Medicine in its Environment:

A repudiation of Domination and Detachment;

A return to Trust and Immersion

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Western medicine has inherited a worldview characterized by humankind dominating our natural environment. In *Perception of the Environment*, anthropologist Timothy Ingold traces the origin of our society's worldview to the transition from hunter-gatherer to pastoral communities[1]. I will show how the position of domination grounded the success of natural science and biomedicine on the one hand, and the societal negligence underpinning climate change on the other. For the field of medicine to mitigate the health threats presented by climate change, its relationship with the environment must be founded on trust and immersion. Thanks to the growing appreciation for complexity in medicine's understanding of disease, I argue what is most lacking is an explicit discussion of medicine's immersion within its environment. This discussion could take the form of simply accounting for all natural resource costs necessary for every step in healthcare delivery.

Humanity in Nature

"Let it be borne in mind how infinitely complex and close-fitting are the mutual relations of all organic beings to each other and to their physical conditions of life" [2]

– Charles Darwin

Ingold characterizes the trust of hunter-gatherers as comprising autonomy and dependency. Just as human relationships are cultivated over time with continued respect, so too with hunter-gatherers and the animals they hunt. They respect the autonomy of the animals by not imposing their will by force. Rather, a successful hunt is one where the animal intentionally presents itself to be killed (e.g., by standing still to

[1] Timothy Ingold, *The Perception of the Environment: essays on livelihood, dwelling and skill*, (Psychology Press, 2000).
[2] Charles Darwin, *The Origin of Species*, (1859), 34.

face the hunters instead of running). Animals choosing to do so reflects reciprocation for the trust they are shown over time. Hunter-gatherers manage resources by fostering respectful relationships with their environment and accepting only what is given. There is no concept of scarcity, and consequently there is no need for stockpiling. As Robin Ridington notes, rather than controlling nature, they control their relationship with it[3]. A corollary of a trust is an immersion with the environment characterized by interdependence. They exist as one node in a complex web of interconnected members of an environment in a "cosmic economy of sharing", and trust is integrated throughout[4]. Far from confronting nature, they yield to it[5].

In contrast, Ingold characterizes the domination of pastoralists as comprising control and separation[6]. Though equally dependent on their environment, they have sought to impose their will so that the animals are no longer autonomous. No longer is it the animal who chooses to be killed by presenting itself accordingly. Similarly, with the development of agriculture, no longer is the environment alive and providing what is needed, but it is passively manipulated to provide more than necessary. Instead of fostering a relationship with the environment, it became possible to control outcomes directly. A corollary of domination is a detachment from the environment characterized by a one-way direction of influence. In seizing control, pastoralists are no longer vulnerable to the environment's reciprocation because trust has been circumvented. The result is a disregard for the consequences of their actions on the quality of this relationship.

The spirit of domination and detachment endure in Western culture today. No

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[3] Robin Ridington, *Technology, world view and adaptive strategy in a northern hunting society,* (Canadian Review of Sociology and Anthropology, 1982*),* 471.
[4] Ingold, *Perception*, 66-69.
[5] Richard Nelson, *Make prayers to the raven: a Koyukon view of the northern forest, (*University of Chicago Press, 1983), 240
[6] Ingold, *Perception*, 72.

longer are we immersed in our environment in an interdependent network, for we have climbed beyond the reach of consequence to stand separate from our environment. No longer must humanity depend on the whims of our environment for we have become its master.

Biomedicine as domination and detachment

"The rise of science propelled man into tunnels of specialized knowledge. With every step forward in scientific knowledge, the less clearly he could see the world as a whole or his own self." [7]

- Milan Kundera

Mastering our environment was epitomized by the pioneers of modern natural science (Galileo, Newton, Descartes) who established the idea that the universe itself is a vast machine which could be harnessed through scientific understanding to serve human interest[8]. Science, after all, is a means of acquiring knowledge of the world that can be used to control outcomes. Natural science is premised on the subject (humans) being detachment from the object of inquiry (the natural world)[9]. Descartes extended this separation to its (arguably illogical) extreme by divorcing the mind from the body[10]. With this move, Descartes could take the human body itself as an object of study. In framing the human body as a machine[11], Descartes provided the precursor for the biomedical conceptions of the human organism[12]. The field of medicine is especially

[7] Milan Kundera, *The Unbearable Lightness of Being*, (Faber and Faber, 1984), 15.
[8] Ingold, *The Perception*, 294
[9] Ingold, *The Perception*, 102.
[10] Rene Descartes, *Meditations, objections, and replies*, (Hackett Publishing 2006).
[11] James Marcum, *An Introductory Philosophy of Medicine: Humanizing modern medicine,* (Springer Science & Business Media, 2008), 49.
[12] Elizabeth Dixon Whitaker, *Health and healing in comparative perspective,* (Prentice Hall, 2005), 299.

