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CHAPTER 2

Critical Biocultural Approaches in Medical Anthropology

*Tom Leatherman
and Alan H. Goodman*

INTRODUCTION

Human health and well being is biocultural. Thus, it might be expected that biocultural perspectives on health, ones that consider the many imbrications, linkages, and intersections between biology and culture, would occupy a central place in medical anthropology. Indeed, the notion that human health and illness are interwoven biocultural processes, best understood through a variety of humanistic and scientific perspectives, has status as a foundational principle. However, as dominant biomedical perspectives illuminated reductive biological mechanisms and explanations, medical anthropology increasingly became more focused on the often ignored and in our view equally important, socio-cultural and political aspects of health. The turn away from the biological is understandable, but also unfortunate.

In our current era of global capitalism, growing inequalities and poverty, and unacceptably high levels of strife, hunger, malnutrition, and disease, there is a need for research that links human biology and health to social, cultural and political-economic dynamics. Biocultural approaches in medical anthropology can potentially provide a fuller understanding of how large scale political-economic processes “get under the skin.” This chapter addresses biocultural approaches that have emerged over the past two decades that aim to enhance the focus on biology in critical medical anthropology. The goal of these efforts is not to reduce health and illness to biological terms and mechanisms; rather, it is to see human biology and health as inherently social and

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cultural. The question is not whether health is more biological or more cultural, but how health processes emerge and intersect as part of the "biocultural dance."

Most studies in the emerging arena of critical biocultural anthropology address the biological consequences of poverty and inequality. These approaches, in one way or the other, attempt to merge critical and political-economic perspectives with ecological and human adaptability perspectives, the latter having long dominated biocultural anthropology. Efforts to build such a synthetic bridge have taken several labels, including the "Biology of Poverty" (Thomas 1998), "Critical and Humanistic Biology" (Blakey 1998), "Political Ecology of Biology and Health" (Baer 1996; Leatherman 2005), and "Critical Biocultural Medical Anthropology" (Singer 1998, 1999; Goodman and Leatherman 1998; Leatherman 1996). We use the term "critical biocultural" to locate this work at the intersection of critical medical and biocultural health studies.

Many biocultural studies do not fully consider political-economic processes and relations of power and inequality (i.e., the critical side of critical biocultural). However, most all acknowledge the importance of these processes in shaping human biology and health. Thus while the goal of this chapter is to outline the history and debates and highlight a few contributions of a "critical biocultural" approach to medical anthropology, we cast our net broadly around a range of important contributions to medical anthropology emerging from biocultural studies. The following review is biased toward contributions from biological anthropologists, since they have historically been the champions of a biocultural perspective and since their contributions have been less noted within medical anthropology (Sobo 2011, this volume). We first outline the emergence of critical biocultural approaches within anthropological studies of health and then discuss their place in medical anthropology and public health. We then review key areas of current research, and potential new directions for critical biocultural approaches.

EMERGENCE OF A CRITICAL BIOCULTURAL APPROACH

Sobo (this volume) notes that medical anthropology has been dominated historically by two broad perspectives: the symbolic/interpretive and the materialist (ecological and political economic). In the 1970s, as medical anthropology was growing as a defined subdiscipline of anthropology, bioculturally oriented medical anthropologists employed an ecological model of disease. This model initially was derived from epidemiology and framed as the interaction of host, pathogen and environment (Armstrong et al. 1992). It was used to examine specific human-environment interactions where disease or other biological indicators of stress were evident (ranging from malaria to nutritional deficiency to psychosocial stress). It also served as a framework for examining the evolution of disease and disease processes in contemporary human populations, often in terms of epidemiological transitions (Armstrong et al. 2005). In the ecological model, the host could be an individual or a group, the environment was composed of social and cultural as well as climatic and bio-geographic conditions, and pathogens were broadened from micro-parasites to a wider category of insults such as physical violence, psychosocial stressors, and anthropogenic toxins and pollutants.

The promise of such an integrative model in medical anthropology, and similarly holistic ecological models, led many to believe that anthropology had achieved a theoretically

coherent integration of biological, ecological, and cultural domains (for a longer analysis see Goodman and Leatherman 1998). Yet, although medical ecological perspectives gained considerable acceptance, they only gained a "broad tacit consensus" (Landy 1983:187), and subsequently, such perspectives were found to be limited. Ecological models were critiqued for their closed systems, overly functionalist and homeostatic orientations, and explicit reliance on the biomedical models of disease. Singer (1989:223) sums up the critique from the critical medical perspective, stating "The flaws in medical ecology...arise ultimately from the failure to consider fully or accurately the role of social relations in the origin of health and illness."

