Evolutionary Medicine: An Overview

Wenda R. Trevathan

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The author is professor in the department of anthropology, The University of Texas at Austin. He took his doctorate at the University of Chicago in 1959 and has long experience of fieldwork in the Middle East and the Arab world, especially with peasant societies.

This guest editorial is based on his response to a number of papers presented on 30 November last at a session of the 1994 Annual Meeting of the American Anthropological Association in Atlanta, entitled 'Ethnography in the muddle: Does the Middle East still exist?', organized by Daniel Varisco and Jon W. Anderson. This session was designed to consider whether recent deconstruction of anthropologists' acts and writings, including the critique of the 'Middle East' as a colonialist imposition, is compromising to the legitimacy of a regional or culture-area approach. 'Who are the "middles" in the Middle East', the organizers asked, 'whose local transformations trace regional dimensions of translocal networks and cultural traditions?' One paper delivered in the session, Andrew J. Shryock's 'Writing oral history in tribal Jordan', will be published shortly in A.T.

pline, constructing a view of the Other which was problematized according to the changing paradigms of anthropological theory. But old anthropological paradigms are rarely of interest to new historians; they are interested in our 'facts'.

However, that is not the whole story. I have done fieldwork in five Middle Eastern settings. All of it addressed whatever seemed most important to me in trying to understand the way things appeared to be. In a couple of cases (Iraq in the late 50s and Afghanistan), this involved the social consequences surrounding the distribution of land and water; in Hail, I became concerned with the emergence of class differences based on the ownership of pickups and water-trucks; in Marrakesh, it was the production and organization of meaning in the market which attracted my attention; in Nubia in the mid 60s it was salvage ethnography, a race to describe what was soon to disappear with forced resettlement. There was what now seems an innocence in these studies, a belief in realities and a search for truth, a faith in the reliability of my own experience. I look at my past publications with a degree of embarrassment. But it doesn't matter. Texts will be caught up and used and re-used, set on independent paths.

But the issue is more complex than this, since it is becoming increasingly clear that the transnational character of late capitalism has also created a transcultural world of common knowledge in which the ethnography is important symbolic capital. This knowledge is being drawn upon by our subjects, by descendants of the people we have written about. Many Iraqi and Nubians and Moroccans regard my own and my wife Elizabeth Fernea's books as part of their pasts, using them as sources for the way things were, markers of the changes in the way things are now. This is not simply a matter of nostalgia, but a sign of catastrophe. Most of the communities I once tried to describe have been destroyed in whole or in part by traumatic events since I left. Forced resettlement, which I knew about, but also civil war, foreign invasions, sky-rocketing population growth and urbanization have all resulted in far more radical changes in the circumstances of my Middle Eastern friends' lives than has been the case in my own or those of my children. When I learnt to think about process and change, disaster was not part of the picture, but many of the people I knew in Iraq and Afghanistan have been killed, their homes destroyed, their economies ruined. An Afghan friend from Taw Burriyan tells me I must publish a long neglected monograph about his village: it is all that is left of it.

Some ethnographers of the Middle East emphasize the strength of local orality which can contest the Word of the State or the mullah; others argue that the anthropology of a literate culture can only hold its own with other disciplines if it takes seriously the analysis of texts. But in whatever form, ethnography becomes part of a history, evidence about the past in printed form which is a source, a documentation for others. We may choose to historicize or we may remain concentrated on the present, but in either case we do not have the last word now. In the end, it is historians who will use us; but, as the selective literacy and cosmopolitanism of late capitalism include tribesmen and villagers, their past – as locally understood, as conversationally processed, as discussed over coffee, on the way to the fields, in factories and shops – will also appropriate our ethnographic texts. Fikri, my Nubian friend who lives in the Egyptian settlement, possesses practically everything written about the Nubians and uses his information in discussions with his friends. I was amazed when I returned after thirty years to find how much history had been learned, parts of history which ties them to the kingdom of Kush, to a time when Egypt was ruled by black people like themselves, as well as to their contemporary cousins in Sudan, Ethiopia and America. As they gain strength as a minority in Egypt, books about themselves are becoming symbolic of their difference from other Egyptians; the printed text slips into local consciousness critically, selectively and is used to fight cultural and political domination by the majority.