indebted to Descartes for this reason. In the words of St John and Davis-Floyd, "to conceive of the body as a machine was to open it up to scientific investigation".[13]

With the human body under the microscope, the biomedical model got a foothold and enshrined as its chief value the principle of separation: things can best be understood out of context[14]. The context in which things are understood is instead a contrived one where variables are controlled and manipulated one at a time to determine the contribution of any variable to the measured effect. The first implication is that science can only address phenomena which are empirical, i.e., things that can be measured[15]. Second, as this process can only divide phenomena into smaller pieces (by teasing variables apart), it hinges on the reductionist philosophy which claims we understand phenomena by understandings its elemental parts[16]. Finally, the effect must be observer-independent, therefore the subject must be separate from the causal relationships.

This framework for acquiring knowledge on death and disease has been pivotal in advancing the field of medicine. Germ theory, the hypothesis that some diseases are caused by microorganisms, is a definitive success. Within the framework of science, Robert Koch formalized criteria to establish causality between microbe and disease[17], and Alexander Fleming confirmed his fortuitous discovery of a mould (penicillin) that inhibited bacterial growth[18].

Dominating our environment remains entrenched in the spirit of medicine as we undertake projects of growing sophistication. Consider the impressive technique of

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[13] Gloria St John and Robbie Davis-Floyd, *From Doctor to Healer: The Transformative Journey*, (Rutgers University Press, 1998), 19.
[14] Ibid,, 17
[15] Mari Womack, *The Anthropology of health and healing*, (Rowman Altamira, 2009), 176.
[16] St John and Davis Floyd, *From Doctor to Healer*, 34.
[17] Robert Koch, *Uber bacteriologische forschung*, (Dtsch Med Wochenschr, 1890), 16:756–757.
[18] Alexander Fleming, *On the antibacterial action of cultures of a penicillium, with special reference to their use in the isolation of B. influenza*, (British Journal of experimental pathology 1929), 10, no.3, 226.

optogenetics which entails inserting a microbial gene into a neuron thereby granting control of neuronal activation to whomever shines a light over the mouse's head[19], or consider the innovations supporting the growth of whole organs in a lab[20]. The hubris of vanquishing disease has spilled into the public sphere, with Bill Gates committing to eradicate polio[21] and Mark Zuckerberg pledging $3billion to "rid the world of all disease"[22]. Masters of the natural world indeed.

Delusion mistaken for Domination

"[Modern man] even talks of a battle with nature, forgetting that, if he won the battle, he would find himself on the losing side."[23]

– Ernst Friedrich Schumacher

Scientific innovations have enabled increasingly complex methods of harnessing energy from the environment, resulting in the combustion of fossil fuels (remnants of organic life from approximately 350 million years ago[24]). The world bank estimates 81% of current global energy consumption is comprised of fossil fuel use[25]. Humanity's reliance on fossil fuels is widely recognized as the main contributor to the increase in

[19] Karl Deisseroth, *Optogenetics: 10 years of microbial opsins in neuroscience*, (*Nature neuroscience*, 2015), 18, no. 9, 1213.
[20]Michelle E Scarritt et al, *A review of cellularization strategies for tissue engineering of whole organs*, (Frontiers in bioengineering and biotechnology, 2015), 3.
[21] The Gates Foundation, "Polio – Strategy Overview", Accessed October 9, 2017. https://www.gatesfoundation.org/What-We-Do/Global-Development/Polio
[22] Marion Dakers, "Mark Zuckerberg pledges $3bn to 'rid world of all disease'", *The Telegraph Journal*, Published September 22, 2016. http://www.telegraph.co.uk/business/2016/09/21/facebook-founder-zuckerberg-puts-3bn-to-work-on-curing-all-disea/
[23] Ernst Friedrich Schumacher, *Small is Beautiful: a study of econonmics as if people mattered,* (Vintage 1973), 14.
[24] Anthony Costello et al, *Managing the health effects of climate change*. (The Lancet, 2009), 373 no. 9676, 1693-1733.
[25] International Energy Agency, "Fossil Fuel Energy Consumption", *The World Bank*, Accessed October 9, 2017. https://data.worldbank.org/indicator/EG.USE.COMM.FO.ZS

global temperatures referred to as climate change[26].

