for his schema. Economic and technical issues arose as interactions between humans and their environment, while politics emerged from a study of personality.

As it would be relatively easy to add art, health, and population to this schema, it does not differ hugely in terms of broad categories from mine, although the borders between categories are not exactly the same. I differ from Parsons, though, in positing the existence of autonomous subsystems within the broader schema. It is possible, of course, that a subset of phenomena might collectively have such weak (or counteracting) links with other phenomena that they could safely be treated separately. I have felt it best to not build such subsystems in, but rather to construct one large schema and leave it to empirical investigation as to whether autonomous subsystems can be identified. The ubiquity of causal links within the larger schema seems to suggest otherwise.[25] Parsons also implied that the schema itself would need to increase in complexity to describe societies of increased complexity; I have tried to define our phenomena in terms of the purpose they serve in the hope that the same schema can be applied to all societies.

Barber (1993) divides the human science subject matter into cultural structure, social structure, and personality structure. The latter category (which he subdivides into five personality attributes) bears the closest similarity to one of mine (note, though, that he makes no mention of genetic predisposition). His cultural category contains several elements of my culture (language, religion, philosophy, and values), as well as the arts (literature, music, architecture, and drama), and science (science, mathematics). His social structure contains prestige stratification, gender, family (kinship), and organization, as well as the economy and polity (he also speaks of power stratification). He also refers to both socialization and communication, which would be causal links rather than phenomena within my schema. Despite ignoring genes, non-human environment, technology, population, and health, and placing ideology with culture, at the highest level of aggregation within my schema there is much similarity. Since he did not intend, at least immediately, to put his schema to work, such omissions should not be assigned a great importance.

The most important distinction is Barber's use of three super-categories. Every human act, he notes, is conditioned by personality, the individual's

social position, and the culture in which the individual operates. Thus, we might be guided always to search for three-variable multiple causation. Often, these effects will prove difficult to disentangle. At other times, though, we can advance our understanding by looking at the causal links separately. Still other times, we will find that one causal link overwhelms the effect of others. Thus, while Barber is right in suggesting that we always look in these three broad directions, we should not constrain our answers to always come in that form.[26]

Brady (1989) proposes a schema comprised of five main categories. Three of these—beliefs (culture), physical environment, and demography (population)—bear a striking resemblance to three of my categories (and notably fill a couple of the gaps in Barber's schema). His fourth category, behavior, includes art, organizations, relationships, ownership, income distribution, and a variety of other elements. These all have places in my schema. His fifth category comprises relationships among the first four. This will be captured by my causal links.

It is gratifying, though perhaps not that surprising, that I can find support for my broadest categories in these previous works. What I cannot find in any of these is any considerable attempt to disaggregate the major categories into their constituent phenomena. This necessarily means that any discussion of causal links must occur at a very general level. Since almost all of the action in the human sciences occurs at lower levels of aggregation, this could explain why these earlier attempts have had a limited impact on research and teaching in human science.

A group of scholars associated with the Human Relations Area Files (HRAF) project have produced a disaggregated list of human science phenomena (Murdock, et al., 1982). The list was developed for two purposes: to assist scholars in annotating and classifying their observations of diverse societies and to aid researchers in locating material in HRAF files, which contain millions of pages of societal descriptions. It thus serves a broadly similar purpose to library classification systems: it allows not just books but individual sentences or paragraphs to be coded by content. While Murdock, et al. (1982) take pains to emphasize the interdisciplinary nature of their project; their system has primarily been used by ethnographers and generally in the study of traditional societies.

While the HRAF organization encourages causal analysis (Ember and Ember, 1988), there is nevertheless a huge difference between their classification system and my schema. I began with a set of logically distinct categories and attempted to disaggregate these into logically distinct subsidiary

phenomena. Murdock et al., admit that while they attempted to group like elements together and arrange entries in "an order not wholly without logic" (1982, p. xvi), their approach was essentially pragmatic in that they listed categories commonly used by ethnographers. From time-to-time, they had experimented with more logical classifications based on theory, but found that this made coding ethnographic material more difficult. The resulting system consists of 79 major (assigned two-digit codes) and 637 minor (three-digit codes) divisions. The major divisions, though, are not really aggregates but catchalls for information not readily classified by minor division. Lacking the hierarchical structure of my schema, the system thus provides a limited guide to how phenomena are related (it is an address book rather than a map). Moreover, without such a structure, the authors confess that their categories are not necessarily mutually exclusive.

Ethnographers often record various aspects of an event simultaneously. The coding system thus mixes up elements of our ten categories. The several major divisions devoted to economic activity tend to include technological (how) and economic (how much) information in the same minor divisions. On the other hand, our cultural category is strewn widely: norms (code 183), attitudes (208), ethical ideals (577), taboos (784), and sex (83).

