Culture and Systems of Thought:
Holistic vs. Analytic Cognition

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Abstract

We propose a theory of how systems of thought arise on the basis of differing cultural practices and argue that the theory accounts for substantial differences in East Asian and Western thought processes. We find East Asians to be more *holistic*, attending to the entire field and assigning causality to it, making relatively little use of categories and formal logic, and relying on "dialectical" reasoning. Westerners are more *analytic*, paying attention primarily to the object and the categories to which it belongs and using rules, including formal logic, to understand its behavior. The two types of cognitive processes are embedded in different naïve metaphysical systems and tacit epistemologies. We speculate that the origin of these differences is traceable to markedly different social systems. The theory and the evidence presented call into question long held assumptions about basic cognitive processes and even about the appropriateness of the process-content distinction.

The British empiricist philosophers of the 18th and 19th centuries, including Locke, Hume, and Mill, wrote about cognitive processes as if they were the same for all normal adults. This assumption of universality was adopted by mainstream psychology of the 20th century, where it has been predominant from the earliest treatment of cognitive psychology by Piaget, to mid-century learning theorists, to modern cognitive science. The assumption of universality was probably strengthened by the analogy to the computer, which has been implicit and often explicit for the past thirty years (Block, 1995; Shweder, 1991). Brain equals hardware, inferential rules and data processing procedures equal the universal software, and output equals belief and behavior, which can of course be radically different given the different inputs possible for different individuals and groups. "Basic" processes such as categorization, learning, inductive and deductive inference, and causal reasoning are generally presumed to be the same among all human groups.

It appears, however, that fairly marked differences in knowledge about and use of inferential rules exist even among educated adults. Work by Nisbett and his colleagues (Larrick, Nisbett, & Morgan, 1993; Nisbett, 1993; Nisbett, Fong, Lehman, & Cheng, 1987; Smith, Langston, & Nisbett, 1992) shows that people can learn statistical, probabilistic, methodological, logical, deontic, cost-benefit and other quite abstract rule systems and categorization procedures, and that training can affect their reasoning about everyday life events and even their behavior. Significant effects can be obtained not merely by extensive training in formal courses but sometimes even by brief instruction in the laboratory. Given that inferential rules and cognitive processes appear to be malleable even for adults within a given society, it should not be surprising if it turned out to be the case that members of markedly different cultures – socialized from birth into different worldviews and habits of thought – might differ even more dramatically in their cognitive processes.

In this paper we argue that the considerable social differences that exist among different cultures affect not only their beliefs about specific aspects of the world but also 1) their naïve metaphysical[1] systems at a deep level, 2) their tacit epistemologies,[2] and 3) even the nature of their cognitive processes—the ways by which they know the world. More specifically, we put forward the following propositions, which we develop in more detail later.

- Social organization directs attention to some aspects of the field at the expense of others.
- What is attended to influences metaphysics, that is, beliefs about the nature of the world and about causality.
- Metaphysics guides tacit epistemology, that is, beliefs about what it is important to know and how knowledge can be obtained.
- Epistemology dictates the development and application of some cognitive processes at the expense of others.
- Social organization and social practices can directly affect the plausibility of metaphysical assumptions, such as whether causality should be regarded as residing in the field vs. the object.
- Social organization and social practices can influence directly the development and use of cognitive processes such as dialectical vs. logical ones.

First, we review evidence that we find to be a convincing example of the contention that societies can differ markedly in their systems of thought. This evidence concerns a comparison of

the societies, philosophical orientations, and scientific outlooks of two highly sophisticated cultures – those of ancient China and Greece. We summarize the views of many historians, philosophers of science, and ethnographers indicating that the two societies differed in marked ways both socially and cognitively and that the social and cognitive differences were related. We next present a general proposal concerning the relation between social factors and cognition based on an examination of social life and cognitive procedures in the ancient world, deriving a number of quite specific predictions from that formulation. We then present a review of evidence regarding these predictions that comes mostly from our recent research comparing modern individuals raised in societies influenced by ancient Chinese thought with people raised in societies influenced by ancient Greek thought. This research shows that, to a remarkable extent, the social and cognitive differences that scholars have reported about ancient China and Greece find their counterparts among contemporary peoples. Moreover, these are not mere parameter differences, but in many cases differences that are quantitatively very large and even qualitatively distinct. Finally, we speculate on the origins of differences in systems of thought, sketch an analysis of the factors that might sustain "socio-cognitive homeostatic systems" over millennia, and present a consideration of the implications of our findings for claims about cognitive universality and for the traditional distinction between cognitive content and cognitive process.

ANCIENT GREEK AND CHINESE SOCIETY

From roughly the 8th to the 3rd century BC, many civilizations made great strides in philosophical and moral thought and in scientific and technological endeavors, notably Persia, India, the Middle East, China and Greece. We will examine the differences between the two civilizations that were most distant from one another and probably influenced one another the least – those of Greece and China. In addition, the influence each of these civilizations on the modern world is particularly great. Greek civilization gave rise to European civilization and post-Columbian American civilization and Chinese civilization gave rise to the civilizations of East Asia including Japan and Korea and also greatly influenced Southeast Asia.

The Ancient Greeks and Personal Agency

One of the most remarkable characteristics of the ancient Greeks (Ionians and Athenians in particular) was the location of power in the individual. Ordinary people developed a sense of personal agency that had no counterpart among the other ancient civilizations. Indeed, one definition of happiness for the Greeks was "the exercise of vital powers along lines of excellence in a life affording them scope" (Hamilton, 1930/1973, p. 25). Though the Greeks believed in the influence of the gods, "divine intervention and independent human action" were seen to work together (Knox, 1990, p. 39). The daily lives of the Greeks were imbued with a sense of choice and an absence of social constraint that were unparalleled in the ancient world. "The idea of the Athenian state was a union of individuals free to develop their own powers and live in their own way, obedient only to the laws they passed themselves and could criticize and change at will." (Hamilton, 1930/1973, p. 144)

Related to the Greek sense of personal freedom is their tradition of *debate*, which was already well established at least by the time of Homer in the 8th century (Lloyd, 1990; Nakamura, 1964/1985; Galtung, 1981). Homer emphasizes repeatedly that, next to being a capable warrior, the most important skill for a man to have was that of the debater. Even ordinary people participated in the debate of the market place and the political assembly, and could challenge even a king (Cromer, 1993, p. 65).

An aspect of Greek civilization that had a great effect on posterity was their sense of *curiosit*y about the world and the presumption that it could be understood by the discovery of rules (Lloyd, 1991;Toulmin & Goodfield, 1961, p. 62).The Greeks speculated about the nature of the objects and events around them and created causal models of them. The construction of these models was done by categorizing objects and events and generating rules about them for the purpose of systematic description, prediction and explanation. This characterized their advances in, some have said invention of, the fields of physics, astronomy, axiomatic geometry, formal logic, rational philosophy, natural history, history, and ethnography. Whereas many great ancient civilizations, including the earlier Mesopatamian and Egyptian and the later Mayan, made systematic observations in many scientific domains, only the Greeks attempted to model such observations in terms of presumed underlying physical causes (Cromer, 1993; Kane, 2000; Toulmin, 1961; Lin, 1936, p. 84).

The Ancient Chinese and Harmony

The ancient Chinese provide a particularly valuable contrast to the Greeks. The Chinese counterpart to the Greek sense of personal agency was a sense of reciprocal social obligation or *collective agency*. The Chinese felt that individuals are part of a closely knit collectivity, whether of a family or a village, and that the behavior of the individual should be guided by the expectations of the group. The chief moral system of China, Confucianism, was essentially an elaboration of the obligations that obtained between emperor and subject, parent and child, husband and wife, older brother and younger brother, and between friend and friend. Chinese society made the individual feel very much a part of a large, complex, and generally benign social organism where prescriptive role relations were a guide to ethical conduct (Lin, 1936; Munro, 1985). Individual rights were construed as one's "share" of the rights of the community as a whole. "[R]ole fulfillment in a hierarchical system…[took] priority over most other goods" (Munro, 1985, p. 19).

Such an emphasis on collective agency resulted in the Chinese valuing in-group *harmony*, "as when the occupants of a social group…perform their functions and do not transgress the boundaries of duty or expectations that accompany those functions" (Munro, 1985, pp. 20-21). Within the social group, any form of confrontation, such as debate, was discouraged. Though there was a time, called the period of the "hundred schools" of 600-200 BC, during which debate, among philosophers at least, did occur (Yang, 1988), "[t]here never developed a 'spirit of controversial language' nor a 'tradition of free public debate"(Becker, 1986, p. 78). "In philosophy, in medicine, and elsewhere there is criticism of other points of view…[b]ut the Chinese generally conceded far more readily than did the Greeks, that other opinions had something to be said for them…" (Lloyd, 1990, p. 550). So far from debate being encouraged in a society with such values, one person could not contradict another without fear of making an enemy (Cromer, 1993, p. 73-74), and to "be involved in a lawsuit was *ipso facto* ignominious" (Lin, 1936).

Chinese civilization was technologically far advanced beyond that of the Greeks. The Chinese have been credited with the original or independent invention of irrigation systems, ink, porcelain, the magnetic compass, stirrups, the wheelbarrow, deep drilling, the Pascal triangle, pound-locks on canals, fore-and-aft sailing, watertight compartments, the sternpost rudder, the paddle-wheel boat, quantitative cartography, immunization techniques, astronomical observations of novae, seismographs and acoustics (Logan, 1986, p. 51). Many of these technological achievements were in place at a time when the Greeks had none.

But most experts hold that these advances should not be regarded as the result of scientific theory and investigation (Cromer, 1993; Kane, 2000; Logan, 1986). Instead, they are reflective of a Chinese genius for *practicality* (Nakamura, 1964/1985, p. 189). "In Confucianism there was no thought of *knowing* that did not entail some consequence for action" (Munro, 1969, p. 55; see also On, 1996). The Chinese did not make formal models of the natural world but rather proceeded by intuition and empiricism. Indeed, it has been maintained that the Chinese never developed a concept corresponding to the laws of nature for the sufficient reason that they did not have a concept of "nature" as distinct from human or spiritual entities (Fung, 1983, p. 55; Lloyd, 1991; Logan, 1986, p. 50; Munro, 1969; Zhou, 1990).

Chinese and Greek Science, Mathematics, and Philosophy

The social-psychological aspects of ancient Greek and Chinese life had correspondences in the systems of thought of the two cultures. Their metaphysical beliefs were reflections of their social existences. And their tacit epistemologies in turn seem to have reflected their different metaphysical beliefs. These resulted in very great differences between Greece and China in their approaches to scientific, mathematical, and philosophical questions.