At the same time that ecological models and the concept of adaptation were being reevaluated within cultural anthropology, critiques and reformulations were emerging from within evolutionary biology (Levins and Lewontin 1985) and biological anthropology (Armehagos et al. 1992; Goodman et al. 1988; Leatherman 1996; Thomas 1998). In the 1960s and early 1970s, human biologists were largely concerned with understanding adaptations to physical and biotic extremes. The initial assumption was that under stable, extreme conditions, human genetic adaptations would emerge and be identified by investigators. However, two decades of research showed that human populations exhibited many more developmental or ontogenetic responses than genetic responses to environmental stressors (Smith 1993). Thus, human adaptability and biological plasticity were recognized as the keys to understanding the adaptive process. It also became clear that groups living in challenging physical environments were often also living in social environments with limited access to means of production, wage work, political power, health care, and education. The resulting stressors with origins in relations of power, such as food insecurity and malnutrition, invariably had a greater impact on biology and health than did physical stressors such as high altitude and cold temperatures (e.g., Greksa 1986).

In the 1980s, the "small but healthy" debate brought into stark relief the theoretical and applied significance of how bodies were "read" and in particular the routine interpretation of small bodies as "adaptations" to low energy availability (Pelto and Pelto 1989:11). Developed by economist David Seklar (1981), the "small but healthy" hypothesis asserts that individuals that are short due to mild to moderate malnutrition (MMM) are nonetheless healthy and well-adapted, particularly to the circumstances of marginal food availability" (Pelto and Pelto, 1989:11). Hence, economic and food resources need not be directed at them but rather, focused on the few who are suffering from more severe forms of malnutrition. In response, Raynaldo Martorell (1989) argued that while smaller people require fewer calories, their "smallness" entailed substantial social, behavioral and biological costs and Pelto and Pelto (1989:14) conclude, "...the concept of a 'no-cost' adaptation makes virtually no sense." The "small but healthy" debate was key to many anthropologists' re-examination of the adaptation concept, and alerted many to the political implications of their science, in this specific case, whether or not millions of MMM Indian children would receive food aid.

The small but healthy debate is linked to a broader critique of the "adaptationist programme" (Levins and Lewontin 1985; also Singer 1989; Leatherman 1996). The program is characterized by circular reasoning, a tendency to see all responses either adaptive or maladaptive, failure to specify contexts and appropriate units of adaptive response, as well as a tendency to quit early by failing to follow adaptive response across multiple dimensions including costs of responses. Perhaps the greatest problem,

however, is the alienation of the human organism and environment, a vision of people passively responding to autonomous external environmental forces rather than recognizing their role in constructing the environments in which they operate (Lewontin 1995; Leatherman and Goodman 2005a).

Biocultural research in the 1990s increasingly became oriented toward documenting biological compromise or dysfunction in impoverished environments (as opposed to adaptations) and the biological impacts of social and economic change (Thomas 1998). Social environments took precedence over physical environments and measures of stressors expanded to include psychosocial stressors and their impact on health conditions such as hypertension and immune suppression (e.g., Blakey 1994; Dressler and Bindon 2000; Goodman et al. 1988; McDade 2002).

Yet, while it became relatively common to associate biological variation with some aspect of socio-economic variation, it was rare that the context or roots of the socio-economic variation were addressed. Similarly, research on "modernizing" populations documented how devastating such changes can be on human biology and health, but provided little or no information about processes of modernization (Bindon 1997). The socio-economic conditions, workloads, and environmental exposures that contribute to diminished health were conceptualized as *natural and even inevitable* aspects of changing environments, rather than contingent on history and social and economic relations.

Themes in a critical biocultural perspective

Beginning in the late 1980s, many biological and biocultural anthropologists turned from critiques of ecology and adaptation to working out models that could link social inequalities and human biology. These models lead to the emergence of critical biocultural medical anthropology, which we suggest offers new possibilities for anthropology generally and medical anthropology specifically. The following are some of the most salient themes (see also Goodman and Leatherman 1998). All but perhaps the last are clearly shared with critical medical anthropology. The last theme explicitly expands studies into the biological body.

Expanding geographic and historical scope In alignment with anthropological political economy and critical medical anthropology, the first fundamental theme of critical-biocultural approach is to *expand the geographic and historical scope of analysis* to examine how nations, communities, populations, and even viral pathways (Garrett 1994) are inextricably inter-connected at regional, national, and global levels. By paying attention to this theme, we come to see the role of historical processes in shaping local environments, social relations, and hence human-environment relationships and health. For example, the poor health of Haitian workers on Bateys associated with sugar cane estates in the Dominican Republic is clearly linked to conditions of abject poverty, limited occupational opportunities, unhygienic environments, and limited access to health care (Simmons 2002). These conditions are not just unfortunate realities but products of a history of colonialism in the 18th century Caribbean, conflicts between Haiti and the Dominican Republic during the 19th century, and more recent human rights and migration policies that deny equal rights and access to resources to Haitian workers (Mintz 1985; Martinez 1995; Simmons 2002). Here, we wish to

expand Wolf's (1983) effort to connect larger political economic processes from the cultures of "people without history" to their biologies as well. Understanding the roots of inequalities is a necessary first step toward posing solutions.