Handing a group of people a book about themselves may be presumptuous, but it is also a form of recognition, a token of esteem in most cases, a basis for cogitation even if it is wrong in particulars or in general according to local discussion. In the event that disaster strikes, it leaves something behind for survivors to gather up and re-use. So it's time to get back to the Afghan ethnography. □

Robert A. Fernea

Evolutionary medicine: an overview

WENDA R. TREVATHAN

Wenda Trevathan is an associate professor of anthropology at New Mexico State University. Her research focuses on the evolution of behaviour related to reproduction in human females. She is the author of Human Birth: An Evolutionary Perspective *and is currently working on an edited volume on evolutionary medicine.*

Evolutionary medicine has been described as the 'newest perspective to emerge out of biological and medical anthropology' (Martin 1993). Perhaps this is true on the surface, but to a large extent, it is simply a new label or 'packaging' for what many biological anthropologists have been doing since the founding of the discipline. If there is anything 'new' in the approach of evolutionary medicine, it is its goal of developing applications of this approach for use in clinical practice.

To highlight the contributions of anthropologists and physicians to this 'new' field of evolutionary medicine, anthropologists Jim McKenna and Neal Smith organized a session at the American Association for the Advancement of Science (AAAS) in February 1993. Topics presented with the evolutionary medicine perspective included Sudden Infant Death Syndrome or SIDS, neonatal jaundice, infant colic, timing of puberty, obstetric care, congestive heart failure, cancers related to women's reproductive systems, and psychiatric disorders.[1] There was a great deal of enthusiasm from the press for the ideas discussed in the AAAS session and it was estimated that articles written by the press attending the session reached as many as 35 million readers and appeared in such publications as *The Economist*, *San Francisco Chronicle*, *Newsweek* and the *Journal of the American Medical Association*. As a way of furthering the development of this field, and with hopes of encouraging more anthropologists to consider evolutionary medicine in their work, Jim McKenna and I organized a session at the American Anthropological

1. Participants and paper titles presented at the AAAS meeting include Barr, R.G., 'Crying and Colic: Adaptive Behavior, Clinical Syndrome, or Both?'; Brett, J. and S. Niermeyer, 'Neonatal Jaundice: A Disorder of Transition or Adaptive Process?'; Eaton, S.B., 'Women's Reproductive Cancers in Evolutionary Context'; Konner, M., 'The Logic of Evolutionary Medicine'; McKenna, J.J., 'SIDS and Infant Sleep: An Evolutionary Experiment'; Nesse, R.M., 'Evolutionary Psychiatry'; Smith, E.O., 'Evolutionary Paradigm in Medicine'; Trevathan, W.R., 'Evolutionary Obstetrics'; Weil, E.J., 'Evolutionary Selection for Salt and Water Retention: Implications for CHF'; and Worthman, C.M., 'The Company They Keep: Sex Differences in Maturational Timing'.

Association (AAA) in November 1993 which featured many of the same topics.

What is 'evolutionary medicine'?

In its current definition, evolutionary medicine (or 'Darwinian medicine' in some accounts – see Williams and Nesse 1991) is the view that many contemporary social, psychological and physical ills can be related to an incompatibility between the lifestyles and environments in which humans currently live and the conditions under which human biology evolved. Related to this is the concern that modern medical practice demonstrates a misunderstanding of the evolution of physical responses to stresses that were faced by our ancestors.

Evolutionary medicine proposes that medical research and clinical treatment consider not only the proximate or direct causes of disease and disorders, but the ultimate causes or explanations as well. Ultimate causes are those which have been shaped by evolutionary forces, primarily natural selection, as humans and the organisms that live with and infect them have evolved over the last several million years. In other words, the patient that seeks medical attention for an illness or disorder should be viewed not only as an individual with a unique developmental history, but also as a member of the human species with its unique phylogenetic history.

An obvious example is provided by considering the infectious organisms that inflict humans. Whether an individual gets ill as a result of contact with an infectious agent and how much he or she suffers from the illness depends on a number of factors, including his or her state of health at the time of contact, the degree of exposure, the virulence of the particular organism and whether or not he or she seeks medical treatment. These are proximate causes of the illness. Life history, or ontogenetic factors, also provide insight into how the illness proceeds. For example, previous exposure may result in immunity to the organism, or it may mean increased pathological response. Medical resources available and socioeconomic circumstances are life history factors that affect the disease process as well. Proponents of evolutionary medicine will argue, however, that consideration of the health history of the patient and his or her family, and the proximate causes of the illness, may not always be sufficient for deciding a course of treatment. They argue that the evolutionary history of the human species, and its co-evolutionary history with the pathogen, must also be considered.