The cognitive differences between ancient Chinese and Greeks can be loosely grouped together under the heading of *holistic* vs. *analytic* thought (Nisbett, 1998; Peng & Nisbett, 1999). We define holistic thought as involving an orientation to the context or field as a whole, including attention to relationships between a focal object and the field, and a preference for explaining and predicting events on the basis of such relationships. Holistic approaches rely on experience-based knowledge rather than abstract logic and are *dialectical*, meaning that there is an emphasis on change, a recognition of contradiction and the need for multiple perspectives, and a search for the "Middle Way" between opposing propositions. We define analytic thought as involving detachment of the object from its context, a tendency to focus on attributes of the object in order to assign it to categories, and a preference for using rules about the categories to explain and predict the object's behavior. Inferences rest in part on the practice of decontextualizing structure from content, the use of formal logic, and avoidance of contradiction.

The distinction between holistic and analytic thought rests on a long tradition of theory about reasoning beginning with James and Piaget and continuing to the present. Holistic thought is associative, and its computations reflect similarity and contiguity. Analytic thought recruits symbolic representational systems, and its computations reflect rule structure. Sloman (1996) has recently reviewed evidence for this distinction in the cognitive realm. Witkin and his colleagues (Witkin, Dyk, Faterson, Goodenough, & Karp, 1974a; Witkin et al., 1954) have made a similar distinction in the perceptual realm between "field dependence" and "field independence." Our definition encompasses both reasoning aspects and perceptual aspects of the distinction, as well as the belief systems that underlie those differences.

Historians and philosophers of science have identified a number of important differences between the Greeks and the Chinese which fit under the definitions above.

Continuity vs. discreteness. A fundamental intellectual difference between the Chinese and the Greeks was that the Chinese held the "view that the world is a collection of overlapping and interpenetrating stuffs or substances… [This contrasts] with the traditional Platonic philosophical picture of objects which are understood as individuals or particulars which instantiate or 'have' properties" (Hansen, 1983, p. 30) which are themselves universals, e.g. "whiteness," "hardness." This profound difference in metaphysics had many ramifications. Most fundamentally, the Greeks, unlike the Chinese, were inclined to see the world as a collection of

discrete objects which could be categorized by reference to some subset of universal properties that characterized the object. Thus although the Greeks debated whether matter was best understood as waves or particles, the Chinese seem never to have had any doubt about the continuous nature of matter (Needham, 1962, p. 1).

Field vs. object. Since the Chinese were oriented toward continuities and relationships, the individual object was "not a primary conceptual starting point." (Moser, 1996, p. 31) Instead, "parts exist only within wholes, to which they have inseparable relations" (Munro, 1985, p. 17) The Greeks, in contrast, were inclined to focus primarily on the central object and its attributes (Hansen, 1983, p. 31). This tendency likely contributed to the Greeks' lack of understanding of the fundamental nature of causality in the physical domain. Aristotle explained a stone's falling through the air as being due to the stone having the property of "gravity" and explained a piece of wood's floating on the surface of water as being due to the wood having the property of "levity." The Chinese, in contrast, recognized that all events are due to the operation of a field of forces. They had knowledge of magnetism and acoustic resonance, for example, and knew the correct explanation for the behavior of the tides (Needham, 1962, p. 60).

Relationships and similarities vs. categories and rules. A consequence of their assumptions about continuity and the importance of the field is that the Chinese were concerned with relationships among objects and events (Lenk, 1993; Zhang, 1985). In contrast, the Greeks were more inclined to focus on the categories and rules that would help them to understand the behavior of the object independent of its context (Nakamura, 1964/1985, p. 185-186). The Chinese were convinced of the fundamental relatedness of all things and the consequent alteration of objects and events by the context in which they were located. It is only the whole that exists; and the parts are linked relationally, like "the ropes in a net" (Munro, 1985). Thus any attempt to categorize objects with precision would not have seemed a terribly important epistemic goal (Chan, 1967; Logan, 1986, p. 122; Moser, 1996, p. 116).[3]

The relationship view vs. the rule stance is well illustrated by the difference between the holistic approach to medicine characteristic of the Chinese and the effort to find effective rules and treatment principles in the West. Surgery was common in the West from a very early period, because the idea that some part of the body could be malfunctioning was a natural one to the analytic mind. But the idea of surgery was "heretical to ancient Chinese medical tradition, which taught that good health depended on the balance and flow of natural forces throughout the body" (Hadingham, 1994, p. 77).

Dialectics vs. foundational principles and logic. The Chinese seem not to have been motivated to seek for first principles underlying their mathematical procedures or scientific assumptions, and, except for the brief "Mohist" period from the end of the 4th to the end of the 3rd century BC, "the Chinese did not develop any formal systems of logic [or] anything like … an Aristotelian syllogism" (Liu, 1974). Indeed, there was an absence "not only of formal logical systems, but indeed of a principle of contradiction" (Becker, 1986, p. 83). It is noteworthy that the Indians did have a strong logical tradition, but the Chinese translations of their texts were full of errors and misunderstandings (Becker, 1986, p. 84). It has been argued that the lack of interest in logic accounts for why, although Chinese advances in algebra and arithmetic were substantial, the Chinese made little progress in geometry where proofs rely upon formal logic, especially the notion of contradiction (Lloyd, 1990, p. 119; Logan, 1986, p. 48; Needham, 1962, p. 1). (Algebra did not become deductive until the twelfth century, Cromer, 1993, p. 89).

In place of logic, the Chinese developed a *dialectic* (Lloyd, 1990, p. 119), which involves reconciling, transcending, or even accepting apparent contradictions. In the Chinese intellectual tradition there is no necessary incompatibility between the belief that *A* and *not A* both have merit. Indeed, in the spirit of the *Tao* or *yin-yang* principle, *A* can actually imply that *not A* is also the case—the opposite of a state of affairs can exist simultaneously with the state of affairs itself (Chang, 1939; Mao, 1937/1962). It is this belief that lies behind much of Chinese thought designed to find the "Middle Way" between extremes—accepting that two parties to a quarrel can both have right on their side or that two opposing propositions can both contain some truth. The Chinese dialectic includes notions resembling the Hegelian dialectic of thesis-antithesis-synthesis and finds its counterpart in modern "post-formal operations" in the Piagetian tradition, for example, understanding of part-whole relations, reciprocal relations, contextual relativism, self-modifying systems, and so on (Baltes & Staudinger, 1993; Basseches, 1984; Riegel, 1973).

Experience-based knowledge vs. abstract analysis. "The Chinese ... sought intuitive instantaneous understanding through direct perception." (Nakamura, 1964/1985, p. 171). This resulted in a focus on particular instances and concrete cases in Chinese thought (Fung, 1983; Lloyd, 1990; Nakamura, 1964/1985, p. 171). Many Greeks favored the epistemology of logic and abstract principles, and many philosophers, especially Plato and his followers, actually viewed concrete perception and direct experiential knowledge as unreliable and incomplete at best, and downright misleading at worst. Thus they were prepared to reject the evidence of the senses when it conflicted with reason (Lloyd, 1990, p. 118).

Ironically, important as the Greek discovery of formal logic was for the development of science, it also impeded it in many ways. After the 6th century Ionian period, the experimental tradition in Greek science was greatly weakened. It was countered by the conviction on the part of many philosophers that it ought to be possible to understand things through reason alone, without recourse to the senses (Logan, 1986, pp. 114-115). Importantly, there never developed in Greece the critical concept of zero, which is needed for an Arabic-style place number system as well as for algebra. Zero was rejected as an impossibility on the grounds that non-being is logically self-contradictory (Logan, 1986, p. 115)! Eventual Western understanding of zero, infinity, and infinitesimals required a detour to the East.

SOCIO-COGNITIVE SYSTEMS

It is possible to derive the intellectual differences between the ancient Greek and Chinese approaches to science and philosophy – their differing metaphysics and epistemology – from their differing social psychological attributes. And, more generally, it is possible to build a psychological theory from the historical evidence. We now return to the points sketched in the introduction concerning the links from social organization to cognitive process. We believe that social organization affects cognitive processes in two basic ways – indirectly by focusing on attention on different parts of the environment and directly by making some kinds of social communication patterns more acceptable than others.

From Attention to Cognitive Processes

Social organization, attention, and naïve metaphysics. If one lives in a complex social world with many role relations, one's attention is likely to be directed outside oneself and toward the social field. The Chinese habit of attending to the social environment might have carried over to the environment in general, allowing, for example, for the discovery of the relevance of the field in understanding physical events. As Markus and Kitayama (1991) put it, "If one perceives oneself as embedded within a larger context of which one is an interdependent part, it is likely

that other objects or events will be perceived in a similar way" (p. 246). Attention to the field should foster attempts to understand relations among objects and events in the field and should encourage explanation of events in terms of the relationship between the object and the field. Similarly, the world might naturally seem continuous and interpenetrating to people who view themselves as part of a larger whole, and who are motivated to maintain harmony within it.

On the other hand, if one lives in a world with fewer and less significant social relations and role constraints, it may be possible to attend primarily to the object and one's goals with respect to it. The object's properties may thus be salient and one may be encouraged to use those properties to develop categories and rules that presumably govern the object's behavior. The belief that one knows the rules governing the object's behavior might encourage exclusive focus on the object for explaining its behavior and might encourage the belief that the world is a place that is controllable through one's own actions. Moreover, the world is likely to be perceived as discrete and discontinuous by those who regard themselves as fully distinct and autonomous entities having limited connections to others and possessing the ability to act autonomously.

Naïve metaphysics and tacit epistemology. Beliefs about the nature of the world can be expected to influence tacit epistemologies, or beliefs about how to get knowledge. If the world is a place where relations among objects and events are crucial in determining outcomes, then it will seem important to be able to see all the important elements in the field, to see relations among objects and to see the relation between the parts and the whole. If the world is a place where the behavior of objects is governed by rules and the categories to which they apply, then it is crucial to be able to isolate the object from its context, to infer category membership of the object from its properties, and to infer how rules apply to categories.

Tacit epistemology and cognitive processes. If it seems important to see relations in the field, then perceptual habits such as deep processing of the environment and covariation-detection skills could be expected to develop, as well as cognitive habits such as explaining events with reference to the field. If it is important to find out the object's properties and the categories to which it belongs, then perceptual habits such as decontextualization of the object from the field, and cognitive habits such as explaining the object's behavior in terms of the categories and rules that apply to it could be expected to develop. Such differential cognitive habits would of course be expected to become largely automatic and unconscious, just as the underlying naïve epistemology would be expected to be largely beyond the reach of conscious awareness.