Relations of power and structural inequalities A second theme is a focus not just on wealth and poverty but also *on the power relations that structure inequalities in society*. Absolute poverty is clearly related to poor health outcomes, but perceived inequalities are equally significant (Wilkinson 1996; Sen 1992). African-American males have life expectancies on par with individuals living in parts of rural India and China (Sen 1992) and infant mortality rates in the USA are well above those of other wealthy nations. Structured inequalities along the socio-political axes of race, class and, gender shape living conditions, exposure to pathogens, access to health care and other resources – and hence differentials in health (Schultz and Mullings 2006). To understand why black babies in the USA are twice as likely to die in their first year as white babies one needs to consider the intersections of gender, race, and class, and what this means for housing, employment, work stress, psychosocial stress, diet, and health care. The idea here is to move beyond identifying health disparities to a clear understanding of the inequalities that shape inequalities and these can take many forms.

Critical reflections on knowledge production In addition to structuring lived experiences, power relations structure the production of knowledge. The third theme focuses on *critical reflections on science*, including the questions we ask, the methods and analyses we employ, the results we reach, how research is funded, and how it impacts peoples lives. If the social contexts of science and research are left unquestioned, then our subjectivities and assumptions are left unexamined. Often this has led to interpretations of inequality as inevitable and natural. A critical biocultural approach recognizes the inherent political dimensions of all research, whether explicit or implicit (e.g., political ramifications of the "small but healthy hypothesis"). Taking a critical perspective on scientific knowledge production, rather than being anti-scientific, as it is often portrayed, is a step towards a more reflective science.

Human agency A fourth theme is a greater attention to human agency in constructing environments and actively and creatively coping with problems and uncertainties, and thus shaping the contexts of their own lived experiences. The goal here is a focus on the interplay between "structure and agency," how social relations are constructed through human actions and simultaneously serve to structure those actions. To say that peoples' actions contribute to the social and environmental contexts of their everyday lives in no way seeks to focus blame on their lifestyle choices as the cause of their health problems. Rather, the idea is to understand how inequalities constrain agency and thus create contexts where the costs inherent in social and behavioral responses to stress are likely to be amplified. Humans experience, perceive, and respond to conditions of vulnerability in different ways, shaped by their social and cultural position. It is always appropriate to ask 'adaptive for whom' and in 'what context'; who gains and who loses. As Krieger (2001:674) comments, it is important to think "critically and systematically about intimate and integral connections between our social and biological existence – and, especially in the case of social production of disease and ecosocial theory, to name explicitly who benefits from and is accountable for social inequalities in health."

Cultures create biologies A final theme, elaborated below, is that critical biocultural approaches argue that in analyses seeking to capture the everyday realities of anthropological subjects, an *understanding of human biology and biological processes* can add a layer of information and viewpoint that is too often missed. Such analyses can reach below the skin to show how daily events, linked to political-economic processes, affect skinfold thicknesses, blood pressures, stress hormones, rates of parasitism and anemia, and cumulative fertility and mortality rates (see Dressler, this volume). Demonstrating these relationships often requires direct measures of biological status, and examinations of the biological processes linking local level experiences to biological outcomes. One arena in which we can see the focus on biology as illuminating processes of inequality is through enhanced understandings of the biological pathways involved in syndemics, the synergistic interaction of multiple diseases (or stressors) that amplify negative health consequences (Singer et al., this volume; Singer 2009; Singer and Clair 2003). The diseases that make up syndemics are often linked through pathways that connect in underlying conditions of poverty and structural inequalities.

CRITICAL BIOCULTURAL APPROACHES IN STUDIES OF HUMAN HEALTH

Points of articulation with medical anthropology and public health

Emphases on inequalities, power relations, and a critical examination of scientific inquiry align critical biocultural studies with critical medical anthropology. Tracing health inequalities upstream to the origins of inequalities is an essential starting point. However, critical biocultural approaches also broaden medical anthropology by seeking to consider evolutionary and ecological dynamics, prehistoric and historic as well as contemporary contexts, direct measures of human biology (often using biomarkers), and efforts to explicitly link the social and political to the biological; the specific mechanisms and processes through which inequalities get “under the skin” (Goodman 2006).

Interestingly, critical biocultural approaches in medical anthropology have much in common with developments in other disciplines, most notably the development of social epidemiological perspectives in public health as well as with critical perspectives in medical sociology and health geography (Cutchin 2007). They particularly share many features with Krieger’s (2001) “ecosocial” approach in social epidemiology. Krieger (2001) argues for a social epidemiology that focuses upstream toward those structured inequalities that shape health disparities, but also sees the need to develop rigorous methods for making direct links between inequalities, biology, and health.