I do not mean to criticize the HRAF—which I think a laudable attempt to bring some order to a vast body of research—but rather to emphasize its difference in purpose and form from the schema outlined here. It does highlight the potential of a comprehensive classification system for collating all scientific research. It also shows that a complex system can still change with experience and new information. Finally, it allows me an opportunity to check for phenomena I may have overlooked. The differences in the HRAF list and my own reflect the fact that they disaggregate some phenomena, such as the economic and technological, much further (listing various products and processes), while not disaggregating others at all, such as norms or personality dimensions (the HRAF list also includes some entries which are better thought of as causal links or evolutionary processes: cultural contact, personality development, socialization). This consistency in lists is especially noteworthy given the HRAF focus on traditional societies and the tendency of my own research to focus on modern societies.

VIII. Grand Theory Is Not the Answer

Attempts to unify human science have generally taken the form of grand theories rather than organizing schemas. From the time of Smith, Hume, and Marx—who naturally roamed across yet-to-be-created disciplinary bound-

aries—through the earliest sociologists, led by Comte and Spencer, to the postwar efforts of structuralists, system theorists, Foucault and Derrida (who, Quentin Skinner [1985] believes, decried the idea of grand theory while creating their own), and recent works of White (1992) and Barkow, Cosmides, and Tooby (1992), scientists have been tempted to believe that one great insight (or perhaps a handful of interrelated insights) held the key to understanding human science. Moreover, such theories have often captured the imagination of thousands of other human scientists. The disillusionment, which naturally accompanies the discovery that no theory has all the answers, has arguably lessened the enthusiasm for interdisciplinarity of all types (Barber, 1993), though the dream of a unified theory has not died. I would share Parsons' (1966) conclusion that single factor theories are wholly unreliable and Trigg's (1985) warning that we must not underestimate the complexity of reality. I would hope that the recognition that human science comprises thousands (millions) of causal links among hundreds (thousands) of phenomena would help put to rest the idea that one theory can explain all or even most of human experience.

Of course, our own everyday experience should always have guided us to the understanding that the world is a very complex place indeed. We do not guide our behavior by some grand theory, but rather by several rules of thumb (schemas) applied to different situations. We are often surprised when these fail to guide us in novel situations. It is likely that our natural desire to oversimplify the world in order to believe that we are in control supports the dream of grand theory; perhaps a clear exposition of a unifying alternative is the necessary antidote.

The natural sciences, it might be noted, are not characterized by one grand theory but by a large number of theories focused on different causal relationships. The natural sciences appear more integrated precisely because there is widespread agreement (not necessarily deserved) on the phenomena of interest and a concerted effort to ensure that theories are compatible across disciplinary boundaries. While our schema alone cannot ensure compatibility, it can at least ensure that scholars know when they are talking about the same causal link.

One advantage of abandoning the quixotic quest for the quintessential theory of human science is that we can proceed to a more sensible debate concerning the validity of theories. It is too easy to point to circumstances where Marxism, neoclassical economics, or evolutionary psychology have little to tell us; it is too dangerous to then leap to the conclusion that these theories are somehow *wrong* and cannot illustrate any facets of human existence. A much better

course is to evaluate theories link by link. In doing so our schema provides us with the advantages of a unified theory in showing how the pieces fit together, while at the same time facilitating the theoretical (and methodological) flexibility on which scientific advance depends.

IX. Philosophical Justification

Realism

Our approach bears a close resemblance to the philosophy of 'realism' as advocated with great success by Roy Bhaskar. Outlined by Cloke, Philo, and Sadler (1991), Bhaskar's realism involves the recognition that the world is comprised of systems, structures—more generally *things*—that exist in causal relationships with each other.[27] The task of science is to identify these things and outline the causal links between them. In the human sciences, both individuals and social formations are things with causal roles to play. Some of these things may be readily observable while others are not. Thus, we should expect that as science advances we will find ourselves adjusting our schema. In particular, just as physicists have increasingly explored a diversity of subatomic particles, we will find that our things have constituent parts (and these in turn have parts). Realists use the term *unpacking* to refer to this sort of disaggregation. We are also likely to find that particular phenomena are joined by multiple causal mechanisms. It is no wonder that many have recoiled at the complexity of the realist research enterprise.

Realism suggests that we should not worry overmuch about the possibility of leaving out key phenomena in our schema. Most, though perhaps not all, things of interest in the human sciences will already be described in the language of the day-to-day world. Rare indeed should be the life-affecting phenomenon that will have escaped notice by the billions of people who have inhabited this globe (though certain causal links will have received little attention). However, as we search for the constituent parts of our phenomena at lower and lower levels of aggregation, we are increasingly likely to uncover previously un-remarked forces at work.

