Ancestral Assumptions: An Epistemic and Ethical Critique of Evolutionary Medicine

Michael Cournoyera
Ancestral Assumptions:
An Epistemic and Ethical Critique
of Evolutionary Medicine

By
Michael Cournoyea

2010–2011 CPHS Lupina/OGS Fellow
Doctoral Candidate, Institute for the History and Philosophy of Science and Technology,
University of Toronto
The Munk School of Global Affairs at the University of Toronto seeks to be an internationally recognised leader in interdisciplinary academic research on global issues and to integrate research with teaching and public education. We place special emphasis on the fostering of innovative interdisciplinary knowledge through the exchange of ideas and research among academics as well as the public, private, and voluntary sectors.

We are delighted to present this collection of research papers from the Comparative Program on Health and Society based on work that our fellows undertook during 2010–2011. Founded in the year 2000, the Comparative Program on Health and Society (CPHS) is a vital and growing research institute based at the Munk School of Global Affairs at the University of Toronto. Generously funded by The Lupina Foundation, the CPHS supports innovative, interdisciplinary, comparative research on health, broadly defined through our extensive range of fellowships, which for 2010–2011 included CPHS Junior Doctoral Fellowships, CPHS Senior Doctoral Fellowships, Lupina/OGS Doctoral Fellowships, Post-Doctoral Top-Up Fellowships, and Research Associate Positions. Our program builds on the scholarly strengths of the University of Toronto in the social sciences, humanities, and public health.

As the CPHS moves into its second decade, we have adopted a renewed vision of the social determinants of health which recognizes the complexity and interrelatedness of domestic, transnational, regional, and global factors that may impact on health conditions and access to health-related services within any country, including Canada. We recognize similarly that emerging and entrenched health inequalities may require policy-makers, communities, and researchers to grapple with challenging ethical, human rights, and social justice questions. We have accordingly expanded the thematic focus of the Comparative Program to accommodate research which specifically focuses on these definitional and operational challenges. The research papers you will read in this year’s collection reflect these themes, and demonstrate the variety, complexity, and importance of comparative health research.

COMPARATIVE PROGRAM ON HEALTH AND SOCIETY
Munk School of Global Affairs
University of Toronto
1 Devonshire Place
Toronto, Ontario, Canada M5S 3K7
Telephone: (416) 946-8891
Facsimile: (416) 946-8915
E-mail: cphs.munk@utoronto.ca
Website: www.utoronto.ca/cphs

The CPHS Working Papers Series

The Comparative Program on Health and Society maintains a collection of academic papers which we call our Lupina Foundation Working Papers Series. These works can range from research papers to thought pieces; and from statistical analyses to historical case studies. Our series represents a snap-shot of the work being done by our Lupina Fellows, past and present. Taken together, our Working Papers Series encapsulates the wide-ranging approaches to the study of the social determinants of health. We hope that you will find the individual papers in our series thought-provoking and helpful.
   By Louis W. Pauly.

2. The Multilateral Agenda: Moving Trade Negotiations Forward.
   By Sylvia Ostry.

   By Michael Bell, Michael J. Molloy, John Bell and Marketa Evans.

   Edited by Jillian Clare Cohen and Jennifer E. Keelan.

   Edited by Jillian Clare Cohen and Lisa Forman.

6. Darfur and Afghanistan: Canada's Choices in Deploying Military Forces.
   By Ambassador David S. Wright.

   By Sylvia Ostry and Thomas Kwasi Tieku.

   By Frank Quinn.

9. Intersubjectivity in Literary Narrative.
   By Tomas Kubicek

    Edited by Jillian Clare Cohen-Kohler and M. Bianca Seaton.

    Loi type sur la protection de l'eau au Canada. Conseil sur les questions de l'eau au Canada en collaboration avec le Programme sur les questions de l'eau.

12. The World's First Anti-Americans: Canada as the Canary in the Global Mine.
    By Richard Gwyn.

    Edited by M. Bianca Seaton and Sara Allin.

14. The Importance of Steel Manufacturing to Canada – A Research Study.
    By Peter Warrian.

15. A Century of Sharing Water Supplies between Canadian and American Borderland Communities.
    By Patrick Forest.

16. Designing a No-Fault Vaccine-Injury Compensation Programme for Canada: Lessons Learned from an International Analysis of Programmes.
    By Jennifer Keelan PhD, Kumanan Wilson MSc, FRCP(C)
17. Socio-economic Status and Child Health: What is the Role of Health Care Utilization?
   By Sara Allin and Mark Stabile.

   By Antony Chum.

19. A Lifetime of Experience: Modelling Labour Market and Family Life Course Histories among Older Adults in Britain.
   By Laurie M. Corna.

20. The Corporatization of Sport, Gender and Development: Postcolonial IR Feminisms, Transnational Private Governance and Global Corporate Social Engagement.
   By Lynndsay M.C. Hayhurst.

   By Seija K. Kromm.
   July 2011 ISBN 0-7727-0857-1

22. Colonial Medicine, the Body Politic, and Pickering’s Mangle in the case of Hong Kong’s Plague Crisis of 1894.
   By Meaghan Marian.

   By Krista Maxwell.

   Author: Tanya Morton.
   July 2011 ISBN 0-7727-0856-4

   By Ubaka Ogbogu.
   July 2011 ISBN 0-7727-0861-8

   By Subha Ramanathan.

27. Abide with Me: A Story of Two Pandemics.
   By Kate Rossiter and Rebecca Godderis.

28. Global Biopolitics and Emerging Infectious Disease.
   By Sarah Sanford.
   July 2011 ISBN 0-7727-0854-0

   By Eliana Suarez.

   By Marisa C. Young.