Pathogens and their human hosts are subject to the same rules in the game of evolution: the individuals who get the most genes into succeeding generations 'win' the game. How they play the game depends on more factors than can be considered here, but often the result is 'co-adaptation' so that both host and pathogen survive and coexist. Another common result is that the host will evolve defences against the pathogen so that it is killed or its virulence is reduced. Two often cited examples of host defences against pathogens are elevated body temperature and decreased blood haemoglobin levels in response to infection. Elevated temperature helps to mobilize white blood cells to fight viral infection and inhibit growth of many bacteria. In most medical practices, however, elevated body temperature is seen as a pathological condition and is traditionally treated with analgesics to eliminate the fever. In a similar way, iron levels in the blood drop with many illnesses. The evolutionary perspective is that this is an evolved response whereby iron is sequestered in the liver to withhold a nutrient essential for the survival and replication of many bacteria and parasites (Weinberg 1984). A common medical solution to lowered haemoglobin levels with illness is to provide iron supplements. Recommended 'treatment' from the evolutionary medicine perspective might be to allow the elevated body temperature to work its defence unless the temperature becomes excessive and to refrain from supplementing a patient with iron unless the levels fall dangerously low (Williams and Nesse 1991).

Influencing the evolution of pathological organisms is another avenue that evolutionary medical research might take. There are a number of examples of once virulent organisms having evolved into less virulent forms. Scarlet fever, for example, was one of the leading causes of death of children in the last century. Although improved medical treatment is often given credit for its decreased effect, it is more likely that the bacterium has evolved to a more benign strain for unknown reasons (Dubos 1965). Paul Ewald (1994) has suggested that one goal of medical research might be to direct the evolution of some organisms from dangerous to more benign states, rather than try to eliminate them altogether, a more expensive goal and less likely to be achieved. He cites recent evidence that water purification has diminished the harmfulness of some diarrhoeal bacteria, but notes that decreased severity per infection is not given as much value as decreased incidence when funding for water purification programmes is considered.

Approaches to evolutionary medicine

In reviewing the literature on evolutionary medicine, I see three general approaches that this perspective offers to physicians in clinical practice and to people afflicted with the disorders that are considered. The first argues that some states that are perceived as abnormal or pathological are actually adaptive responses of the human body to stress in one form or another. One recommended medical approach to these phenomena is to recognize the functions and eschew treatment unless certain parameters of tolerance are exceeded. Elevated body temperature and lowered iron levels cited above are examples of this approach. Other examples are sleep difficulties which often appear in the elderly. In many cases, awakenings and arousals may be appropriate and useful responses to cardiac and respiratory problems. Consideration of the adaptive significance of the awakenings suggests that powerful sleep medications may be contraindicated in some cases.

Also consider that the healthy female body responds to food stress, failing health and normal ageing by inhibiting ovulation when conditions for pregnancy are not optimal. Wasser (1990) argues that reproductive failure in many instances may be evolved responses to temporary or permanent conditions not conducive to reproduction. Thus, amenorrhoea in athletes, in women who are ill and in women over age 50 can be seen, in many cases, as adaptive responses rather than indicative of illness or other pathology. Treatment of these interruptions or cessations of reproductive functioning with hormone therapy may be warranted in only a few cases, rather than being routinely administered to all amenorrhoeic and postmenopausal women.

Margie Profet (1988) suggests that nausea during the first trimester of pregnancy may have evolved because it led women to avoid consuming foods that are potentially harmful to the developing foetus at a particularly vulnerable time. The evolutionary medicine approach would encourage tolerance of this condition unless it becomes life-threatening. Similar recommendations

might be warranted for some allergic responses. Profet views these as ways in which a body warns one about ingestion of or exposure to a potential toxin (Profet 1988).