Points of distinction

As noted in the previous discussion, biocultural approaches distinguish themselves from critical medical approaches by their emphasis on biological processes (sometimes but not always including evolution) and rigorous (often standardized) methodologies. In earlier publications we argued that biological anthropologists have been reluctant to embrace new theoretical directions, and we linked this to an adherence to ecological and evolutionary models (Goodman and Leatherman 1998; Leatherman and Goodman 2005a). We did not suggest a change in paradigms as evolution

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is particularly important to some biocultural studies. What we did advocate for is the creation of a greater space for alternative perspectives that have much to add to our understandings of the biological impacts of poverty and inequality. Armelagos and co-workers (2005), for example, have recently articulated an evolutionary perspective on health and disease framed within epidemiological transitions that includes attention to political-economic processes and health inequalities. Indeed many insights in critical biocultural approaches were derived from evolutionary biologists (Levins and Lewontin 1985).

New work is extending many of Lewontin's (1995) earlier observations on the organism's role in constructing niches (Oddling-Smee et al. 2003), and in advancing understandings of phenotypic plasticity as a lifelong interaction of the triple helix of genes, organism, and environments, and in some cases, how this triple helix contributes to health inequalities. We have long known about the ways environmental stress affects early growth and how diminished adult stature is associated with impaired function, morbidity, and life expectancy (e.g., Martorell 1989). Recent research has extended these understanding to include the entire life course beginning with fetal development (e.g., Leidy 1996; Worthman and Kohrt 2005; Hales and Barker 2001) and to the intersections of disease processes. Writing on syndemics, Singer (2009:55) states "Alterations of the emotions and mental health (owing to trauma or posttraumatic stress, for example), no less than physical diseases, can pave the way for other diseases to develop because our bodies *biologize emotional experience* (that is, transform it into bodily reactions and responses)." Attention to phenotypic plasticity and the developmental process through which individuals biologically internalize environmental experiences over their lives provides a means to begin specifying biological processes that link biology to life experience.

Biocultural anthropologists have used a diverse methodological tool kit which allows us to connect biology to cultural processes. Borrowing heavily from other fields, such measures include epidemiological, demographic, and nutritional assessment techniques, human energetics, and blood pressure, to more recent field assays of tissue levels of stress hormones, and immune function. What is particularly exciting is the growing ability to detect biological distress on the ground and early in the process.

Whether or not to "quantify" culture in similar ways is less clear and less developed, especially given the elusiveness of culture as an analytical category. Nevertheless, there are useful efforts at measuring components of shared culture and relating it to biology. Dressler (in this volume; 2005), for example, has developed measures of cultural consonance (degree to which individual's behavior approximate cultural prototypes). He and others have then related cultural consonance to health outcomes (using biomarkers) in a variety of projects such as on status inconsistency in Samoa (McDade 2002), on racial identity in Puerto Rico (Gravlee et al. 2005), and on culture and health in an African-American community in the southern USA (Dressler and Bindon 2000). Yet, while there are benefits to making dimensions of culture explicit, it is not necessary to quantify culture to make it central to biocultural analyses. What is important is to take culture seriously as it structures and is structured by human action, and to elicit the voices and perceptions of individuals with whom we work (Goodman 2006). Moreover, while standardized methodologies are common in biocultural studies, and of course in epidemiology as well, they can draw attention away from local

contexts and appropriateness of measures. Roseberry (1998), for example, argues that households and other common units of analysis may not be stable across cultures or over time. In short, among all the methods biocultural anthropologists employ, there is no escaping the basic work of doing ethnography.

Themes in critical biocultural research

Biocultural anthropologists have increasingly focused on the biomedical consequences of social and ecological vulnerability. Here we briefly discuss four themes in critical biocultural research: social inequalities and health; populations in transition; bio-psychological stress and response; the biological consequences of race and racism. These themes are neither the only ones we could choose nor are they mutually exclusive. Rather we, present them because they are illustrative of studies that go beyond standard measures of socio-economic status to study vulnerabilities along multiple axes that include race, gender, income, occupation, and access to health care.

Social inequalities, nutrition and health It is now well accepted that social inequalities underlay health disparities in a variety of contexts. It is also becoming clearer that inequalities are growing in contexts of globalization and present a major challenge to public health (Feachem 2000; Wilkinson 1996; Farmer 1999; Sen 1992; Kim et al. 2000; Janes and Korbett in this volume). Biocultural anthropologists have contributed to these observations over the past two decades through grounded research on the dialectical interactions among social inequalities, livelihoods, food security, nutrition, and illness.

In highland Peru, where much had been written on the biological impacts of high altitude environments (Baker and Little 1976), a research team in the early to mid-1980s investigated multiple dimensions of poverty, inequalities and health among small-scale farmers and herders (Thomas et al. 1988). This work illustrated how profound poverty and political marginalization resulting from centuries of exploitation, a failed agrarian reform, and the penetration of capitalist markets, were linked to diets, nutrition, health, coping capacity, and household production (Leatherman 1996, 2005). In short, social environments played a greater role than physical environments in human health. Poorer households with less secure access to land and few economic resources experienced worse nutrition and health and greater impacts of poor health on production and household livelihood. In this context, broad historical processes clearly shape social and economic vulnerabilities that lead to illness. As well, in conditions of constrained agency, illness furthers local conditions of vulnerability.