31. Armed Conflict Exposure, the Proliferation of Stress, and the Mental Health Adjustment of Immigrants in Canada.
   By Marie-Pier Joly.
32. Metabolising MSG: Tasting, Making, and Managing with Flavour Agent Monosodium Glutamate.
   By Sarah Tracy.

33. Tuberculosis and Persons with Severe and Persistent Mental Illnesses: When (Treatment) Worlds Collide?.
   By Diego S. Silva.

   By Brendan T. Smith.
   November 2012 ISBN 0-7727-0896-0

35. Social Context and the Gendered Life Course: What Do They Offer Our Understanding of Socioeconomic Inequalities in Health in Later Life?
   By Laurie M. Corna.
   November 2012 ISBN 0-7727-0897-7

   By Lauren Classen.
   November 2012 ISBN 0-7727-0898-4

37. Safe Houses in Contact Zones: Race Politics, Place-making, and Ethno-specific AIDS Service Organizations in Toronto.
   By John Paul Catungal.
   November 2012 ISBN 0-7727-0899-1

38. Ancestral Assumptions: An Epistemic and Ethical Critique of Evolutionary Medicine.
   By Michael Cournoyea.
   November 2012 ISBN 0-7727-0900-4
Ancestral Assumptions: 
An Epistemic and Ethical Critique 
of Evolutionary Medicine

Michael Cournoyea

Acknowledgements
I would like to thank the Lupina Foundation and the Ontario Graduate Scholarship Program for their generous financial support. For comments and guidance throughout this project I must also thank Professor Marga Vicedo, Professor Denis Walsh, Professor Daniel Sellen, Professor Peggy McDonough, Rebecca Moore, Antony Chum, Diego Silva, Janet Hyer, and the fellows of the 2010–2011 Comparative Program on Health and Society. Without their support this paper would not have been possible.

Abstract
Evolutionary medicine (EM) is an emerging field of medical studies that uses evolutionary theory to explain the ultimate causes of health and disease. The field's main objective is to reconceptualize bodily vulnerabilities and pathophysiologies as evolutionary tradeoffs in order to provide clinically relevant heuristics, treatments, and lines of inquiry. Educational tools, online courses, and medical school modules about EM are being developed for the clinician, whether in training or in practice. At first glance, the marriage of evolutionary biology (a descriptive, phylogenetic discipline) and clinical medicine (a prescriptive, patient-centered practice) may seem unusual. On ethical grounds, the use of evolutionary theory in medicine has a tortuous history, but advocates assert that modern EM is less naive about race, genetic determinism, and the scale of evolutionary change. Unfortunately, modern EM runs into ethical quandaries with its strong approach to adaptationism and its reliance on a strictly biophysical account of health. On epistemic grounds, it seems unusual that the lifestyles of our ancient ancestors might have some relevance to contemporary clinical medicine. EM advocates assert that the use of evolutionary thinking in medicine should be obvious: medicine relies on biology and biology is grounded in evolution. Yet it remains unclear how evolutionary explanations are relevant to clinical medicine. Deconstructing these ethical and epistemic assumptions, I argue that EM cannot meet the central objective of providing clinically relevant knowledge. EM needs to examine its own foundational assumptions before it enters the clinic.

Michael Cournoyea is a Lupina/OGS Doctoral Fellow, studying at the Institute for the History and Philosophy of Science and Technology. He received his BSc at McGill University in Biology and Philosophy and has worked at the intersection of these disciplines for the last five years. He currently works as a don at Victoria College and is active in student life on campus. His work examines the pluralism and politics of causal explanations in medicine -- whether biomedical, evolutionary, phenomenological, or sociological. The implications of such abstract philosophical inquiry is nevertheless pragmatic, as I engage and problematize racialized medicine, the sovereignty of patient health, and how we should live the healthy life.

INTRODUCTION

1. EVOLUTIONARY MEDICINE — ITS SCOPE AND IMPLICATIONS

Evolutionary medicine (EM) is an emerging field of medical studies that uses evolutionary theory to explain the ultimate causes of health and disease. The field’s main objective is to reconceptualize bodily vulnerabilities and pathophysiologies as evolutionary tradeoffs — many the result of an evolutionary mismatch between our ancient genome and modern lifestyle. This conceptual shift allows EM to describe that which constitutes health and disease (in terms of adaptive functions) and to prescribe treatments that best complement our evolved bodies. The goal is to “transform the way patients and doctors see disease”
In order to harness a renewed “feeling for the organism as a product of natural selection” (Nesse 2008, 429) and ultimately provide clinically relevant heuristics, treatments, and lines of inquiry that are more firmly based on biological evolution. In clinical practice, EM aims to unite disparate bits of medical knowledge into an integrative, adaptationist framework that adds another dimension to patient histories: “the history of the complaint itself; the developmental history of that individual; and his or her evolutionary history” (Gluckman et al. 2009, xv). The clinical relevance of such a framework is the focus of my critique. I argue that one's evolutionary history is not relevant to diagnosis, treatment, or prevention given our epistemic uncertainty about such histories.

Uniting evolutionary biology and clinical medicine may seem unusual on both ethical and epistemical grounds. On ethical grounds, the use of evolutionary theory in medicine has an alarming history. From the late nineteenth century until the Second World War, the merger promoted racial typologies, an all or nothing view of natural selection, and eugenics (Zampieri 2009). Modern EM advocates have been clear to denounce any revival of such ideas. Instead, advocates assert that modern understandings of human evolution are less naïve about race, genetic determinism, and the scale of evolutionary change (Gluckman et al. 2009; Nesse et al. 2010).