From Social Organization to Cognitive Processes

Social organization can influence cognitive processes without the direct mediation of metaphysical beliefs. Dialectics and logic can both be seen as cognitive tools developed to deal with social conflict. People whose social existence is based on harmony would not be expected to develop a tradition of confrontation or debate. On the contrary, their intellectual goals when confronted with a contradiction in views might be oriented toward resolving the contradiction, transcending it, or finding a "Middle Way" – in short to exercise a dialectical approach. In contrast, people who are free to contend with their fellows might be expected to develop rules for the conduct of debate, including the principle of non-contradiction and formal logic (Becker, 1986; Cromer, 1993; Lloyd, 1990, p. 8-9). Several commentators have maintained that the Greeks brought to the pursuit of science essentially the same principles of rhetoric that governed debate in the market place.

Science, in this view, is an extension of rhetoric. It was invented in Greece, and only in Greece, because the Greek institution of the public assembly attached great prestige to debating skill…. A geometric proof is ... the ultimate rhetorical form.

The exact psychological processes by which social organization influences metaphysical beliefs, or metaphysical beliefs affect epistemology, or epistemology governs the development of particular processes, cannot of course be known at this time. This is true in part because all of these elements are in homeostatic balance and there is reciprocal influence among each of them. Despite this, it is fruitful to identify the kinds of social practices that tend to be found in conjunction with particular cognitive processes, and we will describe some important ones later. We will also speculate about the ways that the social practices might operate to sustain the cognitive processes.

Contemporary Social Differences

If the differences in the nature of social life between East and West have been maintained, and if the original differences in cognitive orientations were due to the social psychological ones, then cognitive differences might also be found today, and not just among the intelligentsia.

There is substantial evidence that the social psychological differences characteristic of ancient China and Greece do in fact persist. China and other East Asian societies remain collectivist and oriented toward the group while America and other European-influenced societies are more individualist in orientation.[4] For reviews and general treatments of these differences, see Bond (1996), Fiske, Kitayama, Markus, & Nisbett (1998), Hofstede (1980), Hsu (1981), Markus and Kitayama, (1991), Nakamura (1964/1985), and Triandis (1972; 1995). As the psychologist L-H Chiu (1972) put it:

Chinese are situation-centered. They are obliged to be sensitive to their environment. Americans are individual-centered. They expect their environment to be sensitive to them. Thus, Chinese tend to assume a passive attitude while Americans tend to possess an active and conquering attitude in dealing with their environment (p. 236). [The American] orientation may inhibit the development of a tendency to perceive objects in the environmental context in terms of relationships or interdependence. On the other hand, the Chinese child learns very early to view the world as based on a network of relationships; he is socio-oriented, or situation-centered (p. 241).

Contemporary Cognitive Differences?

If the social differences have persisted, and if we are correct in believing that social factors influence metaphysics, epistemology, and ultimately cognitive processes, then several interrelated predictions can be made concerning cognitive differences between contemporary societies that have been influenced by China and those that have been influenced by Greece.

Attention. We believe that attention to the social environment is what underlay ancient Chinese attention to the field in general and accounts in part for metaphysical beliefs such as their recognition of the principle of action at a distance. If this notion is correct, we might find that contemporary Easterners and Westerners attend to different aspects of the environment. East Asians would be expected to attend more to the field than European Americans, who would be expected to attend more to a salient target object. Process implications follow: East Asians should be more accurate at *covariation detection* than Americans, that is, the perception of relationships within the field. East Asians should also be more *field dependent* (Witkin et al., 1974a), that is, they should find it more difficult than Americans to isolate and analyze an object while ignoring the field in which it is embedded.

Control. If a belief in personal agency underlay Greek curiosity and the invention of science, then Americans might be expected to perceive more control in a given situation than East Asians and to benefit more from being given control. They might also be more subject to the *illusion of control* (Langer, 1975), that is, a greater expectation of success when the self is involved in interaction with the object – even when that interaction could not logically have an effect on the outcome.

Explanation. If East Asians continue to have a metaphysical commitment to the notion that the whole context is relevant for a causal assessment of outcomes, we should find that their explanations of events invoke situational factors more frequently than do those of Americans. East Asians would be expected to explain events, both social and physical, with respect to the field, that is, contexts and situations, more than Americans, and Americans would be expected to explain events more with respect to a target object and its properties. Thus Americans would be expected to be more prone to the *fundamental attribution error* – or the tendency to attribute behavior to dispositions of the person and to slight the role of situations and contexts (Ross, 1977).

Prediction and "postdiction." We are proposing that East Asians have always lived in a complex world where many relevant factors are important to a consideration of outcomes. Thus their predictions about events might cast a wider net among potential causal candidates. They might also be expected to be less surprised by any given outcome because of their ready ability to find some explanation for it in the complex of potentially relevant factors. If explanations come to mind very easily for Asians, we might find that they are more susceptible to *hindsight bias*, or the tendency to regard events as having been inevitable in retrospect (Fischhoff, 1975).

Relationships and similarities vs. rules and categories. If Easterners are oriented toward the field, we would expect that they would organize their worlds in terms of relationships among events in the environment. More concretely, East Asians would be expected to group objects and events on the basis of *functional relationships* and *part-whole relationships,* for example, "A is a part of B. Americans, in contrast, would be expected to group objects more on the basis of *category membership*, for example "A and B are both Xs." Other predictions include the expectations that Americans might learn rule-based categories more readily than East Asians and that Americans might rely more on categories for purposes of deduction and induction.

Logic vs. experiential knowledge. If the scant role played by logic in the history of East Asian mathematics, science and philosophy has resonance in the thought processes of ordinary people today, and if the sympathy for formal approaches remains in the West, East Asians might be expected to rely more on prior beliefs and experience-based strategies when evaluating the convincingness of formal arguments than do Americans. We might also find that East Asians would be heavily influenced by prior beliefs in judging the soundness of formal arguments. Americans should be more capable of ignoring prior beliefs and setting aside experience in favor of reasoning based on logical rules.

Dialectics vs. the law of non-contradiction. If harmony remains the watchword in social relations for East Asians, and if social needs influence intellectual stances, East Asians would be expected to seek compromise solutions to problems, to prefer arguments based on principles of holism and continuity, and to try to reconcile or transcend seeming contradictions. If the debater's concern about contradiction continues to affect Western approaches to problems, Americans should be more inclined to reject one or both of two propositions that could be construed as contradicting one another.

As we will see, there is support for each of these hypotheses. In our review, we will not provide details about samples of participants in particular studies. Suffice it to say that we find supportive evidence whether the East Asians studied are ethnic Chinese, Koreans, or Japanese and whether they are studied in their own countries or as foreign students at U. S. universities and whether materials for East Asians are in English or translated into their native languages. Though most of the participants in research to date are students, there is also supportive evidence for nonstudents. It is entirely possible, of course, that there are significant differences among the various East Asian populations with respect to some of the issues we discuss. Certainly there are substantial social and cultural differences, some of which might plausibly affect cognitive processes. It should also be noted that the great majority of people of European culture who have been studied are Americans, and North Americans may well differ more from East Asians than do Europeans or Latin Americans.

Attention and Control

Work by Meyer and Kieras and their colleagues (Meyer & Kieras, 1997a; 1997b; 1999; Meyer, 1995) suggests that allocation of attention is highly malleable and subject to learned strategic adjustments such that perceptual "bottlenecks" can be ameliorated. Work by Rogoff and her colleagues (Chavajay & Rogoff, in press; Rogoff, Mistry, Göncü, & Mosier, 1993) indicates that people in some cultures attend to a much wider range of events simultaneously than do people in other cultures. Thus East Asians might be capable of attending to both the object and the field, and to a wider range of objects in the field, than Americans. We might also expect that, if Westerners attend to the object more, and if they believe that they understand the rules influencing the object's behavior, they might have a greater belief in the controllability of the object than is characteristic of Asians. Several implications follow from these considerations: 1) Easterners should see wholes where Westerners see parts; 2) Easterners should more easily see relationships among elements in the field but 3) find it more difficult to differentiate an object when it is embedded in the field; and 4) Westerners' perceptions and behavior should be more influenced by the belief that they have control over the object or environment.

Holistic vs. analytic Rorschach responses. In an early study by Abel and Hsu (1949), Rorschach cards were presented to European Americans and Chinese Americans. The investigators found that their Chinese American participants were more likely than their European American ones to give so-called "whole-card" responses in which all aspects of the card, or its Gestalt as a whole, was the basis of the response. Their European American participants were more likely to give "part" responses, in which only a single aspect of the card was the basis of the response.

Attention to the field. Masuda and Nisbett (2000) presented realistic animated scenes of fish and other underwater objects to Japanese and Americans and asked them to report what they had seen. The first statement by American participants usually referred to the focal fish ("there was what looked like a trout swimming to the right") whereas the first statement by Japanese participants usually referred to background elements ("there was a lake or pond"). Although Americans and Japanese were equally likely to mention details about the focal fish, Japanese participants made about 70 percent more statements about background aspects of the environment. In addition, Japanese participants made about 100 percent more statement concerning relations involving inanimate aspects of the environment ("the big fish swam past the gray seaweed"). In a subsequent recognition task, Japanese performance was harmed by showing the focal fish with the wrong background, indicating that the perception of the object had been

"bound" (Chalfonte & Johnson, 1996) to the field in which it had appeared. In contrast, American recognition of the object was unaffected by the wrong background.

A similar "binding" result was obtained by Hedden and his colleagues (Hedden et al., 2000; Park, Nisbett, & Hedden, 1999). They asked their Chinese and American participants to look at a series of cards having a word printed either on a background of social stimuli (e.g., people at a market) or on no background. The words were unrelated to the pictures. Then participants were asked to recall as many words as they could. Chinese, but not Americans, recalled words better if they had been presented on the background, indicating that recall of the background served as a retrieval cue for the word for them.

Detection of covariation. Ji, Peng and Nisbett 9 examined ability to detect covariation among environmental stimuli. Chinese and American participants were asked to judge the degree of association between arbitrary figures. On the left side of a computer screen one of the two arbitrary figures was shown—for example, a schematic medal or a schematic light bulb. Immediately following that, on the right of the screen, one of another two figures was shown— for example, either a pointing finger or a schematic coin. Actual covariation between figures on the left and those on the right ranged from the equivalent of a correlation of .00 to one of .60. Chinese participants reported a greater degree of covariation than did American participants and were more confident about their covariation judgments. Their confidence judgments were also better calibrated with actual covariation. In addition, as Yates and Curley (1996) found, American participants showed a strong primacy effect, making predictions about future covariations that were much more influenced by the first pairings they had seen than by the overall degree of covariation they had been exposed to. Chinese participants, in contrast, showed no primacy effect at all, making predictions about future covariation that were based on the overall covariation they had actually seen.