Realism has a great deal in common with other philosophical traditions; indeed, it has at times been accused of trying to embrace all other theories. To the extent that realists are willing to analyze phenomena which are not readily observable, their approach is compatible with idealism (this view, associated foremost with Plato, that human phenomena should be analysed in terms of ideal forms, does differ from realism on many issues, however). Realism is also largely compatible with hermeneutics—the study of meaning—since realism allows for a diverse range of causal links (except to

the extent that advocates of the hermeneutic approach would insist that the only relationship between things involves the communication of meaning). Bhaskar also concurs with the critical theory of Jurgen Habermas, which in essence enjoins human scientists to eschew the belief that any theory explains all, but rather to take on each causal link afresh. This does not mean that we must turn our backs on such theories. Indeed, it reflects a willingness to suspect that all such views of the world likely contain some element of the truth. Our purpose as scientists is to establish such limits case by case.

Postmodernism

While a precise definition of the phrase postmodern is impossible, Cloke, Philo, and Sadler (1991) argue that postmodernism recognizes the need to turn away from grand theory—in part a response to the ideological excesses of the twentieth century—and focus instead on humble, diverse, empirical work. It is especially sensitive to distinctions such as gender, ethnicity, and class (all of which are recognized in our schema). Postmodernism views our modern world as a messy collage of people and places in which a diversity of phenomena collide. While some postmodernists claim that the social world is too complex for scientific understanding, most recognize a need to deal with diversity (and employ diverse methodologies) rather than abandon science. Our schema can be seen as a postmodern attempt to show how science can deal with complexity. Rather than shrink from it we will, in true postmodern fashion, embrace diversity.

Blau (1993) emphasizes the importance of a diversity of viewpoints. It is not just important to countenance a range of theories, but to actively pursue the views of people from diverse economic, cultural, and social backgrounds. While some postmodernists suggest there is in fact no one *reality*, that we each have an equally valid reality in our minds, Blau feels that this is going too far. Nor would she accept the argument that since all *facts* are social constructs, science is therefore impossible. Most postmodernists would be more concerned than Blau with the subjective nature of knowledge. They would emphasize that each observer sees the world in a different way. Some go on from this to argue that reality, if it can be said to exist at all, is internal rather than external. However, as in the parable of the blind men touching different parts of an elephant's anatomy—tail, trunk, legs—and reaching different conclusions as to what stood before them, we should be careful of leaping from the observation that people view the world differently to a conclusion that we cannot speak of an external reality. Yet, the basic observation of subjectivity is one we must deal with at many levels. When

describing individual causal links, we must devote considerable attention to how people develop their world views, the biases that can creep in, and the effects these can have (while recognizing that our understanding of these processes is imperfect). In designing this schema, I have striven to ensure that it limits neither theoretical nor methodological flexibility (and even the schema itself is capable of flexibility, if scholars feel that new or different categories are required).

Postmodernists, it would seem, face a choice. They can give up hope of advancing our understanding in a way that will aid society and can revel in subjective conversation, or, they can strive to battle complexity and subjectivity, holding out hope that we can slowly advance our understanding (Appleby, Hunt, and Jacob, 1994). Those who choose the second path should find much to agree with in this work.

Collins (1998) argues that skeptics of the possibility of enhanced understanding emerged in intellectual history whenever there were *too many* competing scientific theories or viewpoints. In the modern era, the division of science into diverse disciplines has encouraged this skepticism. Ironically, so has the advance of science: "We suffer from cognitive overload, from having amassed too much information to assimilate it" (xvii). We can hope, then, that an attempt to integrate disciplines, show how a diversity of theories can each have a place, and show how a huge mass of information can be integrated will overcome the skepticism of extreme postmodernists.

Appleby, Hunt, and Jacob (1994) note that many postmodernists do not like causal explanations, as these have tended to ignore the complexity of the world. Yet they conclude that our very need to make sense of the world forces us to value causation. One advantage of our schema is that it allows us to simultaneously embrace causation and complexity.

A key subset of postmodernist thought is *deconstruction*. With origins in literary theory—a recognition that texts are full of contradictions which make it impossible to find the one true meaning of a text—deconstruction has evolved into a view of the world which sees all theories and events as full of contradictions.[28] I would argue that events are naturally composed of the intersection of a variety of causal links, and theories as generally constructed tend to be similarly composed. Thus, the search for a hierarchical ordering of phenomena and causal links would seem to be compatible with deconstruction (except, of course, for those who view deconstruction as the antithesis of science). I might note, in particular, that causal links can, and often do, involve complex feedback mechanisms, a likely source of ambiguity and contradiction.