On epistemical grounds, it seems unusual that evolutionary principles might have some relevance to contemporary clinical medicine. EM advocates assert that the use of evolutionary thinking in medicine should be obvious: medicine relies on biology and biology is grounded in evolution. Proponents commonly co-opt Theodosius Dobzhansky's famous aphorism to claim that nothing in medicine makes sense except in the light of evolution (Nesse and Williams 1994; MacCallum 2007; Swynghedauw 2008; Evans 2009; Gluckman et al. 2009; among others). This has become a slogan for advocates who argue that EM can provide insight into nearly every aspect of human health. Two recent EM collections include contributions on nutrition, Type 2 diabetes, childbirth, menstruation, stress, altitude sickness, sleep, heart disease, obesity, addiction, delusions, and more (Trevathan et al. 2008; Elton and O'Higgins 2008). For example, addiction is just the malfunctioning of ancestral “wanting and seeking” mechanisms in modern lifestyles; sleep problems reflect an ancestral tension between the need to remain vigilant and the need to rest; and the life of those with chronic heart failure can be prolonged by blocking ancient neurohormonal adaptations.

To get a sense of how EM might function in the clinic, consider the evolutionary role of fever in the humoral immune response. Without EM, physicians may understand fever as an unfortunate side effect of infection, treating it with fever-reducing medications to reduce a patient's discomfort. With EM, fever is reconceptualized as an adaptive immunological response of host defence that may be best left untreated. Indeed, fever has been shown to quicken some immunological responses and hinder the reproductive rate of some pathogens, suggesting that fever has a distinct evolutionary role in the human immune response (Schaffner 2006). Such a shift in perspective, it is argued, encourages physicians to pursue different treatment courses (i.e., not treating fever). The perspective also encourages clinical researchers to ask unique questions: What might have been the selective advantage of fever? Is fever still adaptive today? How has fever evolved as an immunological response in different organisms or different human populations? Explaining and questioning fever in this way seems to complement any physiological or developmental explanation that might be offered. Thus an explanation of fever (and, indeed, any physiological mechanism) involves two distinct parts: an explanation of fever's physiological mechanisms and an explanation of fever's adaptive functions. Such an evolutionary perspective might guide medical research on fever, but it remains unclear that such insights are relevant to clinical practice. I argue that evolutionary explanations are difficult to justify and contribute little to clinical practice once we have a proximate knowledge of disease.

2. GUIDING THE DISCUSSION

Let me begin with some important clarifications. Within the enormous breadth of EM research, the field explores four general themes in human health:

1. the origin and adaptive function of physiological processes (like breastfeeding)
2. the adaptive use of supposed dysfunctions (like fever)
3. the evolutionary mechanisms that shape host-pathogen interactions (like HIV-AIDS)
4. the genetic dynamics of human populations (like heterozygote advantage with Sickle-cell anemia in places where malaria is prevalent)

A crucial distinction needs to be made between the first two themes (the macro-domain, which addresses long-term human evolution) and the second two themes (the micro-domain, which addresses short-term microorganism or human evolution). The distinction roughly aligns with the distinction between macro-evolution and micro-evolution: domains unique in their subject-matters, methodologies, epistemic standards, and implications. The macro-domain provides coarse-grained explanations (in time and scale) whereas the micro-domain provides fine-grained explanations — a difference of explanatory scope. Both domains incorporate evolutionary thinking into medicine, but it is misleading to lump both domains into one broad field. My aim in making the macro/micro distinction is to highlight our uncertainty in long-term human evolution and its application to current day health standards. Micro-domain evolutionary explanations have greater certainty because the phenomena they explain are more temporally accessible. This accessibility is essential to clinical intervention — a vital epistemic goal — in a way that macro-domain explanations cannot be. A critical analysis of EM must address each domain separately.

Having made this distinction, I should note two things. The first is that the EM literature has failed to differentiate between these domains. Without such a distinction, proponents of EM often take credit for developments in the micro-domain while sidestepping the conceptual pitfalls of the macro-domain. This is deceptive because clinical knowledge from research in EM's micro-domain has been hugely influential (elucidating antibiotic resistance, HIV adaptations, etc.), whereas EM's macro-domain has produced speculative and sometimes controversial clinical knowledge. Both rely on evolutionary reasoning — despite their methodological differences — but the conclusions of this reasoning differ in certainty between the domains. Novel and clinically relevant micro-research does not translate into success in macro-research, and such rhetorical omissions are deceiving.

With this in mind, the second point to note is that my discussion is focused on the misguided and neglected assumptions of EM's macro-domain.2 This focus frames my critique. In section three, I argue that EM's macro-domain relies on evolutionary explanations of human physiology that are based on a strong commitment to adaptationism; as I explain, such a stance is prone to “just-so” fallacies. In section four, I argue that EM's tenuous explanations for health and disease are largely irrelevant to the proximate explanations fundamental to medicine. In section five, I argue that the professional goals of medicine have been oversimplified or neglected in the EM literature. Deconstructing these aspects of EM, I argue that faults in these fundamental assumptions undermine EM's central objective of providing clinically relevant medical knowledge. I maintain that evolution's place in the clinic is controversial and that these conceptual blind spots lead to misguided conclusions about our supposed “human nature.”

Advocates frequently lament the snail's pace at which medical research and education have adopted EM. Nesse confidently claims that “...if 5% of the investment in genetic research was put towards investigating evolutionary questions about disease, the benefits would likely be as large as those we have seen so far from the genomic revolution” (2008, 423). Nesse recommends substantial changes in medical education policies and practices in which evolutionary theory provides the foundation for every medical topic (Nesse et al. 2006; Nesse 2010). Educational tools, online courses, and medical school modules about EM are being developed for the clinician, whether in training or in practice. Given this enthusiasm, some envision the overhauling of medical education such that we might imagine “an entire medical curriculum built around evolution, from anatomy and molecular genetics to pathogen-host interactions” (Evans 2009, 664). Yet attempts to address core problems in EM, often hotly debated in the philosophy of biology and medicine, are missing from these recommendations. At the very least, such bold policy recommendations need to be reexamined and their foundational assumptions challenged. As I hope to show, EM's slow

1. Méthot (2010) has described the distinction as that between “backward-looking” and “forward-looking” explanatory research traditions.