Field dependence. Because of their habit of decontextualization and analysis, Americans should find it easier to separate an object from the field in which it is embedded than would East Asians. In order to examine this possibility Ji and her colleagues (in press) examined the performance of East Asians and Americans (matched for SAT math score) on the Rod and Frame Test of Witkin and his colleagues (Witkin et al., 1954). In this task, the participant looks into a rectangular box framing a rod that sits inside it. The task is to report when the rod appears to be vertical. Field dependence is indicated by the degree to which judgments about the position of the rod are influenced by the position of the frame. Ji and colleagues found that East Asian participants made more errors on the test than American participants. East Asian participants were also less confident about the accuracy of their performance than were American participants.[5]

(Illusion of) control. It seems likely that if Americans believe they have control over events, they might pay more attention to them. Moreover, control is sufficiently important that people often fail to distinguish between objectively controllable events and uncontrollable ones. This "illusion of control" was defined by Langer (1975) as being an expectancy of personal success higher than the objective probability would warrant. The illusion of control can actually result in improvement of some cognitive functions for Americans. For example, participants were found to perform better on routine tasks when they believed mistakenly that they could control a loud noise that occurred periodically during the tasks (Glass & Singer, 1973). Some cross-cultural work suggests that East Asians may not be so susceptible to this illusion. Yamagushi and his colleagues (1997) found that American males were more optimistic in a

condition in which they had an illusion of personal control over the environment, though American females and Japanese of both genders were not.

As these considerations would suggest, both the covariation detection findings and the field dependence findings just discussed were affected by manipulations intended to give participants a sense of control. In one condition of the covariation detection task, participants were allowed to push a button to control which stimulus was presented on the left and they could also control the inter-trial interval. Whereas this manipulation could have no effect on the degree of covariation, Americans who were given "control" in this fashion tended to see more covariation and express more confidence in their judgments about covariation, whereas Chinese participants showed the opposite tendencies. Moreover, control actually impaired the calibration of Chinese judgments, whereas this was not true for Americans. Similarly, in the Rod and Frame task, when participants were allowed to control the movement of the rod, the accuracy of American males improved whereas that of the other groups did not. Finally, the confidence of both American males and American females was greater when they had control over the rod, and this was not true for East Asians of either gender.

Thus the attention of East Asians appears to be directed more toward the field as a whole and that of Americans more toward the object. East Asians found it easier to see relationships in the environment but found more difficulty in separating object from field. In addition, Americans and East Asians were affected quite differently by control or the illusion of it: Americans' performance improved and their confidence increased with control whereas that of East Asians did not.

<div align="center">Explanation and Prediction</div>

It seems reasonable to assume that people attribute causality to the events they attend to. If Westerners attend to the object, we would expect to attribute causality to the object. If East Asians attend to the field and the object's relations with the field, it seems likely that they would be more inclined to attribute causality to context and situations. Each of these expectations is supported by a substantial amount of evidence.

Dispositions vs. Contexts in Explanation

Causal attribution and prediction. One of the best established findings in cognitive social psychology concerns the so-called "correspondence bias" (Gilbert & Malone, 1995) or "fundamental attribution error" (FAE, Ross, 1977) – the tendency to see behavior as a product of the actor's dispositions and to ignore important situational determinants of the behavior. If it is really the case that East Asians are more oriented toward contextual factors than European Americans, then we might expect that they would be less subject to the FAE. Choi, Nisbett, and Norenzayan (1999; Norenzayan, Choi, & Nisbett, 1999) have recently reviewed research supporting this contention.

Work by Miller (1984) initially suggested that the FAE might indeed be more characteristic of Western culture than of other cultures. She found that whereas Americans explained another person's behavior predominantly in terms of traits, for example, recklessness or kindness, Hindu Indians explained comparable behaviors in terms of social roles, obligations, the physical environment, and other contextual factors. A similar demonstration by Morris and Peng (Morris, Nisbett, & Peng, 1995; Morris & Peng, 1994) showed that causal explanations by Americans of events such as mass murders focused almost wholly on the presumed mental instability and other negative dispositions of the murderers whereas accounts by Chinese of the same events speculated on situational, contextual, and even societal factors that might have been

at work. Lee, Hallahan and Herzog (1996) found that sports editorial writers in Hong Kong focused on contextual explanations of sports events whereas American sports writers were more likely to prefer explanations involving the dispositions of individual team members. Norenzayan, Choi and Nisbett (2000) found that Korean participants were more responsive to contextual factors when making predictions about how people in general would be expected to behave in a given situation and, much more than American subjects, made use of their beliefs about situational power when making predictions about the behavior of a particular individual. Cha and Nam (1985) also found Koreans to make far more use of situationally-relevant information when making causal attributions than Americans did.

Importantly, Norenzayan et al. (2000) found that Koreans and Americans were able to articulate metatheories of behavior that accorded with their explanations and predictions. Koreans endorsed situational and interactional theories more than did Americans. The East Asian focus on the field and the American focus on the object can be apparent even when the East Asian attributions are dispositional in nature. Menon and colleagues (1998) have found that East Asian dispositional explanations of events (for example, scandals in organizations) were more likely than those of Americans to refer to *group* dispositions.

The different forms of preferred explanation apparently extend beyond social events. Morris and Peng (1994) and Hong, Chiu, and Kung (1997) showed participants cartoon displays of fish moving in relation to one another in various ways. Chinese participants were more likely to see the behavior of the individual fish as being produced by external factors than were Americans, and American participants were more inclined to see the behavior as being produced by internal ones. Peng and Nisbett (2000) have shown that the physical theories of contemporary Chinese and Americans reflect those of their respective scientific predecessors two and a half millennia ago. For ambiguous physical events involving phenomena that appeared to be hydrodynamic, aerodynamic, or magnetic, Chinese were more likely to refer to the field when giving explanations (e. g., "the ball is more buoyant than the water") than Americans. (For less ambiguous, lever and "billiard ball" events, the explanations of Americans and Chinese were almost identical.) Thus the attributional differences probably should not be regarded as mere belief differences about local aspects of the world, but rather as deep metaphysical differences not limited to rules about particular domains specifically taught by the culture.

Attitude attribution paradigm. One of the first experimental demonstrations of the fundamental attribution error was by Jones and Harris (1967). Participants read an essay, either supporting or opposing some position on an important social question of the day, that allegedly had been written by another student. It was made clear to participants in a "No Choice" condition that the target had no choice about which side to take in the essay. For example, the target had been required to write an essay in favor of Castro's Cuba for a political science exam. Though normatively this information might be expected to eliminate any assumption that the essay reflected anything about the actual beliefs of the target, participants who read the pro essay reported believing that its writer was probably much more in favor of the question than did participants who read the con essay.

Choi and Nisbett (Choi, 1998; Choi & Nisbett) duplicated the basic conditions of the Jones and Harris study and added a condition in which, before making judgments about the target's attitude, participants were required to write an essay themselves and allowed no choice about which side to take. It was made clear to participants that the target had been through the same procedure they themselves had. The American participants in this condition made

inferences about the target's attitude that were as strong as those made by participants in the standard no choice condition. Korean participants, in contrast, made much less extreme inferences than did Korean participants in the standard no choice condition. Thus Korean participants, presumably by virtue of seeing the role that the situation played in their own behavior, recognized its power and made attributions about others accordingly. Similar sensitivity to situational constraints in attitude attribution was obtained with Japanese participants by Masuda and Kitayama (Kitayama & Masuda, 1997; Masuda, 1996)

Holistic Prediction and Postdiction

Attention to the field would appear to have clear advantages for explanation of events, inasmuch as it allows for avoidance of the fundamental attribution error. But attention to a broad range of factors might mean that any event can be readily explained—perhaps too readily explained. If a host of factors is attended to, and if naïve metaphysics and tacit epistemology support the view that multiple, interactive factors are usually operative in a given outcome, then any outcome may seem to be understandable, even inevitable, after the fact. And indeed, Choi, Dalal and Kim-Prieto (2000) have shown that Koreans regard a larger number of factors as potentially relevant to explaining a given event. They gave European American, Asian American and Korean participants a detective story and listed a large number of facts. Participants were asked to indicate which of the facts were irrelevant to solving the mystery. Koreans reported believing that far fewer facts were irrelevant than did European Americans. Asian Americans were intermediate between the other two groups.

Hindsight bias. An advantage of the more simplistic, rule-based stance of the Westerner may be that surprise is a frequent event. *Post hoc* explanations may be relatively difficult to generate, and epistemic curiosity may be piqued. The curiosity, in turn, may provoke a search for new, possibly superior models to explain events. In contrast, if Eastern theories about the world are less focused, and a wide range of factors are presumed to be potentially relevant to any given outcome, it may be harder to recognize that a particular outcome could not have been predicted. *Hindsight bias* (Fischhoff, 1975), or the tendency to assume that one knew all along that a given outcome was likely, might therefore be greater for Easterners.

These notions were tested in a series of experiments by Choi and Nisbett (Choi, 1998; Choi & Nisbett, in press). One study presented a scenario based on the "Good Samaritan" experiment of Darley and Batson (1973). Participants were told about one particular young seminary student, who, they were assured, was a very kind and religious person. He was headed across campus to deliver a sermon and along the way he encountered a man lying in a doorway asking for help. Participants were also told that the seminarian was late to deliver his sermon. In condition a), where participants did not know what the target had done, they were asked what they thought was the probability that the target would help and how surprised they would be if they were to find out that he had not helped. Both Koreans and Americans reported about an 80 percent probability that the target would help and indicated they would be quite surprised if he did not. In condition b), participants were told the target had helped the victim and in condition c) they were told he had not helped the victim. Participants in these conditions were asked what they believed they would have regarded as the probability that the target would have helped –if in fact they had not been told what he did – and also how surprised they were by his actual behavior. Again, both Koreans and Americans in condition b) indicated they would have thought the probability of helping was about 80 percent, and both groups reported no surprise that he did help. Americans in condition c), where the target unexpectedly did not help the victim, also

reported that they would have thought the probability was about 80 percent that the target would have helped and reported a great deal of surprise that he did not do so. In contrast, Koreans in condition c) reported that they would have thought the probability was only about 50 percent that the target would have helped and reported little surprise that he did not. Thus Americans experienced surprise where Koreans did not, and Koreans showed a very pronounced hindsight bias, indicating that they thought they knew something all along which in fact they did not.