Anthropologist John Brett and neonatologist Susan Niermeyer suggest that, in a similar way, nonhaemolytic hyperbilirubinaemia in the healthy full-term human neonate is more often an adaptive response to the stresses of transition to extrauterine life than an indicator of underlying pathology requiring treatment (Brett and Niermeyer 1990). The jaundice that results from hyperbilirubinaemia is often seen as pathological in medical practice and treatment to reduce bilirubin levels is usually recommended. Brett and Niermeyer, noting that elevated bilirubin is not only common in human neonates but in those of other mammalian species as well, argue that bilirubin functions as an antioxidant and is particularly important immediately after birth when antioxidant enzyme systems are not yet fully mature in the neonate. The evolutionary perspective is that nonhaemolytic hyperbilirubinaemia has evolved as a mechanism to assist in adaptation to extrauterine life, and to interfere with that mechanism may be ill advised. The authors are quick to point out that hyperbilirubinaemia resulting from, for example, *erythroblastosis foetalis*, may appropriately be seen as pathological, but that elevated bilirubin levels in the absence of any other sign of disease should not routinely be viewed as abnormal.

Twentieth-century lifestyles and the 'palaeolithic body'

A second approach of evolutionary medicine is the recommendation of changes in lifestyles and habits to bring them more in line with what has been called the 'palaeolithic body'. This is well illustrated by the book *Paleolithic Prescription* written by anthropologists and physicians Boyd Eaton, Marjorie Shostak and Melvin Konner (1988). The authors argue that an evolutionary perspective is important for understanding many of the physical ills of modern civilization, including diabetes, osteoporosis, atherosclerosis, coronary heart disease and many lifestyle-linked cancers. They particularly emphasize the role of nutrition in the development of these 'diseases of civilization'. They argue that human nutritional needs co-evolved with diets that were characteristically low in fats (especially saturated fats), moderately high in protein and high in complex carbohydrates. Contemporary Western diets are high in fat and in simple carbohydrates such as refined white sugar. Higher levels of physical activity than most Westerners experience today are also part of human evolutionary history. An evolutionary medicine recommendation for dealing with many of these health problems would be to alter eating habits and lifestyles so as to be more consonant with the diets and activity levels the human body 'expects'.

For several years, I have argued that the emotional stress and anxiety experienced by women during labour and delivery are responses which evolved because of the selective advantage of having companionship at the time of birth: fear and anxiety that typically accompany labour and delivery can be seen as adaptations because they lead women to seek emotional support. The advantages of companionship at birth result from changes in the way in which the human infant emerges from the birth canal as a result of anatomical changes required for the evolution of bipedalism early in human evolution. The most obvious ways in which birth in humans differs from that of our non-bipedal relatives include the series of rotations that the human foetus exhibits in its passage through the birth canal, the emergence of the foetus facing away from the mother and the degree of immaturity of the infant at birth. All of these placed a selective premium on having assistance at birth to guide the infant from the birth canal, wipe the mucus from mouth and nose if it interferes with breathing, and remove the umbilical cord from around the neck if it prevents further descent.

All of these actions are apparently simple for non-bipedal primate mothers to perform, but are difficult for the bipedal hominid mother to do since the infant emerges facing away from her. The apparent human adaptation to the challenges posed by bipedalism included seeking companionship rather than solitude in response to the contractions of labour. Thus bipedalism effected a transformation of birth from a solitary to a social event. Modern obstetrics may do an adequate job of meeting the physical needs, but there is concern that the emotional needs are perceived as less important. Familiar and emotionally supportive companions may be as critical as skilled midwives or obstetricians in facilitating deliveries. The evolutionary medicine response to the 'problem' of fear and anxiety at delivery is to provide emotional support from close friends and family or skilled birth assistants rather than provide relief from anxiety and pain through medication (Trevathan 1987).

Several scholars working in the area of evolutionary medicine argue that an understanding of the evolutionary history of human infancy may lead to solutions to some of the problems that appear in infancy and early childhood. Jim McKenna (1986) argues that just as the human species as a whole has an evolutionary history, infants have evolutionary histories too, and he suggests that 'it is time for both social and medical scientists to accord both mothers and infants their unique evolutionary pasts' (McKenna 1986). His work on parent-infant co-sleeping has received a great deal of attention because of its possible implications for some cases of Sudden Infant Death Syndrome (SIDS) or Cot Death. Noting that there is a low incidence of SIDS in cultures in which infants and parents (especially mothers) sleep together, he and his colleagues have been investigating the relationship among co-sleeping and neurological development (McKenna *et al.* 1993). They have found that when infants are sleeping with their mothers, they experience much greater variation in waking and sleeping patterns and breathing than when they sleep alone. Co-sleeping infants also spend more time in lighter than in deeper stages of sleep, providing opportunities for more frequent arousals in response to respiratory challenges.