The FAO (2002) recently estimated that 840 million people in the world are undernourished and six million children under the age of five die each year from hunger. Thus, an important focus in critical biocultural studies has been to explore links between economic vulnerability, food security, diets and nutrition (see Himmelgreen and Romero-Daza, this volume). In an example from the global south, Panter-Brick and colleagues (2008b) recently examined multiple aspects of household livelihood and intra-familial malnutrition in Niger. They show how a host of structural and behavioral factors conspire to lead some children, but not others in the same family, to spiral down from mild to moderate to severe malnutrition. Families suffer from food insecurity especially when fathers migrated in search of work. Foods they could

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afford were of poor nutritional quality, families spent relatively large sums on malaria treatments, and children were weaned early due to a high premium on fertility or perceived inadequacy of breast milk. Their work shows both the necessity to consider many dimensions of class and culture to understand intra-household nutrition and also that development efforts must do more than provide basic access to food.

Links between poverty, hunger, and nutrition are also strongly implicated in the global obesity pandemic. Crooks' (1998) investigation of the relationships between poverty, diet, and obesity among poor families in Appalachia provide an example of the dynamics of these biocultural webs. Part of how poverty, diet and nutrition in Appalachia are linked is the consumption at home and in schools of caloric rich but nutrient poor foods. Home environments are linked to structures of parental work, perceptions about providing for the wants of their children, and child activity patterns. School environments offer the ready availability of caloric rich and nutrient poor snack foods because snack food concessions were one of the only sources of income for school-based extra-curricular activities in these impoverished counties. Thus, structures of poverty severely limit options for meeting personal, social, parental, and dietary goals and needs, and the result is the now global association between poverty and obesity.

Populations in transition A deeper appreciation of history makes clear that humans are invariably in transition – from prehistoric shifts in foraging to food production to conquest and colonization, integration into capitalist economies, and tourism. Armelagos and colleagues (2005) frame the health consequences in terms of epidemiological transitions in disease patterns resulting from evolutionary, historical, and political-economic processes associated with social change. The first important social context of the epidemiological transition denotes shifts from foraging to food production, and entails substantial ecological impacts, reduced dietary diversity, and impaired nutrition and health. Goodman (1998) argues that political hierarchies and resource extraction from the peripheries to the center of precapitalist social formations played a key role in declining health in rural areas.

Colonization has had obvious health impacts through transmission of new diseases into previously unexposed populations, and the exploitation of environmental resources and labor. A well known case in point is the decimation of native populations in the Americas. Using historic records and modern epidemiological health surveys, Santos and Coimbra (1998) have researched the health effects of colonization on indigenous populations in Brazil through a series of historical events from initial contacts, to various economic booms and busts (rubber and timber), to more recent migrations of settlers into the Amazon. Their research and the extensive literature examining the biology of populations drawn into western ideologies and capitalist relations of production and consumption, for the most part, point to the damaging health effects of these transitions often glossed as "modernization." Yet, it is clear that transitions to market based economies can have negative, positive, and uneven effects on health (Leatherman 1994; Kennedy 1994; Dewey 1989; Peltó and Peltó 1983). This unevenness in the effects of markets on health and well being provides the rationale of a recent and extensive multidisciplinary biocultural investigation in medical anthropology: the Tsimane' Amazonian Panel Study (Leonard and Godoy 2008).

Tourism is a relatively new but increasingly common form of economic development. Like other forms of capitalist development, tourism can have uneven impacts on the economics, culture, nutrition and health of local groups. Recent research in the Yucatan of Mexico (Pi-Sunyer and Thomas 1997; Leatherman and Goodman 2005b) has demonstrated the impacts of tourism on the social life, economy, identity, and diets of Mayan communities drawn into the tourist economy. One aspect of this research has focused on dietary change commensurate with the commoditization of food systems and increased consumption of processed foods and 'junk' foods (Leatherman and Goodman 2005). Mexico is a leader in per-capita consumption of soft drinks, and poor children in Mayan communities may take in 20% of their calories through soft drinks and snack foods. Micro-nutrient deficiencies are evident in the diets of individuals with uneven access to secure jobs or sufficient land and labor to meet food needs through agricultural production. A pattern of undernourished and stunted children and overweight adults is emerging in these communities, which fits the pattern of emergent obesity and diabetes found in more urbanized areas of the Yucatan and elsewhere in the developing world.