2. For simplicity hereafter, I refer to EM's macro-domain as simply EM.
progress is perhaps more about its tenuous assumptions (and the hesitance of physicians to accept these assumptions) than funding and resources. If EM is to provide a foundation for modern medicine, it needs to examine its own foundational assumptions before it enters the clinic. I begin this examination with an exploration of adaptationism and how it undermines EM’s normative recommendations on health.

3. ADAPTATIONISM

The adaptationist program emphasizes the role of natural selection in evolution. The program seeks to differentiate between organismal traits that have arisen via natural selection (adaptations) and those that are the result of non-selective processes (drift, constraints, etc.). Adaptationism provides a seemingly powerful heuristic for identifying adaptive functions and is employed in evolutionary disciplines from molecular genetics to evolutionary psychology. Yet the adaptationist approach is not just a “scientific” commitment: it is positioned at the intersection of scientific and philosophical approaches to the biological sciences. Critiques of the adaptationist program incited controversy thirty years ago with the publication of Gould and Lewontin’s anti-adaptationist manifesto (1979). Despite the wide reception of this article, many biologists never lost faith in the adaptationist program “post-spandrel” (Rose and Lauder 1996). In a similar fashion, Gould and Lewontin’s critiques have not been discussed in the EM literature. In Williams and Nesse’s (1991) seminal article that began work in EM, adaptationism is adopted without mention of its criticisms. This critical gap remains in EM’s literature today. I begin my discussion of adaptationism with a brief overview of its reasoning and review some of its critiques with a particular focus on the difficulties they pose for EM. I end this section by considering the implications of such reasoning for ideals of health and well-being.

3.1. EM’s Adaptationist Reasoning

EM proponents are strong adaptationists when addressing the evolution of human anatomy, physiology, and sociality. In a recent PNAS supplement on the Sackler Colloquium dedicated to “Evolution in Health and Medicine,” adaptationism is used widely throughout the eighteen contributed colloquium papers, but its conceptual limitations are not once addressed. In their introductory remarks to the supplement, Stearns et al. (2010) fail to mention the adaptationist commitment of EM research; adaptationism is simply taken for granted. In contrast, the introductory remarks of the EM textbook by Gluckman et al. (2009) warn against the difficulty of holding adaptationist arguments too firmly because of their inferential nature:

[…] with respect to much of this book it needs to be kept in mind that while a given adaptive scenario may be likely if not compelling, the evidence is nearly always inferential. Thus adaptive arguments in human biology must therefore always be considered, to some extent, to be hypothetical. […] Thus, whenever in this book an adaptive argument for the origin of a trait is proposed, the caveat exists that while the particular argument represents the collective view of evolutionary biologists, it cannot usually be proved or disproved. We must always remember the potential for a plausibly adaptive trait to be a spandrel, to be an exaptation, or to have arisen through random drift and neutral mutation rather than through selection. (45)

At the very least, this admission acknowledges EM’s commitment to adaptationism. Unfortunately, Gluckman et al. do not consider how such limitations might undermine EM’s conclusions, heuristics, or clinical efficacy. This trend of using adaptationism without discussing its limitations is pervasive in the EM literature. This may not be surprising for a field of study whose central question already assumes empirical adaptationism: Why has natural selection left our bodies so vulnerable to disease?

3.2 The Limits of Adaptationism

Adaptationism is notoriously unfalsifiable — and sometimes even fanciful — in its inferential segmentation of organisms into modular traits and then in its explaining and justifying each trait with an adaptive story

3. While inferential knowledge is crucial in nearly every explanatory approach to medicine, my point here is that adaptive reasoning about humankind’s distant past is extremely uncertain. Medical practitioners must learn to cope in the epistemic brush with uncertainty and EM proponents have been irresponsible in failing to account for the limitations of adaptationism.
(Gould and Lewontin 1979; Godfrey-Smith 2001). Adaptationists assert that such traits are canalized through evolution, reaching environmental optimality after long periods of selection. Developmental constraints and the non-selective mechanisms of evolution (i.e., drift) are given a backseat to adaptive functionality; only with conflicting selective pressures do trade-offs between traits lead to organismal suboptimality. For example, that the adaptive function of “traits” might be exapted (coopted for another purpose) is given little or no consideration. Unfortunately, the difficulty of delineating traits and finding evidence to justify their adaptive functions severely limits the empirical testability of the program. Explanations of why certain physiological, mental, or social traits exist must take these difficulties into account.

Advocates position themselves in a number of ways to argue that adaptationist reasoning is central in the study of health and disease: (1) adaptations give us insight into why our bodies are so vulnerable to disease (the vulnerability stance); (2) adaptations elucidate the mismatches between our ancestral biology and modern lifestyles (the diseases of civilization stance); and/or (3) adaptationism is important because it unifies disparate pieces of medical knowledge in the “evolved body” (the unificationist stance). The foundation of these stances is “found not so much in biological data, but in views about the place of biology within science and culture as a whole” (Godfrey-Smith 2001, 350). While it is beyond the scope of this paper to address each stance in detail, the critiques of adaptationism discussed below are wholly relevant to each stance. Each of these stances allows EM to describe ideals of health and well-being based on speculative claims about hunter-gatherer life-histories.