McKenna argues that human infants have been selected by evolutionary forces to sleep in close proximity to their caregivers, particularly during the time when the brain is undergoing rapid reorganization and growth, i.e. from four to six months of life. McKenna and his colleagues conclude that infant sleep physiology evolved within a 'social sleep' environment and that contemporary ideas about infants sleeping alone represent a departure from what human infants have experienced for at least five million years.

A third approach to evolutionary medicine informs treatment or research in a limited way, but asks that we evaluate a behaviour or physical response in a manner that leads toward understanding its significance in the evolutionary past and thus to consideration that it was once a positive rather than pathological response. An example comes from the classic study of Frank Living-

Brett, J. and S. Niermeyer. 1990. Neonatal jaundice: A disorder of transition or adaptive process? *Medical Anthropology Quarterly* 4: 149-161.

Dubos, R. 1965. *Man Adapting*. New Haven, CT.: Yale U.P.

Eaton, S.B., M. Shostak and M. Konner. 1988. *The Paleolithic Prescription*. New York: Harper and Row.

Ewald, P. 1994. On Darwin, Snow, and deadly diseases. *Natural History* 103: 42-43.

Livingstone, F. 1958. Anthropological implications of sickle cell gene distribution in West Africa. *American Anthropologist* 60: 533-562.

McKenna, J.J. 1986. An anthropological perspective on the sudden infant death syndrome (SIDS): The role of parental breathing cues and speech breathing adaptations. *Medical Anthropology*, 10: 8-92.

——, E. Thoman, T. Anders, A. Sadeh, V. Schechtman and S. Glotzbach. 1993. Infant-parent co-sleeping in evolutionary perspective: Implications for understanding infant sleep development and the Sudden Infant Death Syndrome (SIDS). *Sleep*, 16: 263-282.

Martin, D.L. 1993. Evolutionary medicine: Biological and cultural origins of health, or 'The Flintstone

Diagnosis?'. *Anthropology Newsletter* 34: 13.
Nesse, R.M. 1991. What good is feeling bad? *The Sciences* Nov/Dec: 30-37.
Profet, M. 1988. The evolution of pregnancy sickness as protection to the embryo against Pleistocene teratogens. *Evolutionary Theory* 8: 177-190.
——1991. The function of allergy: Immunological defense against toxins. *The Quarterly Review of Biology* 66: 23-62.
Trevathan, W.R. 1987. *Human Birth: An Evolutionary Perspective.* Hawthorne, NY: Aldine de Gruyter.
Wasser, S.K. 1990. Infertility, abortion, and biotechnology: When it's not nice to fool Mother Nature. *Human Nature* 1: 3-24.
Weinberg, E.D. 1984. Iron withholding: A defense against infection and neoplasia. *Physiological Review* 64: 65-102.
Williams, G.C. and R.M. Nesse. 1991. The dawn of Darwinian medicine. *Quarterly Review of Biology* 66: 1-22.

stone (1958) about the adaptive significance of the sickle cell allele. Inheriting two alleles for sickled haemoglobin usually leads to early death from the particularly severe form of anaemia that is associated with this genotype. Selective forces would be expected to eliminate the allele in several generations because of its lethal effects. Persons who inherit one allele for sickled haemoglobin are more resistant to malaria, however, so in areas where malaria is endemic, the allele reaches higher frequencies than would be expected without the effects of counter-balancing selective forces. The evolutionary medicine approach would not argue against genetic engineering to eliminate the allele but suggests thoughtful consideration of the consequences of doing this before a vaccine for malaria is available.