Influence of alternative possibilities on surprise at outcomes. An additional study by Choi and Nisbett indicates that Easterners are not as surprised by unanticipated outcomes as are Americans. We would expect Westerners to regard a scientific finding as more likely if they had previously been presented only with a theory that would lead them to expect that finding than if they had also been presented in addition with a theory that would lead them to expect the opposite. On the other hand, if Koreans are in the habit of regarding outcomes as inevitable, then we would not necessarily expect them to be much more surprised when presented with two opposing theories than when presented only with the theory predicting the actual outcome. And indeed this is what was found. Americans reported being more surprised when presented with two strongly competing hypotheses, whereas Koreans were no more surprised when presented with two opposing hypotheses than when presented with only one.

Surprise when an "outcome" is found not to be true. In a final study, Choi and Nisbett showed that Koreans expressed little surprise even when an outcome literally contradicted an outcome they had just read about. Participants read either that scientific research had shown that more optimistic people have better mental health or that more realistic people do. Participants rated how surprising they found this result to be. Then, under a ruse, the experimenter "discovered" that the materials they had read were mistaken, due to a printing error, and that it was the opposite hypothesis that had been supported. Apologetically, he asked the participants if they would fill out the materials again. Americans reported substantial surprise if they read that it was the less plausible, "realism" hypothesis that, after all, was the correct one. Koreans reported much less surprise than Americans.[6]

The results support the view that East Asians have complicated but underspecified theories about the world that leave them insufficiently surprised by outcomes which differ from those that are anticipated. Thus, we would maintain that the same cognitive predispositions that make Asians less prone to the fundamental attribution error leave them prey to the hindsight bias and may also reduce their epistemic curiosity.

Relationships and Similarities vs. Rules and Categories

If Westerners attribute causality primarily to objects, it seems likely that they do so on the basis of rules that they presume to govern the behavior of objects. Rules in turn are of value to the extent that they apply over a large and specifiable number of objects, that is, to a category. Thus rules and categories would be expected to be a major basis of organizing events for Westerners. If Easterners attribute causality primarily to the field, then it is relationships between the object and the field, and relationships among events in the field, that might serve as the basis of organization. There is a good deal of evidence supporting these expectations.

Relationships vs. categories as the basis for grouping. Chiu (1972) gave items consisting of three pictures of human, vehicle, furniture, tool or food categories to American and Chinese children. Children were asked "to choose any two of the three objects in a set which were alike or went together and to state the reason for the choice" (p. 237). The dominant style of the Chinese children was "relational-contextual." For example, shown a picture of a man, a woman, and a

child, the Chinese children were likely to group the woman and child together because "the mother takes care of the baby." In contrast, American children were much more likely to group objects on the basis of category membership or shared features, for example, to group the man and the woman because "they are both adults."

       <u>Relationships vs. categories as the basis for judgments of association</u>. Ji and Nisbett (Ji, 2000; Ji & Nisbett, 2000) obtained the same results as Chiu with adult Chinese and American college students, who were tested in their native languages. They asked participants to indicate which of two objects out of three, described verbally, were most closely related. In all cases two of the objects shared some kind of relationship, either functional (e.g., pencil and notebook) or contextual (e.g., sky and sunshine) and also shared a category (e.g., notebook and magazine) or some feature that would allow them to be categorized together (e.g., sunshine and brightness). Chinese were more likely to group on the basis of relationships and Americans were more likely to group on the basis of categories or shared object features. Participants were asked to justify their groupings and Chinese were found to be more likely to offer relationships as the justification ("the sun is in the sky") whereas Americans were more likely to offer category membership as the justification ("the sun and the sky are both in the heavens").

       <u>Family resemblance vs. rules as the basis for judgments of similarity</u>. Norenzayan, Nisbett, Smith and Kim (Norenzayan, 1999; Norenzayan et al., 2000) presented East Asians (Chinese and Koreans), Asian Americans and European Americans with a series of stimuli on a computer screen in which a simple target object appeared beneath two groups of four similar objects. The groups were always constructed so that the use of a family resemblance strategy and the use of a rule strategy led to different responses (Kemler-Nelson, 1984). The objects in one group had a close family resemblance to each other and to the target object whereas the objects in the other group did not share a close resemblance with the target object. Instead, the objects of the second group were all describable by a unidimensional, deterministic rule, for example, they all had a curved stem (vs. a straight stem), and the rule was also applicable to the target object. Participants were asked to indicate which group the target object was most similar to. A majority of East Asian participants picked the "family resemblance" group whereas a majority of the European American participants picked the "rule" group. Asian Americans showed intermediate reasoning, having equal preferences for the rule group and the family resemblance group.

       <u>Categories and induction</u>. Osherson, Smith, Wilkie, Lopez, & Shafir (1990) have proposed a theory of inductive inference from categories which holds that people's willingness to generalize is in part a function of the extent to which premise categories "cover" the lowest level category that includes all premise categories. Thus when people are told that lions and giraffes have a particular property they are more willing to infer that rabbits have the property than when they are told that lions and tigers have the property (since lions and giraffes provide more coverage of the category mammal than do lions and tigers). Work by Choi, Nisbett and Smith (1997) indicates that Koreans make less use of categories for purposes of inductive inference than do Americans. For example, they were less influenced than Americans by coverage of the category—unless the category was made salient in some way. In one manipulation, for example, the category was mentioned in the conclusion (that is, participants made an inference about "mammals" rather than "rabbits"). This manipulation had no effect on Americans but increased the degree to which Koreans relied on the category. Thus categories are apparently less spontaneously salient for Koreans and hence less available for guiding generalizations.

Category learning. If East Asians are relatively unlikely to use explicit rules for assigning attributes to objects and objects to categories, then we might find that it might be more difficult for them to learn how to classify objects by applying rule systems. Work by Norenzayan, et al. (2000) suggests this is the case. Adopting a paradigm of Allen and Brooks (1991), they presented East Asians, Asian Americans, and European Americans with cartoon animals on a computer screen and told them that some of the animals were from Venus and some were from Saturn. Participants in an exemplar-based categorization condition were asked simply to observe a series of animals and make guesses, with feedback, about the category to which each belonged. Other participants were assigned to a rule condition and went through a formal, rule-based category learning procedure. They were told to pay attention to five different properties of the animals—curly tail, knobby antennae, etc.—and told that if the animal had any three of these properties it was from Venus, otherwise it was from Saturn.

Asian and American participants performed equally well at the memory-based categorization task with respect both to errors and to speed of response. But in the rule condition, East Asian participants' response times were slower than those of Americans. Most tellingly, when the test trial in the rule condition presented an animal that met the formal rule criteria for a given category but more closely resembled an animal in the other category—thus placing rule-based and memory-based categorizations in conflict—Asians made more errors of classification than did Americans. (They did not make more errors when the test animal more closely resembled an instance of the category of which it was also a member in terms of the formal rule and thus either a rule-based decision or an exemplar-based decision would yield the right answer.) Asian Americans' performance was almost identical to that of European Americans for both speed and accuracy.

Thus the results of several studies indicate that East Asians rely less on rules and categories and more on relationships and similarities in organizing their worlds than do Americans. East Asians preferred to group objects on the basis of relationships and similarity whereas Americans were more likely to group objects on the basis of categories and rules. Americans were more likely to rely spontaneously on categories for purposes of inductive reasoning than were East Asians and found it easier to learn and use rule-based categories.

Formal Logic vs. Experiential Knowledge

There is a long Western tradition, from the ancient Greeks, to the medieval Scholastics, to the propositional logic theoreticians of the late 19th and early 20th century, of analyzing argument structure apart from content, and reasoning on the basis of the underlying abstract propositions alone. Such a tradition has never been common in the East, where instead there has been an explicit disapproval of such decontextualizing practices and an emphasis on the appropriateness of plausibility and sense experience in evaluating propositions. Several studies suggest that East Asians do indeed rely less on formal logic and more on experiential knowledge in reasoning than do Americans – at any rate when logic and experience are in conflict.

Typicality vs. Logic

Consider the following two deductive arguments. Is one is more convincing than the other?
1. All birds have ulnar arteries
Therefore all eagles have ulnar arteries
2. All birds have ulnar arteries
Therefore all penguins have ulnar arteries

One way to measure the extent to which people spontaneously rely on formal logic versus experiential knowledge in reasoning is to examine how they project properties (the "blank" property "ulnar arteries" in the above example) from superordinate categories (birds) to subordinate categories (eagles, penguins). Notice that the two arguments have identical premises but their conclusions vary in the typicality of the exemplar (eagles are more typical birds than penguins). Reasoners who apply logic would "see" the implicit middle premises of each argument ("All eagles are birds," and "all penguins are birds"). Such reasoners would find both deductive valid arguments equally convincing. But people often find typical arguments to be more convincing than atypical ones (Sloman, 1993).

Norenzayan and colleagues (2000) asked Korean, Asian American, and European American participants to evaluate the convincingness of a series of such arguments. The responses of participants who received only typical arguments were compared with those who received only atypical arguments. As expected, Koreans showed a large typicality effect, being more convinced by typical than atypical arguments. European Americans, in contrast, were equally convinced by typical and atypical arguments. Asian Americans' responses were in between those of European Americans and Koreans. (When an experimental manipulation was introduced that increased the salience of the typicality information, all three groups showed the typicality effect to the same extent.)

Knowledge vs. Logic

In another study, Norenzayan and colleagues (2000) presented participants with syllogisms that were either valid or invalid and that had conclusions that were either plausible or implausible. In addition, some arguments were presented in abstract form with no content. Korean and American university students were instructed to evaluate the logical validity of each argument, deciding whether or not the conclusion followed from the premises. Results showed that, overall, there was an effect of logic as well as of knowledge, consistent with past research. Thus, participants correctly judged valid arguments to be more likely to be valid than invalid ones, and incorrectly judged arguments with plausible conclusions to be more valid than arguments with implausible conclusions. As predicted, Korean participants showed a stronger "belief bias" than American students for valid arguments, being more inclined to judge valid arguments as invalid if they had implausible conclusions. Importantly, this difference cannot be attributed to cultural differences in the ability to reason logically, since both cultural groups showed equal performance on the abstract items. Rather, the results indicate that when logical structure conflicts with everyday belief, American students are more willing to set aside empirical belief in favor of logic than are Korean students.

Dialectics vs. the Law of Non-contradiction

Peng and Nisbett (Peng, 1997; Peng & Nisbett, 1999) have maintained that East Asians do not have the same commitment to avoiding the appearance of contradiction as do Westerners. Examples of rules about contradiction that have played a central role in the Western intellectual tradition include the following:

- *The law of identity*: A = A. A thing is identical with itself.
- *The law of non-contradiction*: A ≠ not-A. No statement can be both true and false.
- The *law of the excluded middle*: Any statement is either true or false.