Bio-psychological responses to stress Since the early 1980s, biocultural anthropologists have focused on psychosocial stress as a pathway to link lived experiences to biology (Goodman et al. 1988). The stress perspective can be traced to the pioneering work of Hans Selye (1956) on the activation of adrenal cortical and medullary stress hormone pathway. Stressors can include an excess or dearth of stimuli, and range from noise, to hunger, to traumatic events, to frustrations and concerns over a host of lived experiences. Also, perception of stress is critical to physiological response. As well, the physiological pathways between stressful stimuli and biological responses are linked to a wide variety of health conditions, and studying these pathways can contribute to broad preventative efforts. Thus the stress perspective links culture, psychology, and political economy to a broad range of health conditions through specific physiological pathways and biological processes.

Biocultural anthropologists are now developing new methods for measuring stress responses in the field. Research has included a focus on stressful life events, social supports, and cultural consonance (Dressler 2005), status inconsistency (McDade 2002), war-related trauma (Panter-Brick et al. 2008a), and food insecurity (Hadley et al. 2008). Psychosocial stressors are then related to a series of biological outcomes such as child growth, blood pressure, cardiovascular disease, and more recently directly to stress hormones (e.g., salivary steroids) and immune function (e.g., EBV antibody level). A recent volume, *Measuring Stress in Humans*, by Ice and James (2007) provides an excellent overview of a wide range of uses in measuring stress, via catecholamines, cortisol, blood pressure, and immune function measurements. The "anthropological trick" is to not only bring these methods to the field but to connect these specific mechanisms to the larger ideological and political systems in which we live. For example, in the next section we note that racist acts (as stress events) are specific and content dependent, but are also connected in meaning and structure to broader historical and social system.

Panter-Brick and colleagues have conducted research on stress in contexts where these larger political, economic, and ideological systems are starkly evident, including among street children in Nepal (Panter-Brick 2002) and in war-torn Afghanistan

(Panter-Brick et al. 2008a). Their work in Afghanistan illustrates the sort of findings emerging from many settings of conflict, where stressors are often unevenly felt and in not entirely predictable ways. In contexts of war, political insecurity, and household and family vulnerability, they found that mental distress, prevalence of psychiatric disorders and biomarkers of stress (blood pressure and Epstein-Barr virus) were most prevalent among women and girls (i.e., significant gender differences were evident), but mapped more closely onto familial contexts and cultural prescriptions in Afghan society than to economic distress or exposure to war-related stressful events.

Critical perspectives on race and racism Biological anthropologists have been at the forefront of questioning the naturalization of the idea of race (Blakey 1998). It is now widely accepted that race is not in our genes but rather, race becomes biological through discourses and practices. A key aspect of this work is a critical evaluation of how race is used in medical practice, specifically a systemic critique of the explanation of health differences by race as due to racial differences in genetics (Goodman 2000). As many have noted, "blaming" race-based health inequalities on genetics might work to maintain these inequalities by shifting attention away from structures of inequality and their effects on health. For example, the rise in diabetes among some Native Americans groups is often thought to be due to a genetic predisposition (Weiss et al. 1984). However, the contemporary variation in diabetes rates among Native North American groups is great, the rise in diabetes rates is a relatively recent phenomenon (Young 1994), and other groups experiencing similar shifts in diet and physical activity have experienced similar increases in the diabetes and related diseases. The diabetes pandemic provides an example of how large scale political economic change impacts local culture and ecology, in particular changing diets, activity patterns and sense of culture, and these then reach under the skin to increased insulin resistance, obesity, and diabetes.

Racism is both a powerful psychosocial stress and a structural inequality. Social epidemiologists have recently developed a number of interview and questionnaires that assess recent acts and perceptions of racism, racial discrimination, and racial harassment (Karlsen and Nazoo (2008) provide an excellent summary of this literature). In general, epidemiologists attempt to develop methods that work in a wide variety of contexts, but the context of gestures and actions is extremely important. As well, most measures of racism focus on interpersonal issues and miss connections to the historic and structural features of the political-economy of racism. Recently, medical anthropologists working with critical biocultural perspectives have begun to address some of the inadequacies in these approaches in exploring how the lived experience of race and racism might lead to health differences. For example, Dressler and Bindon (2000) have linked the realities of being African-American in the southern USA to cultural consonance, or the ability of individuals to approximate in their own behavior the shared cultural models of their society. Lack of consonance was associated with elevated blood pressure. In the end, they note that the inability to achieve the perceived goals associated with local cultural models might be anticipated for African-Americans in racist societies where frequent unemployment, low wages, and poor living conditions are part of the lived experience for many. Gravlee and co-workers (2005) begin with an ethnographic understanding of the meaning of skin color in

Puerto Rico, and demonstrate how those local meanings mediated experiences of racism and stress in specific local contexts; connecting social categories of race/color with socioeconomic status incongruities and blood pressure. These analyses offer a social, cultural, and environmentally based explanation for the racial variation in blood pressure found in much medical and public health research.