Dealing with Diversity

As noted above, one of the driving forces in postmodernist thought has been a concern with diversity. Still, we must be careful to not equate one with the other (Appleby, Hunt, and Jacob, 1994). Many have worried that our modern scientific theory and method are suspect because of the past domination of scholarship by white, middle class males. They *might* thus hesitate to embrace a schema developed from the existing body of knowledge (and the author must confess to a greater acquaintance with Western than Eastern thought). The very flexibility of the schema provides a powerful counterargument. And issues of race, gender, and class find a prominent place within our schema. I have tried, moreover, to develop a schema that is applicable to all people and societies. As our discussion of grand theory suggested, one of the virtues of our schema is that it suggests limits to the authority of all past great thinkers.

Practitioners of interdisciplinarity have often noted that by drawing together the perspectives of different disciplines the biases that motivate diverse scholars are exposed. Rigid disciplinary paradigms, which privilege certain types of research and teaching, are likely repositories of bias (Hendershott, Barnhardt, and Wright, 1997). Our schema, by providing scholars and students with a guide to related work in other disciplines, could further expose such biases. Scientific advance depends on open and honest communication among scholars, and this is enhanced when they bring diverse interests and experiences to the task.

X. Concluding Remarks

I have in this article established the possibility of an organizing schema for human science and taken the task of designing such a schema an important step further than previous scholars. In the larger project of which this paper forms a part, I move further by outlining hundreds of causal links, drawing on hundreds of monographs, works of synthesis, and texts spanning human science.

I believe that such a schema will help us to solve many of the difficulties presently facing human science. We have already seen that the schema can ensure a more balanced scholarly effort and protect against certain types of discovery being forgotten.[29] I would also hope that acquaintance with such a schema would alter the world view of most disciplinary scholars; they may now be dimly aware that the causal links on which they focus are not the whole story but can all too easily forget this fact in practice. I must say that I was continually shocked while researching this project by the ignorance displayed by even the best of scholars toward closely related research in

other disciplines.

It might be thought that any attempt to *map* human science must itself constrain scholars in some ways. While most maps do indeed focus attention on particular features, our map excludes no phenomenon or link from consideration. Scholars and students are still free to follow their curiosity in any direction. The map serves to point out the various possibilities, keeps us from getting *lost*, and guards against the all too common error of thinking the route we follow is the only one.

Our students would gain indirectly from any enlightenment of their teachers. More directly, the schema would provide them with a road map as they attempt to blend material from diverse courses. Integrating such material is an important component of critical thinking. Since the schema both provides a powerful example of how complexity can be handled by disaggregation and shows students that no one theory has all the answers, it is supportive of many of the skill-related goals of interdisciplinary teaching: critical thinking, appreciation of diverse viewpoints, awareness of bias, and suspicion of authority.

The liberal arts have received a great deal of criticism in recent decades. While I could hardly summarize a diverse debate here, I would note that a common complaint is that there is no longer a core set of information we feel an educated student should possess. This leads many to advocate returning to an emphasis on Western civilization (usually history and/or literature, often with a classical focus). Responding with a list of the cognitive skills we hope our students will attain is certainly valid but unlikely to mollify our fiercest critics. Gaff (1991) notes that many proponents of core programs are motivated by a fear that college curricula are no longer coherent, but fears that there is no obvious path to achieve this goal without losing the advantages of specialization. The schema herein may take us a step further: it allows us to argue that there is a coherent structure to understanding in the liberal arts, and to structure one or more courses which will impart this broad structure while focusing on a diversity of causal links. Each student would then gain some insight into issues of culture, gender, race, power, status, aesthetics, etc. before choosing some subset of causal links as the focus of their studies.[30]

The schema is easily incorporated into existing curricula. Where sequences of required interdisciplinary courses already exist, it could serve as a background resource for all. At universities like my own, which rely primarily on breadth requirements to give students an extra-disciplinary perspective, introductory courses could be designed with the schema as their basis. If the schema were used in such a manner, it might encourage a reduction in

disciplinary boundaries or at least a more logical distribution of disciplinary tasks. But such advances are not a prerequisite for its use.

One of the forces driving the modern interest in interdisciplinarity is a recognition that public policy issues do not come in neat disciplinary packages (Klein, 1990). Yet, the vast majority of scholars still have a disciplinary focus which their public policy advice reflects. Economists comment on trade agreements as if these only had economic effects; political scientists and sociologists match their folly by speaking as if there were only political or cultural considerations. Economists ignore the suffering of the unemployed, the role of altruism in human motivation, and cultural influences on economic activity simply because these have no place on their map. The situation is duplicated in other disciplines. If instead we all worked from a shared map, we could not so casually ignore diverse causal links. Scientists would still specialize, of course, but they would be guided to a greater humility in public policy pronouncements.

I have been critical in the preceding pages both of those who attempt to oversimplify the world we live in and thus proffer simplistic solutions to complex problems, and those who become so overwhelmed by the complexity of our world that they give up hope of scientific understanding. My fondest hope is that a schema such as this would cause a softening of both positions. The world is a complex place indeed, but we can reasonably expect to gradually extend our understanding of each causal link. We will never be able to predict the future in its entirety, but we can steadily enhance our ability to predict the effects of particular human actions.