Following the proposals of many philosophers both of the East and of the West (e.g., Liu, 1974; Needham, 1962/1978; Zhang & Chen, 1991), Peng and Nisbett argued that there is a tradition in Eastern philosophy that is opposed at its roots to the formal logic tradition, namely

the dialectical approach. So-called "naïve dialecticism" resembles the dialectic of Hegel and Marx inasmuch as it sometimes involves the creation of a synthesis from a thesis and antithesis. But more commonly it involves transcending, accepting, or even insisting upon the contradiction among premises (Huff, 1993; Liu, 1974; Lloyd, 1990; Needham, 1962; Zhang & Chen, 1991; Zhou, 1990). Peng and Nisbett (1999) characterized dialecticism in terms of three principles.

- *The principle of change*: reality is a process that is not static but dynamic and changeable. A thing need not be identical with itself at all because of the fluid nature of reality.
- *The principle of contradiction*: Partly because change is constant, contradiction is constant. Thus old and new, good and bad, exist in the same object or event and indeed depend upon one another for their existence.
- *The priniciple of relationship or holism*: Because of constant change and contradiction, nothing either in human life or in nature is isolated and independent but instead everything is related. It follows that attempting to isolate elements of some larger whole can only be misleading.

These principles are of course not altogether alien to Western epistemology of either the naïve or the professional sort. Indeed, Western developmental psychologists (Baltes & Staudinger, 1993; Basseches, 1980, 1984; Riegel, 1973) have argued that such "post-formal" principles are learned in late adolescence and early adulthood to one degree or another by Westerners and that "wisdom" consists in part of being able to supplement the use of formal operations with a more holistic, dialectical approach to problems. But evidence we now present indicates that Western reliance on dialectical principles is weaker than that of Easterners and Western reliance on the foundational principles of formal logic, especially the principle of non-contradiction, is stronger.

Dialectical Resolution of Social Contradictions

Peng and Nisbett (Peng, 1997; Peng & Nisbett, 1999) presented Chinese and American students with contradictions drawn from everyday life. For example, they were asked to analyze a conflict between mothers and their daughters and between having fun and going to school. American responses tended to come down in favor of one side or the other ("mothers should respect daughters' independence"). Chinese responses were more likely to find a "Middle Way" which found merit and fault on both sides and attempted to reconcile the contradiction ("both the mothers and the daughters have failed to understand each other").

Dialecticism and Preferred Argument Form

Peng and Nisbett (Peng, 1997; Peng & Nisbett, 1999) gave Chinese and American participants, all of whom were graduate students in the natural sciences, two different types of arguments for each of two different propositions and asked them to indicate which argument they preferred. In each case one of the arguments was a logical one involving contradiction and one was a dialectical one. Thus in one problem two arguments for the existence of God were pitted against one another. One was a variant of the so-called "cosmological" or "first cause" argument. It holds that since everything must have a cause, this creates an infinite regression of cause and effect unless there is a primary cause by an infinite being. The dialectical argument applied the principle of holism, stating that when two people see the same object, such as a cup, from different perspectives, one person sees some aspects of the cup and the other sees other aspects. But there must be a God above all individual perspectives who sees the truth about the object. Americans preferred the argument based on non-contradiction in each case and Chinese preferred the dialectic one.

Judgments About Contradictory Propositions

One of the strongest implications of the notion that Westerners adhere to a logical analysis of problems is that, when presented with apparently contradictory propositions, they should be inclined to reject one in favor of the other. Easterners, on the other hand, committed to the principle of the Middle Way, might be inclined to embrace both propositions, finding them each to have merit. In one study, Peng and Nisbett (Peng & Nisbett, 1999) presented participants either with one proposition or with two propositions that were, if not outright contradictions, at least very different and on the surface unlikely to both be true. The propositions were presented in the form of social science studies. For example, one proposition was: "A survey found that older inmates are more likely to be ones who are serving long sentences because they have committed severely violent crimes. The authors concluded that they should be held in prison even in the case of a prison population crisis." Its counterpart was: "A report on the prison overcrowding issue suggests that older inmates are less likely to commit new crimes. Therefore, if there is a prison population crisis, they should be released first."

Participants read about one of these studies (A or B) or both (A and B) and rated their plausibility. In the case of all five issues presented, Chinese and American participants agreed on which of the two was the more plausible. In the A and B condition, Americans judged the plausibility of the more plausible proposition as greater than did Americans who read only the more plausible assertion by itself. Thus Americans actually found a contradicted assertion to be more plausible than the same proposition when not contradicted, a normatively dubious tendency which indicates that they felt substantial pressure to resolve the contradiction by buttressing their prior beliefs. (This finding is reminiscent of one by Lord, Ross & Lepper (1979), who found that when people read about two different studies, one supporting their view on capital punishment and one opposing it, they were more convinced of their initial position than if they had not read about any studies.) In contrast, Chinese participants in the A and B condition resolved the contradiction between the two propositions by finding them to be equally plausible, as if they felt obligated to find merit in both the conflicting propositions. They actually found the *less plausible* proposition to have more merit when it had been contradicted than when it had not—also a normatively dubious inference but utterly different in kind from that of the Americans.

Persuasion by Strong vs. Weak Arguments

If Westerners respond to apparent contradiction by trying to decide which side is correct, but Easterners respond by yielding points to both sides, then the two groups might respond differently to arguments against an initially held position. Westerners might increase their confidence in their initial position when presented with a weak argument whereas Easterners might decrease their confidence. This is what was found by Davis and her colleagues (Davis, 2000; Davis, Nisbett, Schwarz, & Kim, 2000). They presented groups of Korean, Asian American, and European American participants with a set of strong arguments in favor of funding a particular scientific project. They presented another group with the same set of strong pro arguments and an additional set of weak arguments against funding the project. Korean and American participants were equally in favor of funding the project when presented with just the strong pro arguments, but the two groups behaved in qualitatively different ways when presented additionally with weak anti arguments. Koreans were more unfavorable when weak anti arguments were added. But Americans were actually more favorable toward funding the project when presented with the additional weak anti arguments than when presented with no anti arguments – behavior that is normatively quite suspect.

<u>Justification of Choice</u>

      The Western preference for principle-guided decisions and the Eastern preference for the "Middle Way" appears to apply also for actual choice behavior. Briley, Morris, and Simonson (in press) studied the consumer choices of East Asians and European Americans. All choices were among a triad of objects which differed on two dimensions. Object A was superior to both Object B and C on one dimension and Object C was superior to both Object A and B on the other dimension. Object B was always intermediate between A and C on both dimensions. On average, across the range of choices, Americans and East Asians in a control condition were about equally likely to choose intermediate Object B. In an experimental condition, Briley et al. had participants give reasons for their choice. They anticipated that this would prompt Americans to look for a simple rule that would justify a given choice (e.g., "RAM is more important than hard drive space") but would prompt people of Asian culture to seek a compromise ("both RAM and hard drive space are important"). This is what was found. Americans in the justification condition moved to a preference for one of the extreme objects whose choice could be justified with reference to a simple rule, whereas Asian culture participants moved to a preference for the compromise object. Justifications given by participants were consistent with their choices, with Americans being more likely to give rule-based justifications and Chinese being more likely to give compromise-based justifications.

      Thus there is substantial evidence to indicate that Easterners are not concerned with contradiction in the same way as are Westerners. They have a greater preference for compromise solutions and holistic arguments; they are more willing to endorse apparently contradictory arguments; and they are more willing to move their beliefs in the direction of an argument even when it is a weak one. Finally, when asked to justify their choices, they seem to move to a compromise, "middle way" instead of referring to a dominating principle. It should be noted that the greater adherence to the principle of non-contradiction on the part of Americans seems to produce no guarantee against normatively questionable inferences. On the contrary, their adherence to the principle of non-contradiction may sometimes cause them to become more extreme in their judgments under conditions in which the evidence indicates they should become less extreme. This tendency mirrors complaints about hyper-logical Western habits of mind often expressed by philosophers and social critics (Korzybyski, 1933/1994; Lin, 1936; Liu, 1974; Nagashima, 1973; Saul, 1992).

CREATING AND SUSTAINING SYSTEMS OF THOUGHT

      What produced the differences in ancient times? What sustains them today? These are matters of speculation, of course, so we will confine our response to brief considerations, especially for the first, historical question.

The Origin of Socio-Cognitive Systems

      The explanation for the cognitive differences that we prefer is a distally materialistic but proximally social one that we have put together from the arguments of scholars in a large number of disciplines (Barry, Child, & Bacon, 1959; Berry, 1976; Cromer, 1993; Nakamura, 1964/1985; Needham, 1954; Whiting & Whiting, 1975; Whiting & Child, 1953; Witkin & Berry, 1975).

      Chinese civilization was based on agriculture, which entailed that substantial cooperation with neighbors was necessary in order to carry out economic activities in an effective way. This is especially true of the rice agriculture common in the south of China. China was organized at the level of the large state very early on, and society was complex and hierarchical: the king and later the Emperor and the bureaucracy were ever-present controlling factors in the lives of

individual Chinese. Harmony and social order were thus central to Chinese society. Social scientists since Marx have observed that economic and social arrangements such as these are generally associated with "collectivist" or "interdependent" social orientations as distinguished from "individualistic" or "independent" social orientations that are characteristic of societies with economies based on hunting, fishing, trading, or the modern market economy.

In marked contrast to all the other great civilizations of the ancient world, the Greek economy was not completely dependent on agriculture. The Greek ecology conspired against an agrarian base, consisting as it does mostly of mountains descending to the sea. This sort of ecology was more suited to herding and fishing than to large-scale agriculture. The sense of personal agency that characterized the Greeks could have been the natural response to the genuine freedom that they experienced in their less socially complex society.

The politically decentralized Greek cities also provided great scope of action as compared to Chinese cities. Greeks who wished to leave one city for another were free to do so – the sea provided an escape route for dissidents. In addition, Greeks were involved in trade at one of the crossroads of the world. Thus they would have had plenty to pique their curiosity and much to discuss. The nature of social relations meant that debate would have posed few interpersonal risks, and the authority structure of the city state was too weak to prevent the free expression of opinion. Indeed for Athens and other city states debate was an integral part of the political system.

Speculative as it is, this view has the virtue that it at least is consistent with the economic changes that preceded the Renaissance, namely the reduced reliance on agriculture and the rise of relatively independent city-states with economies based on crafts and trade. During the Renaissance the West recapitulated some of the Greek social forms and intellectual traditions, including the rediscovery of science. The invention of the printing press greatly enhanced the conditions of freedom of thought. Ironically, though the Chinese invented movable type before the Europeans, it was suppressed in China, on the quite correct grounds that the authority of the government would be undermined by it.