3.3. Adaptive Ideals of Health and Well-being

Much of the emphasis in EM’s early research program was in reinterpreting unpleasant and seemingly useless physiological processes as adaptive functions of bodily systems. Fever, vomiting, diarrhea, coughing, nausea, pain, fatigue, morning sickness, anxiety, and even jealousy were reconceptualized as adaptive functions of the body that had evolved to protect individuals from a variety of dangers (Nesse and Williams 1994). Recent papers in EM use the same adaptationist assumptions about humanity’s evolutionary past to justify the norms of health and well-being.

Solutions to the modern world’s “dietary crisis,” for example, can be found in an evolutionary perspective on nutrition, which highlights the disparity between “Stone Age” diets (the ideal to which we evolved) and current eating habits (which are far from ideal) in terms of quantity, quality, and variety (Cordain et al. 2005; Turner et al. 2008). This perspective also explains why many have difficulty digesting cow’s milk, bread, or root vegetables (Lindeberg 2010, 5). The human body has not evolved to eat the kinds of foods consumed in affluent nations today: modern lifestyles have little to no “evolutionary precedent.” Medical research examining the health benefits of pre-agricultural lifestyles (such as the “paleo” diet) is increasingly carried under the banner of EM.

Noel Boaz, professor of anatomy and anthropology at the Ross University School of Medicine, refers to such disparities between our ancestral health and our current health as discordances of “adaptive normality,” arguing that such normality is our “evolutionary birthright” (2002, 5). Boaz makes it clear that evolutionary thinking (and, it seems, only evolutionary thinking) allows us to understand “what our normal ranges of environment, anatomy, physiology, and behavior really are” (2002, 2; emphasis added). These normal ranges evolved during the Paleolithic environment of evolutionary adaptedness (EEA) from about two million years ago until 10,000 years ago before the agricultural revolution (Pollard 2008). This is not to say that human evolution stopped during the agriculture revolution or that the EEA was static; rather, the view is that “Human biology is designed for [adapted to] Stone Age conditions” (Williams and Nesse 1991, 1). Adaptive normality defines the ideals of health and well-being, canalized for millions of years in our evolved bodies. Thus only with knowledge of our evolutionary origins can we know who we really are, leaving no room for “normalcy” outside “adaptive normality” or bodily functionality outside evolved functionality.

4. Note that these difficulties do not pose a challenge to evolutionary explanations, per se, but to evolutionary explanations that rely on adaptationism.
Such adaptationist reasoning is disconcerting because it can be misguided and potentially dangerous when applied to ideals of health and well-being. The program is misguided in proposing that we define ideals of health and human nature based on speculative claims about humanity’s evolutionary past; it is potentially dangerous in suggesting that the “natural and normal” are best just because they are “natural and normal.” The worry with such ideals is that since our ancestral life-histories are difficult (if not impossible) to test empirically, normative judgments about how our bodies should function can be naturalized. In this circular argument, such naturalizations may then appear to offer powerful justifications for what we should do.

Moreover, if the ideal function of some physiological process is found “in nature” then malfunction, disease, and illness are interpreted as physiological malfunctions rather than biological variability. In a sense, theory becomes immune from error since a “biological system can fail to behave as a theory predicts without impugning the prediction: we can say that the system is malfunctioning” (Murphy 2008). The life sciences appear unique in this regard because of natural variation and malfunction. Homosexuality (to take a controversial example) might be pathologized and medicalized as bodily malfunction rather than used to question adaptive ideals of heterosexuality — normalization and naturalization begin to blur as normative views are subtly naturalized. These concerns are even more salient when adaptationist thinking is used to propose species-wide or racially specific standards of health, rather than considering the complexities of sociocultural dissimilarities or the uniqueness of an individual’s subjective health. EM necessarily precludes these approaches because it naturalizes and defines health/disease in supposedly objective adaptationist terms. EM may even trade one “fallacy of medical normalcy” for another, rejecting ethnocentric ideals of health for one that is “biocentric,” based on speculative ancestral conditions.

While these are dangerous normative directions for EM, they are not necessary consequences of adaptationist reasoning. As I argue in the next section, EM may have a particular place in medical research even though it is unclear how EM can contribute to clinical practice.

4. MEDICALLY RELEVANT EXPLANATIONS

Clinical medicine is pragmatic, action-oriented, and patient-centred; its goals are to alleviate suffering through the treatment/prevention of illness and promote good health in all the senses of personhood. This goal is made possible via direct or indirect intervention, a process made possible with an interdisciplinary understanding of the human body and its biomedical complications. Thus medically relevant explanations are those that offer the possibility of intervention in the pursuit of health. In other words, explanations that lead to the possibility of intervention are epistemically virtuous and desirable. Even statistical explanations that appeal to systematic trials or epidemiological data must offer some point of clinical intervention (i.e., clinical guidelines). The site of such intervention is almost always the clinical encounter, where medical practitioners treat patients with unique needs and difficulties.

Of course, sometimes no intervention is better than intervening if the iatrogenic effects of treatment would have poor or insignificant consequences. I do not think this caveat undermines the epistemic point since it is the possibility of intervention, rather than actual intervention, which is central to medical explanations. Medical explanations of terminal or untreatable conditions may not have any actual intervention even though the possibility of intervention still holds. In a patient with terminal cancer, explaining the cancer with proximate causes may still allow the possibility of intervention at a future date with new technology. On the other hand, using an ultimate explanation (without a proximate explanation) may suggest hypotheses for medical research without adding anything clinically relevant to the proximate explanations of medical practice. This is where evolutionary biology and medical practice diverge.