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Notes

1. Some philosophers argue that the reasons people use to justify acts are logically distinct from causes; both would count as influences in my schema. Braybrooke (1987) identifies three types of inquiry in human science: a 'naturalistic' search for causal regularities which follows the natural sciences, an 'interpretive' look at what makes certain acts appropriate or what they signify, and a 'critical' analysis of such questions as 'whose interests do certain rules serve?' While practitioners tend to view these approaches as in opposition, Braybrooke establishes that they are complementary and that all three use causal statements.
2. I should stress that hierarchy here refers to levels of abstraction, rather than any sort of value judgment. Phenomena at one level are disaggregated into (lower-level, less abstract) phenomena which together comprise the first phenomenon. I argue that each phenomenon fits in only one place in the schema, though it will be causally related to other phenomena.
3. Our ten highest-level phenomena or categories are only rarely the subject of causal analysis. Lower in the hierarchy, causal links exist between phenomena at varying levels of aggregation. In saying that each phenomenon affects each other, we must keep in mind that affecting a lower-level phenomenon must imply affecting those phenomena of which it is a component.
4. It is thus common for interdisciplinary scholars to make a plea for question-oriented research (Klein, 1990, 188). Scholars who start first with a question will be more likely to recognize that a variety of theories and methods can illuminate it. One can think of our causal links as questions to be answered.
5. I have used the word *category* to refer to the ten phenomena at the highest level of aggregation, in large part to signal that causal links usually operate at lower levels of aggregation.
6. As society becomes more complex, we may become aware of new phenomena which deserve a place in our schema. Note, though, that logically our schema is designed so that it encompasses societies at all yet-realized levels of complexity. While most of the examples used in this paper are modern, the schema was designed with an eye to earlier societies.
7. Further, we can conceive of what Barber (1993) calls changes in type versus changes within type. Another element of culture is standards of personal attire. One type of such standard is modern Western fashion, wherein we expect styles to change from year-to-year. If this type were to give way to a more traditional and relatively unchanging standard of attire, we could speak of a change in type. Changes in type will be our predominant focus. However, we could also think of changes within type: there are inevitably yearly changes in styles of clothing for both men and women. The particular form these take are of much less interest to the human scientist, though they may still be at least in part causally related to changing artistic tastes or gender roles or a host of other phenomena.
8. Ironically, the schema outlined here, while highlighting the artificial nature of the boundaries between the social sciences, serves to highlight the potential advantage of

area studies (and history) departments. These can, for example, show how differences between Chinese and American culture are related to political, economic, social, and artistic differences, among others.

9. Bulick (1982, p. 162) describes how the Library of Congress classification system has suffered from the illogical division of human science subject matter. Having taken disciplinary self-definitions as its starting point, the system has been seriously distorted as disciplinary boundaries have shifted.

10. I should stress, though, that I am not pursuing a reductionist research program which aspires only to explanation at the lowest level of disaggregation. In the natural sciences, it is now recognized that we cannot reduce all understanding to the level of sub-atomic particles (Hodgson, 1993). Likewise, in human science, analysis is sometimes best posed at our first level of disaggregation and other times at much lower levels. Alfred Kuhn (1974) recognized that human science depended on a mixture of holistic and reductionist analyses.

11. Since our categories are logically distinct, it follows that all subsidiary phenomena belong in only one place in the schema. Occasionally, as with love, the same word appears twice. The emotion of love is nevertheless a distinct phenomenon from social attitudes toward love.

12. I believe that all the phenomena identified below as part of genetic predisposition are primarily determined by genes. If future research showed any of them to be socially determined, they would be better seen as cultural phenomena.

13. Occasionally, evolutionary psychologists draw on the study of animal behavior as well. For those who are uncomfortable with the idea of theorizing about human evolution, I would note that the very nature of our schema, with thousands of links between hundreds of phenomena, guarantees that any one mistaken idea can have only a limited impact on our collective understanding.

14. Barlow, Cosmides, and Tooby (1992) provide a good overview of evolutionary psychology, and provide a basis for much of the information in this section. Wilson (1998) also provides many useful insights.

15. These six, plus an intrapsychic intelligence best dealt with under schemas below, were first suggested by Gardner (1983). He also unpacked these: interpersonal intelligence for example includes leadership, relationships, conflict resolution, and recognition of others' relationships.

16. These phenomena are more relevant for modern societies. Note, though, that the observation that inflation and/or unemployment are impossible in a certain society is itself of great importance.

17. Books and Prysby (1991) describe three methods by which we could identify such groups: differences in attitudes, concentrations of interpersonal interactions, and defining characteristics. See also Gross and Rayser (1985).