Some research by Witkin and his colleagues gives credence to the notion that stronger social networks might produce a more holistic orientation to the world. Berry and Witkin (1967; 1976; Witkin & Berry, 1975) showed that farmers in a number of societies are more field dependent than hunters, herders or industrialized peoples. Witkin and his colleagues (Adevai, Silverman, & McGough, 1970; Dershowitz, 1971; Meizlik, 1973) found that Orthodox Jewish boys, whose families and communities require strict observance of a variety of social rules, were more field dependent than secular Jewish boys who in turn were more field dependent than Protestant boys. These differences held even when general intelligence was controlled for. Moreover, individual differences in social orientation within a culture apparently are associated with field dependence. Americans who are more interested in social activities and in dealing with other people are more field dependent (even when intelligence is controlled) than people with less social interest (Witkin & Goodenough, 1977; Witkin et al., 1974b).

Finally, Kühnen, Hannover, and Schubert (2000) were able to prime field dependence on the Embedded Figures Test by a variety of techniques intended to make participants temporarily more collectivist in their orientations. For example, they asked participants to think about what they had in common with family and friends (vs. asking them to think about how they differed from family and friends). The results confirmed that a collectivist prime led to more field dependence.

Socio-Cognitive Systems in Homeostasis

Mere inertia would not result in contemporary differences in the way people think. We propose that systems of thought exist in homeostasis with the social practices that surround them. We will describe a number of ways in which the social practices and cognitive processes could support or "prime" one another (Hong et al., in press).

<u>Holistic vs. analytic practices</u>

- The practice of <u>feng shui</u> for choosing building sites (even Hong Kong skyscrapers) may encourage the idea that the factors affecting outcomes are extraordinarily complex and interactive which in turn encourages the search for relationships in the field. This may be contrasted with more atomistic and rule-based approaches to problem-solving characteristic of the West. Consider, for example, the nature of approaches to self-help in the West: "The Three Steps to a Comfortable Retirement" or "Six Ways to Increase Your Word Power."

- Employees in the top third of the Japanese economy are rotated among their company's divisions frequently, so as to be able to see the company's operations from as many viewpoints as possible. A graduate of a top university would be expected to work in the factory for the first year or two of employment and might actually represent union employees to the company (Hampden-Turner & Trompenaars, 1993).

- The West, beginning in the 18th century and continuing at an increasingly rapid pace into the 20th century, introduced "modularity," that is, uniform, atomistic and interchangeable design and production (Shore, 1996). From the introduction of piece good manufacture in English cottages to Henry Ford's production line to the chain restaurant, the West and America in particular remain the chief innovators and consumers of modular production and products.

- The most popular game of intellectuals in the East is *Go* and the most popular in the West is chess. Xia (1997) and Campbell (1983) have pointed out that Go is more complex and holistic than chess, the analytic game *par excellence*. *Go* boards have 19 X 19 spaces whereas chess boards have 8 X 8 spaces. *Go* pieces have more variation in possible moves than do chess pieces, which must adhere to a fixed set of rules for movement. Hence moves in *Go* are more difficult to predict. The appropriate strategy for *Go* has been termed *dialectic* (Xia, 1997) in that the "competition between the black and white is a well calculated trade-off…. It is not wise to be greedy and overplay" (Xia, 1997).

<u>Argument, Debate and Rhetoric</u>

- In daily life, East Asians strive to maintain harmony. Ohbuchi and Takahasi (1994) asked Japanese and American businesspeople how they dealt with conflict with their fellow managers. Twice as many Japanese as American respondents reported using avoidance as a means of dealing with a conflict of views, and three times as many Americans as Japanese reported attempting to use persuasion.

- Decision processes in boardrooms and executive councils in Japan are designed to avoid conflicts. Meetings often consist of nothing more than the ratification of consensus among members obtained by the leader prior to the meeting.

- Western educators often complain that their Asian students do not participate in class discussions and that they do not follow the requirements of rhetoric in their writings, for example: statement of principles and assumptions, derivations, hypotheses, evidence, argumentation, conclusion. Neither their culture nor their prior educational experience has prepared them for the canonical rhetoric forms that are taken for granted in the West (See

Tweed & Lehman (2000) for a review.)

- Galtung (1981) has described the intellectual styles of academics from different cultures. The Anglo-American style "fosters and encourages *debate* and *discourse...*and pluralism is an overriding value." (p. 823-824) In contrast, for the Japanese, "*the first rule would be not to harm pre-established social relations*" (p. 825).

Law and Contracts

- Although the ancient Chinese had a complex legal system, it was in general not codified in the way it was in the West (Logan, 1986). Today, courts of law are relatively rare in the East and there is a marked preference for solving conflicts on the basis of the particulars of a specific case and by negotiation through a middleman (Leung & Morris, in press).
- Easterners and Westerners have fundamentally different understandings of the nature of contracts. In the West, a contract is unalterable; in the East a contract is continually renegotiable in the light of changed circumstances (Hampden-Turner & Trompenaars, 1993). This drastic difference of view has often resulted in conflict and bitterness between Eastern and Western negotiators.

Religion

- Some scholars have contended that Christianity has far stronger theological concerns than other religions, finding it "necessary to formulate elaborately precise statements about the abstract qualities and relations of gods and humans" (Dyson, 1998, p. 8).
- Religions in East Asia have long been characterized by their interpenetrating and blending qualities. Societies and individuals readily incorporate aspects of several different religions into their worldviews. In contrast, for Christians, there is a strong tendency toward insistence on doctrinal purity. This sometimes results in religious wars in the West, a rarity in East Asia.

Language and Writing

Perhaps the most pervasive and important of all practices that operate to sustain the cognitive differences are those having to do with language and writing. Indeed, some scholars, notably Logan (1986) have tried to make the case that most of the cognitive differences we have discussed are due primarily to differences in language and writing systems.

- The basic writing system of Chinese and other East Asian languages has been essentially pictographic. It can be maintained that the Western alphabet is more atomistic and analytic by nature and "is a natural tool for classifying and served as a paradigm for codified law, scientific classification, and standardized weights and measures" (Logan, 1986, p. 55).
- The actual grammar of Indo-European languages encourages thinking of the world as being composed of atomistic building blocks whereas East Asian languages encourage thinking of the world as continuous and interpenentrating. "[R]ather than one-many, the Chinese language motivates a part-whole dichotomy" (Hansen, 1983, p. vii).
- East Asian languages are highly contextual in every sense. Because of their multiple meanings, words must be understood in the context of sentences. Because of the minimal nature of syntax in Sinitic languages, context is important to understanding sentences (Freeman & Habermann, 1996). In contrast, Heath (1982) has shown that language socialization for middle class American children quite deliberately decontextualizes language. Parents try to make words understandable independent of verbal context and utterances understandable independent of situational context.
- Although Western toddlers learn nouns (i.e., words referring to objects) at a much more rapid

rate than verbs (i.e., words referring to relationships), the reverse appears to be true for Chinese (Tardif, 1996) and Koreans (Choi & Gopnik, 1995). Moreover, Western toddlers hear more noun phrases from their mothers whereas East Asian children hear more verbs (Fernald & Morikawa, 1993; Tardif, Shatz, & Naigles, 1997).

- "Generic" noun phrases, that is, those referring to categories and kinds (e.g. "birds," "tools," as opposed to exemplars such as "sparrow," "hammer") are more common for English speakers than for Chinese speakers (Gelman & Tardif, 1998), perhaps because Western languages mark in a more explicit way whether a generic interpretation of an utterance is the correct one (Lucy, 1992).

- Consistent with the above findings about category usage, Ji and Nisbett (Ji, 2000; Ji & Nisbett, 2000) found that English-speaking Chinese used relationships more and categories less when they grouped words in Chinese than when they did so in English.

Thus there are some good reasons to believe that social practices and cognitive ones maintain each other in a state of equilibrium. Cognitive practices may be highly stable because of their embeddedness in larger systems of beliefs and social practices.

IMPLICATIONS FOR PSYCHOLOGY

Magnitude of Effects

The cognitive differences we have discussed vary in size, but it is important to note that many of them are unusually large, whether the standard is the magnitude of mean or proportion differences (often on the order of two or three to one or higher) or effect size (often well in excess of 1.00).

But in fact many of the differences we have reported are not merely large. The East Asians and the Americans responded in qualitatively different ways to the same stimulus situation in study after study we have reported here. For example, American participants showed large primacy effects in judgments about covariation whereas Chinese participants showed none. "Control" tended to increase the degree of covariation seen and the self-reported accuracy of Americans but tended to have the opposite effect on Chinese, and "control" increased the accuracy and confidence of American participants for the Rod and Frame test but had no effect for Chinese participants (Ji, et al., in press). Similarly, Cha and Nam (1985) and Norenzayan, Choi, and Nisbett (2000) found that Koreans were greatly influenced in their causal attributions by the sort of situational information that has no effect for Americans. Choi and Nisbett (in press) found that Koreans showed large hindsight bias effects under conditions where Americans showed none. Peng and Nisbett (1999) found that Americans responded to contradiction by polarizing their beliefs whereas Chinese responded by moderating their beliefs. Qualitative differences, with Americans responding in one way and East Asians in another, were found in other studies by Briley, et al. (1999), Choi & Nisbett (1998), Davis, et al. (2000), Norenzayan et al. (2000) and Peng and Nisbett (1999). These qualitative differences indicate that literally different cognitive processes are often invoked by East Asians and Westerners dealing with the same problem.

Universality

The assumption of universality of cognitive processes lies deep in the psychological tradition. We believe that the results discussed here force consideration of the possibility that an indefinitely large number of presumably "basic" cognitive processes may be highly malleable. When psychologists perform experiments on "categorization," "inductive inference," "logical reasoning," or "attributional processes," it does not normally occur to them that their data may

apply only rather locally, to people raised in a tradition of European culture. They are of course prepared for parameter differences, but parameter differences between populations on the order of three or four to one or more provide an occasion for wondering about universality. Qualitative differences between populations, it is no exaggeration to state, preempt any claim to universality – unless there is reason to believe that experimental procedures are not comparable across groups.

Just how great the cultural differences can be is unclear at this point, of course. Moreover, although we have looked at tasks measuring important perceptual and cognitive variables, we have no way of knowing what population these variables were selected from. It is possible that the particular variables we have examined exhibit cultural differences that are substantially greater than the differences that might be found in other tasks that are equally good measures of the conceptual variables. But it is equally if not more probable that investigators have not been uncannily insightful at this early stage of research and that there are variables and measures that would show even larger differences than the ones we have examined. Moreover, the participant populations, consisting mostly of college students, would be expected to be more similar to one another than to more representative members of their parent populations.