In this section, I argue that ultimate explanations do not fulfill this vital epistem goal. I begin by outlining ultimate explanations and argue that they do not directly inform the proximate explanations upon which medical intervention can be based. Proximate, rather than ultimate, explanations are all we need in clinical medicine. I continue by showing that EM has acknowledged but neglected this limitation in its program.

5. This is part of the larger problem of trying to develop laws in the life sciences that account for such variation.

6. I elaborate on this narrow definition in section five. Unfortunately, a full discussion of what defines clinical medicine is beyond the scope of this paper.
4.1. Explaining Ultimate Explanations

Evolutionary biology seeks to answer “why” questions: Why is there an abundance of nerve endings in the fingertips? Why does the body experience fever? Why do women in labour experience fewer complications with a birthing companion? Answers take the form of adaptive stories: Nerve endings in the fingertips improved the manual dexterity of tool-making hominids; fever provided our ancestors with humoral immunity; women that evolved positive feedback mechanisms to wait for a birthing companion gave birth more successfully. Such answers are deemed ultimate explanations and act to supplement (rather than replace) proximate explanations. Ernst Mayr is most often credited with the first detailed description of proximate and ultimate causes in his *Cause and Effect in Biology* (1961). Yet even today the distinction remains confused (Ariew 2003) and ultimate explanations are often misunderstood or taken out of context (Lozano 2010). As a detailed discussion of the proximate/ultimate distinction is beyond the scope of this paper, I simplify the nuances in stating that proximate causes are those that take place within the lifetime of an organism (in ontogeny) whereas ultimate causes are those that take place over evolutionary timescales (in phylogeny).  

It is important to note that explanations take different forms (causal, statistical, unificatory) depending on their intended goal. Proximate explanations of hyperglycemia (elevated blood glucose) could involve a long disjunctive set of mechanistic events (eating a cookie, depressed insulin release, etc.) or a statistical series that links probabilities and likelihoods in a causal chain. Ultimate explanations are invariably statistical since they describe adaptive changes via population-level fitness distributions over evolutionary timescales. Such statistical interpretations of ultimate explanations may not be causal (i.e., citing the “forces” of evolution as causes) but remain explanatory (Walsh 2007). Ultimate explanations also fulfill the unificationist’s goal of explaining a variety of phenomena with a stringently reduced set of facts (Kitcher 1989). This is commonly referred to as a vital goal of EM’s adaptationist reasoning (the unificationist stance); seemingly disparate, unconnected, or contradictory facts about the human body (from fever to lactose intolerance) can be explained by appealing to human evolution. This does seems to fulfill the epistemic goal of explanatory unification (rather than simply classificatory or formal unification). Yet even if evolutionary thinking offers a valuable heuristic for understanding proximate explanations, this heuristic fulfills a similar educational role as might mnemonics or organizing medical curricula by organ systems. While “why” questions and their ultimate answers may be interesting and pedagogically useful in unifying proximate explanations, only proximate explanations seem directly relevant to clinical medicine. Clinical medicine relies on the *hows* of biomedicine, not the *whys* of evolutionary thinking.

4.2. Phylogeny Does Not Imply Ontogeny

Understanding a trait’s phylogeny may provide clues about its naturally selected function, but this does not necessarily inform us about its proximal function, processes, or interactions. In this way, the function of proximal processes in biology is epistemically independent of the adaptive function (Griffiths 2008; Lozano 2010). A complete knowledge of human biology would, ideally, include both kinds of explanation. Yet in medicine, it seems that proximate explanations should take precedent over ultimate explanations because they offer the possibility of intervention. While ultimate explanations serve a distinct and important purpose

7. With regard to medical causation, no single account seems satisfactory. It is inevitable that the causal pathway between symptoms and treatment (in biomedicine), social indicators and disease (with the social determinants of health), or experience and illness (in the phenomenology of health) will require a pluralistic approach to causation. Mechanistic causation, for instance, may be apt at describing the physiological course of tuberculosis but inadequate when describing the causal pathway between poverty and high incidences of tuberculosis. The same pluralism is necessary for medical explanations which rely on more than causal pathways in search of interventions (such as causally contentious epidemiology). A full account of medical explanation — including its diverse forms, limitations, and necessary conditions — is beyond the bounds of this project; however, it seems clear that a necessary condition of any (good) medical explanation is the possibility of intervention. This highlights the pragmatic, action-oriented, and patient-centred nature of medical practice, whose central aim is the alleviation of suffering.

8. To cite ultimate causes, if one agrees with the statistical interpretation, is just to invoke a rhetorical shorthand for such ensemble effects. If one disagrees with the statistical interpretation, evolutionary causes qua causes are explanatory and ultimate explanations are no longer invariably statistical.
in the biological sciences that is independent of proximate explanations, ultimate explanations in medicine are merely heuristic. This point is reinforced by the confidence we can have in proximate explanations that we cannot have in ultimate explanations. The need for practical certainty in medicine may even ethically preclude the speculative claims of adaptationist, ultimate explanations.

Consider a patient that presents with an inflamed gallbladder (cholecystitis). Suppose that we knew (with uncanny certainty) the adaptive function of gallbladders throughout human evolution: early humans with functioning gallbladders were able to digest lipid-heavy diets, giving them greater energy, more time for reproduction, and hence a selective advantage.9 While such an adaptive story would certainly enhance our understanding of the gallbladders’ adaptive function in human evolution, such an explanation does not tell us anything clinically important (i.e., when to treat inflamed gallbladders and when not to).