18. I think this distinction the most important, for it captures critical differences in both the motivation for and effects of crime. The distinction may be blurred in many cases, of course. And for some societies other distinctions, such as religious/non-religious might be more important. If this were true for many societies, we would

want to adjust the schema.
19. Of course, individuals may perceive their religion, or even their entire culture, as one seamless whole, rather than a set of interrelated phenomena. For scholars to compare societies, though, we need to disaggregate (implicitly if not explicitly). I would also argue that it is a mistake to see a religion or culture as monolithic, with each characteristic uniquely determined by other characteristics. Cultures gradually evolve over time precisely because it is possible for individual traits to change (with changes within one phenomenon encouraging changes within others).
20. In discussing culture, I draw heavily on Barber (1993) and Brown (1991). I should note that the latter in turn drew heavily on Clark Wissler, who also inspired the Human Relations Area Files.
21. Where are justice, mercy, truth, and freedom? I have tried to avoid words with multiple meanings. With respect to justice, I can think of two main sorts of question: do I think the world is just (captured by attitudes to fate) and will I behave justly (captured under ethics). Mercy is captured by righteousness and vengeance, and truth by honesty and the search for knowledge. Freedom means countless things. Attitude to fate again captures part of it as does attitude to individuals.
22. I would suggest, in any case, that the natural sciences are in less need of an overarching schema because disciplinary divisions there have a more logical basis. Physics, chemistry, and biology can, to a significant degree, be distinguished by the level of aggregation of their subject matter (though of course biochemistry and palaeontology blur these distinctions). Certainly there is much greater consistency in theory across natural science disciplines than in the human sciences.
23. Hutcheon (1996) has noted both that some have shied away from a focus on causation due to a belief that it detracts from the exercise of free will and that, in fact, a better understanding of causal relations will improve our ability to have the impact we desire on the world. The fact that we try to comprehend how personality affects behavior does not at all detract from the ability of individuals to exercise their best judgment in order to achieve their goals.
24. While our focus is on causal links among phenomena, we cannot ignore whatever internal dynamics may exist within certain phenomena. Note, though, that whatever forces for change *may* be inherent in a phenomenon, the course of change will nevertheless be shaped by interactions with other phenomena.
25. Kuhn (1974) defines *system* more loosely as any set of one or more causal links that are regular enough to be interesting. He then goes on to define several different types of systems. As noted before, in studying any causal link we are concerned primarily with identifying general patterns rather than explaining individual occurrences. Still, while Kuhn (1974) focuses on static relationships, our schema is flexible enough to capture the dynamics of societal change. In this context, note that even if we were able to detect a Parsonian subsystem defined by weak links to other phenomena, in the end these weak links will still have a large cumulative effect (see Hodgson, 1993, pp. 242-250).
26. It might be thought that a schema such as ours is inherently deterministic. To be

sure, we do argue that all human acts can potentially be explained in terms of one or more causal links. As Barber emphasizes, though, our inner personalities play a key role in these causal relationships. Our behavior, then, is jointly determined by our personalities and external circumstances. This is hardly at odds with common conceptions of *free will*, nor are our attempts to comprehend personality as influenced by both genes and environment, especially as our understanding is necessarily incomplete.

27. Bhaskar's tendency to use the word *structures* or *systems* as a synonym for his *things* implies the existence of relatively autonomous social subsystems. To avoid such an implication I have used the term *phenomena*. Yet this seems to be only a semantic difference: Bhaskar is merely emphasizing that scientific investigation occurs at many levels, and that the phenomena we investigate will turn out to have sub-components which need analysis in their own right. Thus, to understand why any phenomenon changes in a particular way, we need to understand its composition as well as its causal links with other phenomena.

28. A minority of deconstructionists argue that the problem of ambiguity is so severe that an attempt such as ours to increase understanding is doomed. "Most philosophers and critics would be quite willing to admit that slippage of meaning occurs [poetry works on just such a principle], but would draw the line at saying that *nothing but* slippage occurs: it is hard to see how, if that were the case, we could even communicate such a state of affairs" (Sim, 1992, p. 109).

29. Science can be thought of as an evolutionary process involving variation and selection. Our schema will enhance variation by limiting the loss of certain discoveries, and enhance selection by juxtaposing diverse sorts of information.

30. By reducing student frustration, the schema might help encourage their joy in learning. And some of the less studied causal links would present great opportunities for student assignments and presentations. The schema should also help students pursue continuous learning after graduation.

References

Appleby, J., Hunt, L., and Jacob, M. (1994). *Telling the truth about history*. New York: Norton.

Barber, B. (1993). *Constructing the social system*. New Brunswick, NJ: Transaction Publishers.

Barkow, J. H., Cosmides, L., and Tooby, J. (Eds.). (1992). *The adapted mind*. Oxford, UK: Oxford University Press.