NEW DIRECTIONS

As critical biocultural anthropologists increasingly integrate anthropological political-economic perspectives into their research, they may continue to develop by drawing upon new theoretical developments. As a start, notions of structural violence (Farmer 2004; see also Briggs and Briggs 2003; Briggs, this volume) and biological citizenship (Petryna 2005) might be useful. These two concepts are gaining wide currency in medical anthropology, but are as of yet underutilized in biocultural approaches.

Structural violence

The work of the physician-anthropologist Paul Farmer stands out as an exemplary model for a critical biocultural medical anthropology in that his work combines rich history, political economy, and assessments of health while also putting people's experiences, stories, and words in the foreground. In *AIDS and Accusation* (1992), Farmer links the epidemiology of HIV/AIDS and stories of personal suffering to local level conditions of extreme vulnerability, framed within the political-economic history of Haiti and in USA discourses on Haiti as the source for HIV/AIDS.

His framing of dimensions of vulnerability using the concept of structural violence (Farmer 2004) has resonated widely in medical anthropology, and might be particularly useful for biocultural anthropologists. Structural violence attempts to capture the extremes of poverty and social and political marginalization, often expressed along axes of race, class, and gender, and how these deny access to resources, constrain agency, and limit human potential. Structural violence is embedded in ubiquitous social structures and normalized by stable institutions and regular experience. This *normalization* and *regularization* often renders it invisible and silent, part of the social machinery of oppression (Farmer 2004:307).

Within a critical biocultural approach to health, structural violence denotes the ways inequalities promote malnutrition and disease, and increase the vulnerabilities to their effects. It can manifest as chronic hunger and poverty, pollution and environmental degradation, military and police brutality, and unequal and inadequate housing, education, and health care. Farmer (2004) specifies that an analysis of structural violence and health must combine history, political economy, and biology. Too often, one or more of these key features is erased or ignored; and this limits our ability to explain the causes of malnutrition, disease, and other *biological outcomes of social processes*. For biological anthropologists working with a biocultural perspective and used to measuring biology and local environments, this approach suggests further the need to pay more attention to history and political economy.

Biocultural studies of conflict and violence Given that structural violence shapes the ways inequalities promote malnutrition and disease, and increase the vulnerabilities to their effects, it is also often a precursor to direct violence; as political violence of the state or interpersonal violence of everyday life (Bourgois 2001). Thus, it can be particularly useful in thinking about the health costs of armed conflict and other forms of violence. The anthropology of violence is a growing theme in socio-cultural anthropology but relative new and unexplored within critical biocultural approaches. Nevertheless, biocultural anthropologists are beginning to study the social, psychosocial, and biological consequences of conflict and violence. The work of Panter-Brick and colleagues (2008a) has already been mentioned. In studies of historic and prehistoric groups, Michael Blakey (2001) and Debra Martin (2008) show how biological signatures of structural violence made be read from skeletons. In Martin's (2008) case study from the La Plata River (AD 200–1300) in northwest New Mexico, she documents the effects of forced captivity especially among women and children, and situates this analysis within a broad biocultural framework to examine the political-economic factors that maintain and perpetuate violence.

Leatherman and Thomas (2008) have used structural violence as a framing concept to examine the real and potential impacts of the 20 year civil war between *Sendero Luminoso* and the Peruvian state on the lives and livelihood of Andean communities in southern Peru. The roots of armed conflicts and violence are found in the inequalities born of structural violence, and the consequences on health and health systems have both immediate and long-term consequences. Thus, one goal of ongoing work on the costs of conflict in the Andes (Leatherman and Thomas 2008) was to identify the conditions of structural violence that led to the political violence of civil war, and how the impacts of conflict might serve to reinforce and transform patterns of structural violence currently affecting highland populations. Precursors to revolution included severe poverty, political marginalization, racism, and poor health, all of which are rooted in a history of conquest and colonization, in post-colonial exploitation of rural producers by the landed oligarchy, and the intense frustration of a failed agrarian reform, topped off in the 1980s by a catastrophic economic crisis. The impacts included severe food insecurity, fear, psychosocial trauma, mistrust, and disrupted social relations that persist today and will likely continue to affect future livelihood strategies that were historically based in part on patterns of social cooperation and reciprocity. Yet these large scale changes were uneven in how they got under the skin: some individuals showed great resilience and others heightened vulnerability. The civil war also influenced major – and uneven – shifts in land tenure and political power, which in some ways have served to benefit local indigenous peoples. Thus, these impacts have subtly shifted the very nature of inequality, marginality, and vulnerability in the region.

Biological citizenship

The notion of biological citizenship is even less developed in biocultural studies but has obvious points of articulation with critical biocultural anthropologies. Rose and Novas (2005) describe biological citizenship as encompassing all citizenship projects that link conceptions of citizens to beliefs about their biology. In other words, it refers to the way biological presuppositions explicitly or implicitly structure the discourses

and practices of individuals and authorities. The examples are many, and there are obvious ways these ideas resonate with critical perspectives on racialized biologies. However, current uses of the concept tend to go beyond racialization and include myriad ways that groups may shape their own identity based on biology and use this identity to advocate for rights, resources, and even research (in the case of genetic disorders).