The epistemic yardstick of clinical importance is the possibility of causal intervention. In treating cholecystitis, it may be important to know the gallbladder’s role in lipid digestion, how essential this function is to the body, the patient’s dietary intake of fats, contraindications of surgery, and so on. These considerations (including the gallbladder’s adaptive function) must be determined and confirmed by proximate physiological knowledge. Even developmental and hereditary knowledge (typically included in medical histories) is only indirectly relevant to a patient’s current condition. If our patient’s cholecystitis arose because of a genetic abnormality that has existed in a particular human population for thousands of years, and even if this abnormality had adaptive value, such phylogenetic knowledge of the gallbladder’s function is irrelevant unless it informs a proximate explanation of (or proximate interventions for) our patient’s condition.10

4.3. Ultimate Explanations at the Bedside

As I argued in section three, answering “why” questions is difficult (if not impossible) because of limitations in the adaptationist program. This is particularly problematic for EM’s macro-domain, which relies heavily on adaptationist thinking to address why our bodies are so vulnerable to disease. In this section, I argued that ultimate explanations give us little more than clues about the proximate explanations so central to biomedicine. EM may aid in unifying facts about human physiology and suggest new research directions, but these epistemological outcomes remain irrelevant to the goals of clinical medicine. For these reasons, EM’s clinical relevance is limited. This difference between relevant explanations in clinical medicine and evolutionary theory may suggest a priori that we should exclude the possibility of an evolutionary medicine; however, this has not prevented EM’s research program from growing.

These limitations of ultimate explanations have been a concern in EM since the field first began, with Williams and Nesse admitting that “medicine is a practical enterprise, and it hasn’t been immediately obvious how evolutionary explanations might help us prevent or treat disease” (1991, 18). This sentiment is repeated in the introductory chapter of the most recent EM collection:

[An] overweight person may be counseled to alter [his or her] diet while increasing activity levels. From the standpoint of evolutionary medicine, however, an explanation about the adaptive advantage of being able to store fat during times of excess leading to increased survival and reproductive success in times of scarcity may not be particularly useful or meaningful to a person concerned with looking “fat” or suffering from one of a variety of serious weight-related illnesses like diabetes. In this case, a clinician who focuses on the ultimate or evolutionary explanation (who “practices” evolutionary medicine) will have little or no impact on the patient’s health and well-being when compared to the physician who focuses on and treats the proximate causes. (Trevathan et al. 2008, 11)

The authors of this introduction offer no solution to this apparent impracticality, but remain optimistic about the future applicability of EM. I do not share such optimism. Perhaps, as Nesse argues (2008; 2010),

9. The gallbladder stores bile from the liver, which aids in the digestion of fats.
10. In other words, EM provides coarse-grained explanations while medically relevant explanations must be fine-grained.
an evolutionary perspective most powerfully influences our “feeling for the organism,” providing us with a more complete framework with which to view the body and an appreciation of the long-term evolution of humans (the unificationist stance). He outlines several ways that EM might contribute to medicine, but still admits that EM is a young field with limited, though potentially enormous, importance. Nesse believes this potential to be conceptual: “While evolutionary medicine has some useful applications, its great promise arises from its ability to pose new research questions and to offer a solid framework for integrating much medical knowledge about why our bodies are so vulnerable to disease” (2008, 417).

Yet despite these conceptual benefits, Nesse does not discuss clinical applications of EM, and Gluckman et al. dedicate only one page in their 300-page textbook to the implications of evolutionary theory for “prevention and therapy” (2009, 273). Ultimate explanations may have a place in medical curricula as interesting learning tools to understand biology’s “hodgepodge of unconnected facts” (Nesse 2008, 427), but advocating EM for clinical decision-making is misguided. I do not mean to imply that there is no value to evolutionary explanations at all, or that such explanations do not address specific and important problems in evolutionary theory about human biology. It is simply unclear that evolutionary explanations can help clinicians understand what to do without proximate causes, now or in the future.

Despite the dream of knowing both how and why the human body functions, clinical medicine — with its pragmatic, epistemic virtue of intervention — has no use for ultimate explanations. Evolutionary explanations may deepen our understanding of human biology, but such explanations have yet to facilitate clinical diagnoses, treatments, and the alleviation of suffering — the central goals of medicine.

5. A BIOPHYSICAL CRITIQUE

In the previous section, I argued that the epistemic goal of medical interventionism could not be fulfilled by ultimate explanations. In this section, I consider the professional goals of medicine and how EM may not be useful to achieving these goals. Conceptual definitions of medicine and health are a fundamental step in any attempt to reconceptualize the field of medical practice. Defining medicine and health is a monumental project and not my aim in this section. Instead, I will briefly illustrate the need for pluralism within the complexity of such a project — a need that has been neglected by EM.11

With evolution as the basis of biology and biology as the foundation of medicine/health, the relationship between evolution and medicine is clear. Yet if health is not simply an adaptively functional body and medicine is not simply the practice of treating the biophysical body, then evolution’s relationship to medicine and health is no longer obvious. To say, in defence, that EM simply benefits the biophysical part of medicine is to adopt an incomplete and inaccurate view of medical practice. In discussing this intersection of disciplines, human biologist Stephen Lewis best articulates this complex relationship between evolution and medicine: “the idea that because humans are biological entities, medicine, in dealing with them, therefore rests on biology as a fundamental science, is a little too simplistic. Biology and medicine meet within the ethical and metaphysical confines of a social and cultural context. It is one thing for biology to contribute to medicine in a technical way; it is quite another for it to contribute in a conceptual way” (2008, 403).

As Lewis notes, EM aims to reconceptualize medicine without exploring these complexities. Nesse’s most recent articles (2008; 2010) outline the importance of evolution for medical curricula but fail to define the goals of medicine; his oversimplified assertion that “medicine is based on biology and biology is based on evolution” (2008, 416) misrepresents the real complexity of medicine. Which aspects of medicine are “based on biology”? Most importantly, what are the professional goals of medicine and can evolutionary thinking help accomplish such goals?