Bechtel, W. (Ed.). (1986). S*cience and philosophy: integrating scientific disciplines*. Dordrecht, Holland: Martinus Nijhoff.

Bhaskar, R. (1989). *Reclaiming Reality*. New York: Verso.

Blau, Judith R. (1993). *Social contracts and economic markets*. New York: Plenum Press.

Books, J. W., and Prysby, C. L. (1991). P*olitical behavior and the local context*. New

York: Praeger Press.
Brady, M. (1989). *What's worth teaching? Selecting, organizing and integrating knowledge*. Albany, NY: SUNY Press.
Braybrooke, D. (1987). *Philosophy of social science*. Englewood Cliffs, NJ: Prentice-Hall.
Brown, D. F. (1991). *Human universals.* Philadelphia: Temple University Press.
Bulick, S. (1982). *Structure and subject interaction*. New York: Marcel Dekker.
Caws, P. (1993). *Yorick's world; science and the knowing subject*. Berkeley: University of California Press.
Cloke, P., Philo, C., and Sadler, D. (1991). *Approaching human geography*. London: Paul Chapman Publishers Ltd.
Collins, R. (1998). *The sociology of philosophies: A global theory of intellectual change*. Cambridge, MA: Belknap (Harvard University) Press.
Dogan, M., and Pelassy, D. (1990). *How to compare nations* (2nd ed.). Chatham, NJ: Chatham House Publishers.
Durham, W. (1991). *Co-evolution: Genes, culture, and human diversity*. Palo Alto, CA: Stanford University Press.
Elster, J. (1983). *Explaining technical change*. Cambridge, UK: Cambridge University Press.
Ember, C. R., and Ember, M. E. (1988). *Guide to cross-cultural research using the HRAF archive*. New Haven, CT: Human Relations Area Files Inc.
Finer, S. E. (1997). *The history of government from the earliest times*. Oxford, UK: Oxford University Press.
Frey, B. S. (1992). *Economics as a science of human behavior*. Boston: Kluwer.
Gaff, J. G. (1991). *New life for the college curriculum*. San Francisco: Jossey-Bass.
Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences*. New York: Basic Books.
Gross, J. L., and Rayser, S. (1985). *Measuring culture*. New York: Columbia University Press.
Hendershott, A. B., and Wright, S. P. (1997). The social sciences. In J. G. Gaff, J. L. Ratcliff, and Assoc., *Handbook of the undergraduate curriculum*. San Francisco: Jossey-Bass.
Hodgson, G. M. (1993). *Economics and evolution*. Cambridge, UK: Polity Press.
Hornsby, W. F., and Jones, M. (1993). *An introduction to population geography*. Cambridge, UK: Cambridge University Press.
Hutcheon, P. (1996). *Leaving the cave: Evolutionary naturalism in social-scientific thought*. Waterloo, Canada: Wilfrid Laurier University Press.
Klein, J. T. (1990). *Interdisciplinarity*. Detroit, MI: Wayne State University Press.
Kontopolous, K. (1993). *The logics of social structure*. Cambridge, UK: Cambridge University Press.
Kuhn, A. (1974). *The logic of social systems*. San Francisco: Jossey-Bass.
Lambert, K., and Brittan, Jr., G. R. (1992). *An introduction to the philosophy of science* (4th ed.). Alacasdero, CA: Ridgeview Publishing Co.

Merton, R. K. (1996). *On social structure and science*. Chicago, IL: University of Chicago Press.
Miller, L. (1990). *Inner natures: Brain, self, and personality*. New York: St. Martin's Press.
Murdock, G. P., Ford, C. S., Hudson, A. E., Kennedy, R., Symons, L. W., and Whiting, J. W. M. (1982). *Outline of cultural materials* (5th ed.). New Haven, CT: Human Relations Area Files Inc.
Parsons, T. (1966). *Societies: Evolutionary and comparative perspectives*. Englewood Cliffs, NJ: Prentice-Hall.
Pervin, L. A. (Ed.). (1990). *Handbook of personality theory and research*. New York: Guildford Press.
Sanderson, S. K. (1995). *Social transformation*. Oxford, UK: Blackwell.
Shweder, R. A., and Fiske, D. W. (1986). Introduction: Uneasy social science. In D. W. Fiske and R. A. Shweder (Eds.), *Metatheory in social science*. Chicago, IL: University of Chicago Press.
Sim, S. (1992). Deconstruction. In D. E. Cooper (Ed.), *A companion to aesthetics*. London: Blackwell.
Skinner, Q. (Ed.). (1985). *The return of grand theory in the human sciences*. New York: Cambridge University Press.
Szostak, R. (1991). *The role of transportation in the Industrial Revolution*. Montreal: McGill-Queen's University Press.
Trigg, R. (1985). *Understanding social science*. Oxford, UK: Basil Blackwell.
Vromen, J. J. (1995). *Economic evolution*. London: Routledge.
White, H. C. (1992). *Identity and control: A structural theory of social action*. Princeton, NJ: Princeton University Press.
Wilson, E. O. (1988). *Consilience*. New York: Knopf.