One example of biological citizenship is provided by the work of Adriana Petryna (2005) on the aftermath of the 1986 disaster at the Chernobyl power plant. She describes how in the Ukraine, where democratization (following the dissolution of the USSR) was linked to a harsh market transition, that the injured biology of a population became the basis for social membership and staking claims to citizenship. The individuals who suffered the ill consequences of radiation exposure, or who believed that they suffered from exposure, asserted their rights to health services and social support from the state in the "name of their damaged biological bodies." Because of ambiguities in the science of exposure and categorization of suffering, whole new dynamics of science and politics emerged with very real effects on population welfare.

On a broader level, advocacy around specific diseases based on biological citizenship is increasingly common and is part of the terrain of scientific research. The collective advocacy around HIV/AIDS provides one of the best examples. We might also think about future collectives – war veterans returning with brain damage from Iraq, or groups organizing around threats to their biology from environmental contamination. Such acts of biological citizenship would seem to provide particularly rich avenues for critical biocultural research; research that demands a thorough knowledge and integration of biology and culture.

Today, individuals and whole populations are valued for their genes, ranging from people afflicted with a recognized genetic disorder, to those considered more isolated or "native", to Icelanders who sold rights to their genomes. They use their positions to advocate for research, to become partners in research, and in the case of the Human Genome Diversity Project, to assert property rights over their own genetic material and deny scientists access to their genome. As new reproductive technologies allow ever earlier detection of many genetic variations and personal genomes become more affordable, an age of "flexible eugenics" (Taussig et al. 1998) is emerging. We can expect new debates over what is genetically normal, over reproductive rights, and over the use of biotechnology to modify bodies. These are issues to which critical biocultural approaches are aptly suited and ones likely to draw some critical biocultural anthropologists into new collaborations.

CONCLUSIONS

Biocultural approaches in medical anthropology have at times occupied center stage and at times have sat on the intellectual periphery. In the later half of the 20th century a "chasm" developed between biological and culture perspectives in anthropology and this was nowhere more evident than in medical anthropology. Yet, there is no escaping that human health – the focus of medical anthropology – is quintessentially a biocultural phenomenon. The question ought not to be whether to engage with biology, rather, it ought to focus us on how biocultural approaches might best enhance

our understanding of biology and health in social and cultural contexts. We argue here for approaches we have termed critical biocultural that lie at the intersection of critical medical and biocultural studies of health. Like Farmer's (2004) anthropology of structural violence, or Baer and Singer's (2009) examination of the political ecology of global warming, critical biocultural approaches link human biology and health to social inequalities by drawing together large scale political-economy processes, culture, and biology. They begin with an explicit recognition that health disparities emerge from social inequalities, and that efforts to specify the source and nature of those inequalities is a critical task of medical anthropology. The sources of inequalities, whether they link to political oppression, poor access to markets, structured barriers to land ownership, or failed education and health care systems, are not trivial. The root causes of poverty or inequality shape the forms they take, discourses and practices, efforts to alleviate the problem, and these are all key to a more complete and "critical" biocultural approach in medical anthropology.

We are optimistic that such critical approaches can help bridge the divide between biology and culture in medical anthropology. Indeed, steps toward rapprochement between biocultural and critical medical anthropologies are well underway (see Baer 1996; Morsy 1996; also Singer 1998, 1999). The emergence of political ecology as a cross-disciplinary effort (e.g., in geography, anthropology, history, feminist theory, sociology, etc.) toward a "novel reformulation of the relationship between society and nature, humans and environment, biology and history" (Hvalkof and Escobar 1998:425) has helped make a "political-ecology of health" central in medical anthropology; a political ecology of biology and health is yet another way of framing critical biocultural approaches (Leatherman 2005).

The global health problems we face now and in the future are endless, but as Richard Feachem (2000) stated in the first issues of the *Bulletin of the World Health Organization* for the 21st century, addressing the health consequences of social inequalities is the most important global health task for the 21st century. We need a full range of anthropological perspectives to meet this task, and biocultural perspectives are particularly important for specifying the biological as well as social dimensions linking inequalities and health. Addressing these issues will call on us to expand our perspectives in new directions and build new collaboration across disciplines. Two examples of ways to extend biocultural perspectives into discussions of structural violence and biological citizenship were offered here. These are but two of many potential directions critical biocultural research could take. The key is how to apply these and other perspectives in new ways that enhance understandings and promote improvements in human health. Indeed, "integrating biological and socio-cultural perspectives in concrete and project oriented situations" (Hvalkof and Escobar 1998:443) may be the best means of achieving a biocultural synthesis.

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