<div align="center">Fixedness of Cognitive Content</div>

It is ironic that, just as our evidence indicates that some cognitive *processes* are highly susceptible to cultural influence, other investigators are providing evidence that some cognitive *content* may not be very susceptible to cultural influence. Naïve theories of mechanics and physics (Baillargeon, 1995; Carey & Spelke, 1994; Leslie, 1982; Spelke, 1988; Spelke, 1990), naïve theories of biology (Atran, 1990; Atran, 1995; Berlin, 1992; Berlin, Breedlove, & Raven, 1973; Gelman, 1988) and naïve theory of mind (Asch, 1952; D'Andrade, 1987; Leslie, 1994; Wellman, 1990) appear so early, and are apparently so widespread, that it seems quite likely that at least some aspects of them are largely innate and resistant to social modification. Theories of causality, both highly general ones having to do with temporal sequence and spatial contiguity (Seligman, 1970), as well as highly specific ones such as the link that all omnivorous mammals are likely to make between distinctive-tasting food and gastrointestinal illness experienced many hours later (Garcia, McGowan, Ervin, & Koelling, 1968), are clearly a part of the organism's biologically-given cognitive equipment. Hirschfeld (1996) has argued that "essentialist" beliefs about the nature of the social world are universal and Sperber (1985) and Boyer (1993) have argued that even religious conceptions such as spirits and superhuman agents are remarkably similar from one culture to another. As Sperber (1996) has written, the human mind is equipped with a set of cognitive properties that make it easier or harder to think certain kinds of thoughts.

So it appears that the assumption that cognitive content is learned and indefinitely malleable and the assumption that cognitive processes are universally the same and biologically fixed may both be quite wrong. Some important content may be universal and part of our biologically-given equipment and some important processes may be highly alterable. While it is still the case that widely different social and intellectual traditions exist on the planet we have an opportunity to learn a great deal more about the fixedness and malleability of both content and process.

<div align="center">The Inseparability of Process and Content</div>

Our theoretical position is at the same time less radical and more radical than the assertion that basic processes differ across cultures. We are urging the view that metaphysics, epistemology, and cognitive processes exist in mutually dependent and reinforcing systems of

thought such that a given stimulus situation often triggers quite different processes in one culture than in another. Thus it is not possible to make a sharp distinction between cognitive process and cognitive content. Content in the form of metaphysical beliefs about the nature of the world determines tacit epistemology. Tacit epistemology in turn dictates the cognitive procedures that people use for solving particular problems.

People who believe that knowledge about objects is normally both necessary and sufficient for understanding their behavior will believe it is important to find the appropriate categories that apply to the object and the appropriate rules that apply to the categories. The search for categories and rules will dictate particular ways of organizing knowledge as well as procedures for obtaining new knowledge about rules. Such practices in turn are aided by a reliance on formal logic, including especially attention to the specter of contradiction which undermines beliefs about the validity of rules. Abstractions will be a goal because categories and rules will seem to be useful just to the extent that they have wide applicability and because it can be easier to apply formal logic to abstractions than to concrete objects.

Similar points can be made about people who believe that causality is a complex function of multiple factors operating on an object in a field. Complexity indicates dynamism and constant change. A belief in change and instability will tend to make the habits of categorization and search for universal rules about objects seem to be dubiously relevant. Rather, an attempt to see the interrelatedness of events will seem important. Contradiction will seem inevitable, since change is constant and opposing factors always coexist. A concern with concrete objects and events will seem to be more useful than a search for abstractions. Logic will not be allowed to overrule sensory experience or common sense.

Thus, without saying that Easterners are unable to make use of categorization or that Westerners are unable to detect covariation, we can see that the differences between cultures can still be very great. 1) The circumstances that prompt the use of one process vs. another will differ substantially across cultures; 2) the frequencies with which the very most basic cognitive processes are used will differ greatly; 3) consequently the degree and nature of expertise in the use of particular cognitive processes will differ; and 4) tacit or even explicit normative standards for thought will differ across cultures (Stich, 1990).

Claude Lévi-Strauss, the great French anthropologist, proposed that, in their attempts to solve the problems of daily life, people might be regarded as *bricoleurs*—handymen with their bags of cognitive tools. Pursuing this metaphor, we may say that even if all cultures possessed essentially the same basic cognitive processes as their tools, the tools of choice for the same problem may habitually be very different. People may differ markedly in their beliefs about whether a problem is one requiring use of a wrench vs. a pliers, in their skill in using the two types of tools, and in the location of particular tools at the top vs. the bottom of the tool kit. Moreover, members of different cultures may not see the same stimulus situation as a problem in need of repair. A seeming contradiction is a problem for Westerners but may not be for Easterners. Indeed, as some of the perceptual work we have reviewed indicates, the different focus of attention of Easterners and Westerners indicates that they may sometimes not be seeing the same stimulus situation at all – when even when their heads are immobilized at a fixed distance away from a computer screen.

Another way cognitive processes can differ across cultures is that cultures may construct composite cognitive tools out of the basic universal toolkit, thereby performing acts of elaborate cognitive engineering, as Dennett's (1995) characterization of culture as a "crane-making crane"

(p. 338) suggests. Modern statistical, methodological and cost-benefit rules provide examples of such crane-produced cranes. Nothing like them existed prior to the 17th century, when they were constructed in the West on the basis of rule-based empirical observation, mathematics and formal logic, and there is great variation among members of Western society today in the degree of understanding and use of these rules. Similar points may be made about the transformation of the ancient Chinese notions about *yin* and *yang* into more sophisticated dialectical notions about change, moderation, relativism, and the necessity of multiple viewpoints.

The psychological ideas that our position most closely resembles are those in the Vygotskian (1978; 1987) tradition (e.g., Cole, 1995; Cole & Scribner, 1974; Hutchins, 1995; Lave, 1988; Luria, 1931; Rogoff, 1990), which insists that thought always occurs in a pragmatic problem setting, including the cultural assumptions that are brought to the task. This view, recently referred to as the "situated cognition" view, has been defined by Resnick as the assumption that "the tools of thought…embody a culture's intellectual history….Tools have theories built into them, and users accept these theories—albeit unknowingly—when they use these tools"(Resnick, 1994, pp. 476-477).

The particular cognitive orientations we have been discussing have endured for millennia. One of the questions that intrigues us most concerns what it might take to seriously disturb the homeostasis of one of these historically-rooted systems of thought. It is not hard to introduce Westerners to cost-benefit rules; and these rules can affect their reasoning and their behavior and leave them fully accepted members of their communities. It is far from clear that it would be so easy to introduce East Asians to that rule system, that it would leave members who adopted the rule system so fully accepted by their communities, or that it would leave unscathed the socio-cognitive homeostasis of their societies if the rule system were to be widely adopted. There seems to be one quite interesting case of resistance to change of a homeostatic system. The introduction of the highly individualistic economic element of capitalism into Japan 130 years ago appears to have had far less effect on either social practices or, as our research indicates, cognitive processes, than might have been anticipated.

It is clear from some of the work summarized in this paper that Asians move radically in an American direction after a generation or less in the United States. But it might be a mistake to extrapolate from these facts and assume that would be an easy matter to teach one culture's tools to individuals in another without total immersion in that culture. It is far from clear that, using normal pedagogical techniques, Americans could be given many of the advantages of a dialectical stance or that East Asians could be taught to experience surprise at outcomes when surprise is warranted.

We hope we have persuaded the reader that the cognitive processes triggered by a given situation may not be so universal as generally supposed, or so divorced from content, or so independent of the particular character of thought that distinguishes one human group from another. Two decades ago, the senior author wrote a book with Lee Ross entitled, modestly, Human Inference. Roy D'Andrade, a distinguished cognitive anthropologist, read the book and pronounced it a "good ethnography." The author was shocked and dismayed. But we now wholeheartedly agree with D'Andrade's contention about the limits of research conducted in a single culture. Psychologists who choose not to do cross-cultural psychology may have chosen to be ethnographers instead.

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[1] We use the philosopher's term *metaphysics* rather than ontology, which is a more common term for psychologists to use to describe theories about the nature of the world, because we wish to convey concerns with very general notions about the nature of causality and reality, as well as the relationship between substance and attribute, and fact and value.

[2] We use the term *epistemology* to refer to people's theory of knowledge, including what counts as knowledge, the degree to which different kinds of knowledge are certain, and the presumed relation between the knower and the object that is known. This definition is probably congenial to both psychologists and philosophers.

[3] At any rate, the Chinese were not much interested in constructing rigorous classifications of a sort that could make possible scientific rule construction (Atran, 1995).

[4] Though we do not wish to imply that Eastern and Western societies have been marked continuously by the sorts of differences found in ancient times. The West during the Middle Ages was similar economically and socially to ancient China in many ways, and one would never characterize the feudal period as being notably individualistic. In contrast, in various periods in China, especially during the late 2nd century to the early 4th century AD, there were substantial strains of individualism (Yu, 1985). It was probably not until the late Medieval Period that the West began to return to levels of individualism characteristic of ancient Greece. Since that time, however, the West has continued on an ever more individualist trajectory while the East in general has not. It is also important to note that there are marked differences even today within both the societies that we are labeling collectivist and those that we are labeling individualist. While acknowledging these differences, we agree with the mainstream view of historians, ethnographers, sociologists and social psychologists that there are nonetheless broad and deep differences between East and West with respect to the collectivist-individualist dimension.

[5] Several studies compared the field dependence of East Asians and Westerners using Witkin's Embedded Figures Test (EFT), in which a small figure is shown to participants and they are then asked to find it in a larger, more complicated figure. Typically no difference is found or a slight difference is found favoring East Asians (Bagley, 1995; Huang & Chao, 1995). As Bagley (1995) has pointed out, however, this result is ambiguous, because the

figures used in the test resemble the characters in Chinese and other East Asian writing systems. In order to examine whether it was indeed writing systems that might be responsible for the lesser field dependence of East Asians examined using the EFT, Kühnen et al. (2000a) compared various Western populations with Malaysians, a highly collectivist East Asian population, who, however, have a Latin writing system. They found the Malaysians to be substantially more field dependent than any of the other three groups.

[6] (When shown only one hypothesis, Koreans and Americans regarded the "optimism" hypothesis as equally likely and the two groups also regarded the "realism" hypothesis as equally likely. Neither Americans nor Koreans expressed much surprise when the more plausible hypothesis replaced the less plausible one.)