Defining medicine and its goals is far from straightforward. Both cardiac surgeons and dermatologists practice medicine, but each practice is unique in its techniques and ways of thinking. What ties the various disciplines of medicine together is a central goal of alleviating suffering — whether physical, mental, or social (Cassell 2004; Lewis 2008). Medical practices and technologies that broaden our understanding of

---

11. Also, importantly, defining Darwinism (of “Darwinian medicine”) has been neglected (Marks 2008).
physiology or increase our life expectancy or maximize our fertility are tangential and supplemental to this central goal. Of course, defining and explaining suffering is itself challenging. Consider Eric Cassell's concept of “personhood” as it relates to suffering:

[…] persons cannot be reduced to their parts so that they can be better understood. Reductionist scientific methods, so successful in other areas of human biology, are not as useful for the comprehension of whole persons [...] All the aspects of personhood — the lived past, the family's lived past, culture and society, roles, the instrumental dimension, associations and relationships, the body, the unconscious mind, the political being, the secret life, the perceived future, and the transcendent-being dimension — are susceptible to damage and loss. (2004, 41–42)

Instead of defining health and disease in terms of the adaptive functions of the body, Cassell adopts the notion of personhood in order to illustrate that both health and disease are multidimensional, only partially involving the body. Damage and loss are not simply biophysical, nor are the ideals of health and well-being. In a similar vein, the 1948 constitution of the World Health Organization (WHO) defines health as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” — this constitutional definition has not been amended since 1948. Medicine should be concerned with the alleviation of suffering and the promotion of health in all these senses of personhood.

In stark contrast to Cassell's approach to personhood, EM relies on a biophysical account of health, one in which medicine's role is the maintenance or recovery of bodily homeostasis and adaptive functionality. Thus a healthy patient is one that functions best, where function is defined by adaptive functionality. Even suffering, in some of its forms, is naturalized by EM: “Selection need not maximize fitness in the vernacular sense of strength, health, and longevity. It does not necessarily enhance the welfare of the species or the happiness of the individual. In fact, many of the capacities for suffering seem to have been shaped by natural selection to serve special adaptive functions” (Williams and Nesse 1991, 3).

Yet given an alternative framework (such as that outlined by Cassell), a person might be healthy while adaptively dysfunctional or unhealthy while adaptively functional. Suffering becomes decoupled, though not entirely unlinked, from the biophysical body. Health, and the role of medicine, is not as straightforward as a biophysical approach suggests.

5.1. Objectivism Naturalized

One of the central messages of EM is the de-mechanization of the evolved body. An understanding of evolution helps us to realize that human bodies are not well-designed machines, but rather “bundles of compromises shaped by natural selection to maximize reproduction, not health” (Stearns et al. 2010, 1691). No matter how seamlessly our bodily systems may be integrated, bodies remain entrenched in the fitness trade-offs and developmental constraints of their evolutionary pasts. For instance, aging is an ontogenetic trade-off for reproductive success in early life, rather than a slow deterioration of a mechanical body. While the evolved body of EM is clearly more accurate than a mechanized body lacking evolutionary insight, EM simply trades one biophysical ideal for another: ideal health becomes determined by adaptive functionality rather than mechanistic integration. Adaptationist reasoning trades objective mechanism for objective functionalism, but neither objective ideal allows the possibility of a pluralistic approach health.

EM implicitly advocates a naturalized (or objectivist) concept of health, with adaptive functionality as the measure of health. This view is similar to Christopher Boorse's influential Bio-Statistical Theory (BST) — the classic objectivist stance — in which health is a statistical normality of species-typical function (1977; 1997). Boorse's view of function relied on adaptive functionality, much like EM, and aimed to defend a


13. It would be difficult to argue that EM simply contributes one of many pluralistic methodologies to medical practice, since it takes an objectivist stance to health that precludes such pluralism. I discuss such a stance in greater detail in section 5.1.
definition of health that was empirical, objective, and thus value free. In a sense, EM is the research program that justifies Boorse's view that “the normal is the natural — that health is conformity to a ‘species design’” (1997, 7). Slight deviations from the statistical norm may be harmless or beneficial, but larger deviations result in an absence of health (or “disease”). The BST relies on the concept of normal function: a statistically typical contribution of a biological part or process within members of a reference class to their individual survival and reproduction. Yet determining the threshold at which statistical deviations become diseases requires normative considerations; objectivists argue that these norms do not undermine the naturalism of this statistical interpretation.14 These normative judgments are given less conceptual priority than that afforded by social constructionists, but they remain an important roadblock to a completely objective account. The inevitability of such normativism suggests that a pluralistic approach is needed. Such objectification is perhaps inevitable in a research program that aims to uncover an ancestral human nature and then recommends individualized care based on such biologically deterministic claims.

6. CONCLUSIONS

As EM continues to grow in popularity, it will become increasingly important to explore pluralism and the conflict between objective and subjective accounts of health and disease. The widening gap between naturalism and normativism in the philosophy of medicine seems to parallel public and professional uncertainty about what counts as good medicine, how we should fund research in “alternative” medicines, and how we should aim to live the healthy life. These are both practical and philosophical questions at the forefront of unprecedented advances in biomedical theory and technology. The epistemic is ethical in the philosophy of medicine. Evaluating EM’s place in the clinic is about more than the role of evolutionary explanations in medical theory. This work challenges our craving for scientism and answers to “why” at the edge of life and death.

14. Boorse (1997), an exception here, argues that even such thresholds are objective. Also note that diseases need not be natural kinds to the objectivist, but rather superordinate classes delimited by human interests consisting of subordinate natural kinds that are empirically testable (Murphy 2008).
Bibliography