Appendix

Table of Phenomena

Categories	Second-Level Phenomena	Third-Level Phenomena
Genetic Predisposition	Abilities	Consciousness, subconsciousness, vocalization, perception (taste, touch, sight, smell, hearing), toolmaking, learning, decision-making, other physical attributes (locomotion, eating, etc.)
	Motivation	Food, clothing, shelter, safety, sex, betterment, aggression, altruism, fairness, identification with group
	Emotions	Love, anger, fear, jealousy, guilt, empathy, anxiety, fatigue, humor, aesthetic sense, joy, grief, disgust, emotional display
	Time Preference	
Individual Differences	Abilities:	
	Physical Abilities	Speed, strength, endurance
	Physical Appearance	Height, weight, symmetry
	Energy Level	Physical, mental
	Intelligences	Musical, spatial, mathematical, verbal, kinesthetic, interpersonal
	Personality:	
	Sociability (Extro/introversion)	Talkative, assertive, adventurous, and enthusiastic vs. reserved, withdrawn
	Emotionality (Stable/moody)	Contentment, composure, vs. anxiety, self-pity
	Conscientiousness	Thoroughness, precision, foresight, organization, and perseverance vs. carelessness, disorderly, frivolous
	Affection (Selfish/agreeable)	Sympathetic, appreciative, kind, and generous, vs. cruel, quarrelsome, faultfinding
	Intellectual Orientation (Holistic/analytical)	Openness, imagination, curiosity, and sensitivity vs. close-mindedness
	Other dimensions?	Dominant/submissive, in/dependent, strong/weak, future/present oriented, humor, aggression, happiness
	Disorders?	Schizophrenia, psychoticism, ...?
	Sexual Orientation	
	Schemas	View-of-self, others, casual relationships
	Interpersonal Relationships	Parent/child, sibling, employee/r, romance, friendship, casual

Continued on next page

Categories	Second-Level Phenomena	Third-Level Phenomena
Economy	Total Output	Price level, unemployment, individual goods and services
	Income Distribution	
	Economic Ideology	
	Economic Institutions	Ownership, production, exchange, trade, finance, labor relations, organizations
Art	Non-reproducible	Painting, sculpture, architecture
	Reproducible	Theater, film, photography, music, dance, prose, poetry
Social Structure	Genders	
	Family types	Nuclear, extended, single parent
	Kinship	
	Classes (various typologies)	Occupations (various)
	Ethnic/Racial Divisions	
	Social Ideology	
Politics	Political Institutions	Decision-making systems, rules, organizations
	Political Ideology	
	Nationalism	
	Public Opinion	Issues (various)
	Crime	Against people, against property
Culture	Languages	By descent?
	Religions	Providence, revelation, salvation, miracles, doctrine
	Stories	Myths, fairy tales, legends, family sagas, fables, jokes, and riddles
	Expressions of culture	Rituals, dance, song, cuisine, attire, ornamentation of buildings, games
	Values (Goals:)	Ambition, optimism, attitudes toward wealth, power, prestige, beauty, honor, recognition, love, friendship, sex, incest, marriage, time preference, physical and psychological well-being
	(Means:)	Honesty, ethics, righteousness, fate?, work valued intrinsically, violence, vengeance, curiosity, innovation, nature
	(Community:)	Identity, family vs. community, openness to outsiders, trust, egalitarianism, attitude to young and old, responsibility, authoritarianism, respect for individuals
	(Everyday Norms:)	Courtesy, manners, proxemics, tidiness, cleanliness, punctuality, conversational rules, locomotion rules, tipping

Categories	Second-Level Phenomena	Third-Level Phenomena
Technology & Science	Fields (various)	Innovations (various)
	Recognizing the Problem	
	Setting the Stage	
	Act of Insight	
	Critical Revision	
	Diffusion/transmission	Communication, adoption
Health	Nutrition	Diverse nutritional needs
	Disease/Injury	Viral, bacterial, environmental
Population	Fertility	Fecundity, deviation from maximum
	Mortality	Causes of death (various)
	Migration	Distance, international?, temporary?
	Age Distribution	
Non-Human Environment	Soil	Soil Types (various)
	Topography	Land forms (various)
	Climate	Climate Patterns (various)
	Flora	Species (various)
	Fauna	Species (various)
	Resource Availability	Various Resources
	Water Availability	
	Natural Disasters	Flood, tornado, hurricane, earthquake, volcano
	Transport Infrastructure	Mode (various)
	Built Environments	Offices, houses, fences, etc.
	Population Density	