In considering the possible adaptive significance of some emotional stresses and disorders, Randolph Nesse (1991) calls attention to the difference between defects and defences. Defects, such as paralysis, tumours and seizures, are malfunctions of the body rather than evolved responses. Defences, in his view, are responses that may have evolved to counter the effects of stresses and diseases. Nesse argues that negative emotions are more likely defences rather than defects, and suggests that many contemporary psychological pathologies such as panic disorder and anxiety attacks may have deep evolutionary roots in a time in which they served their bearers well (Nesse 1991). In many cases, they no longer have such benefits in many contemporary settings, and treatment may be necessary. But, at the very least, it may enable people afflicted with some of these 'problems' to feel a bit better knowing their roots are very ancient and were once advantageous in the environments of our ancestors. In other cases anxiety may provide benefits if it causes the person to pay close attention to decisions and actions that may have far-reaching consequences. As noted above, anxiety on the part of women in labour and first-time mothers may lead to seeking support from others who provide relief or guidance that may be useful in reducing the pain, insecurity or stresses which caused the anxiety.

These are just a few of the examples of research that could be called evolutionary medicine. Clearly, there are many more anthropologists, evolutionary biologists and psychologists and medical specialists whose work would fall under this new packaging format. If it is to meet its goal, however, those who adopt the packaging must encourage biomedical research and clinical practice to consider not only the immediate context of the individuals being treated, but also the evolutionary history of the human species and of the organisms which afflict it. Infectious diseases have been cited as having the most powerful effect on shaping the course of human evolution since the origin of agriculture and sedentism approximately 10,000 years ago. Almost weekly we learn of new disease-causing organisms such as HIV and of diseases which have become more virulent and dangerous because their evolution has been shaped by our 'cures' such as antibiotics. Clearly, the human species is still evolving, as are the organisms which afflict it. In addition, decreasing child mortality in technologically advanced nations has resulted in an increase in the impact of diseases associated with ageing as they are 'uncovered by preventing earlier causes of mortality' (Williams and Nesse 1991: 14). The field of evolutionary medicine is positioned not only to suggest courses of treatment for current health problems, but to predict future causes of illness and death as well. It is no longer merely an 'interesting' way of looking at health problems; as currently conceived, it offers practical and crucial solutions, perspectives and suggestions for future research. □

Interview with Michael Fischer

on computing and anthropology

GUSTAAF HOUTMAN

Appointed head of the Centre for Social Anthropology and Computing (CSAC) of the University of Kent in 1990, Michael Fischer is well-qualified to sketch us a picture of what computers might mean to anthropologists, now and in the future.

CSAC, founded in 1985 by John Davis, now professor of social anthropology at Oxford University, is dedicated to the use of computers in mainstream anthropology. It is also one of few centres in the world to put on-line extensive

What specific gains has computing offered anthropology so far?

Computers, like any tool, tend to rest in the background of an anthropologist's work. Just as until recently there were few articles and books which discuss the specific use of notebooks, tape recorders or cameras, little of the work which has benefited from computers directly addresses this use unless they happen to write a piece on research methods.

In the beginnings of anthropological computing in the 1960s through the early 1970s there was a tendency towards programmatic works based on important problems but with limited ethnographic data. There was a need to develop basic approaches to anthropological computing, but this restriction was also due to the cost of computer storage at that time and to the amount of access anthropologists could expect to an institutional computer. Much of the work focused on the interactions of demography and social structure (e.g. Kunstadter, Could and Randolph, Hammel, Dyke and MacCluer), but other problem areas were explored: properties of change in belief systems (Colby); the settlement of Polynesia (Levison) and melodic variation in folk songs (Scherrer and Scherrer).

In the mid-1970s and early 1980s we find less focus on programmatic statements and methods, and more ethnographic substance. Social scientists gained much more access to computers and computer storage for data, including microcomputers. There was an increase in the use of statistical analysis of data using 'packages' such as SPSS. Although these packages could perform the computations easily, rapidly and accurately, they could not provide judgement on when to apply computations and how to interpret the results. Beyond simple tabulation, anthropological data often violates all of the assumptions underlying conventional statistical procedures. It was left to anthropologists to find methods which did suit their data. The main trend was to use more or less 'conventional' anthropological methods on large data sets, as in: work on mating choice and opportunity on Sanday, Orkney Islands (Brennan); incest prohibitions and their effects in the Villefranchian (Hammel); comparative structure of the sexual division of labour (Goody); the structure of tabla improvization in