The punchline is that science, the discipline that objectified our environment in asserting a separation of subject and object, now provides evidence illustrating this separation has been illusory. Credit where credit is due, Nobel laureate Svante Arrhenius suggested in 1896 that human activity could warm the planet by adding CO2 to the atmosphere, but the contributions were thought to be minimal to the point of irrelevance[27]. Unbeknownst to humanity, however, consequences were steadily accruing, invisible but existent. Today climate change should serve as a compelling counterpoint to the narrative of domination of our environment. The causal pathways may have grown long and winding, but humanity has been unable to escape the consequences of our actions.

The consequences, now painfully obvious, directly pertain to the field of medicine. Climate change is expected to have substantial effects on human health across the globe[28]. Increased temperatures lead to broader geographical regions for vector-borne diseases (e.g., Lyme disease, malaria) and exacerbations of cardiovascular, kidney, and respiratory illnesses[29]. Worsened air quality (e.g., increase pollen, changes in precipitation) further exacerbates respiratory illnesses[30]. Extreme weather events (e.g., hurricanes, droughts, tornadoes, floods, rising sea levels) disrupt social infrastructure, food security, and lead to environmental degradation[31]. All the above inevitably accumulate in downstream effects on community health and cohesion.

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[26] S. Solomon et al, Intergovernmental Panel on Climate Change, *Climate change 2007. The physical science basis. Contribution of working group I to the fourth assessment report of the intergovernmental panel on climate*, (Cambridge University Press, 2007).
[27] Costello et al, *Managing the health effects of climate change*.
[28] A. Crimmins et al, *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment*, (U.S. Global Change Research Program, 2016)
[29] Ibid
[30] Ibid
[31] Ibid

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A Repudiation of Control

"In both macro and microecology, human beings appear, as Harvard's Dick Levins put it, 'utterly incapable of embracing complexity'."[32]

– Laurie Garrett

The field of medicine is faced with a tough pill to swallow. Its inherited worldview of dominating the environment, the one which grounded its success, is contributing to "the biggest global health threat in the 21st century"[33]. To be sure, this is not solely a medical problem but a societal one. But what good are the values of medicine if it cannot seriously engage such a threat to human health? The path forward should be guided by a return to a relationship with the environment founded on trust and immersion. Respectively, this means in the place of control, there is complexity. In the place of detachment, there is immersion.

To the first point, repudiating control in favour of complexity is not so radical a development. On the contrary, in many respects this is already the norm in medicine. First, consider that the statistical significance of a therapy from a randomized controlled trial offers no guarantee that it will be efficacious for any given patient. Second, consider how the adversarial relationship with microbes has grown nuanced over time. Antibacterial resistance shows our dominance over bacterial infections was short-lived, and the discovery of the microbiome (microorganisms living in a symbiotic relationship with the human body) shows we are interdependent rather than detached. Ironically, antibiotic treatment is itself a risk-factor for a *C. difficile* (bacterial) infection because it

[32] Laurie Garrett, *The coming plague: newly emerging diseases in a world out of balance*. (Farrar, Straus and Giroux, 1994), 619.
[33] Costello, *Managing the health effects of climate change*, 1.

can wipe out the microbiome[34]. Finally, the field of public health has largely shifted its focus to risk factors and broader perspectives on determinants of health, including the complexity in integrating across personal, social, political, and economic levels[35].

These examples illustrate the shades of grey between health and disease, and external and internal origins of disease. Medicine traditionally orients itself in antagonism with disease, yet disease is as much a part of life as any other aspect of our biological world[36]. Medicine traditionally frames diseases as having a single cause, yet "although the clinically detectable stimulus may be a virus or vitamin deficiency, disease itself is the end of a chain of factors related to ecosystem imbalances"[37]. In sum, there is a growing appreciation in the field of medicine of the limitations of scientific knowledge and the pursuit of control. In considering the complexity of the world and humanity's place within it, the pursuit of domination is slowly being abandoned to make room for a return to trust.

A Return to Immersion

"I drained the pond and the woods beyond for dinner, and the river for a song
The more I've got the more I want. I'm blinded but I'm waking up!"[38]

– Tim Baker

The more radical development will be for the field of medicine to re-immerse itself in its environment from a position of detachment. Only when the field perceives

[34] CDC (Centers for Disease Control and Prevention), "Clostridium difficile infection", Accessed October 9, 2017. http://www.cdc.gov/hai/organisms/cdiff/cdiff_infect.html
[35] Robert E. McKeown, *The epidemiologic transition: changing patterns of mortality and population dynamics,* (American journal of lifestyle medicine, 2009), 3, 19S-26S, 4.
[36] Michael Alan Park, *Biological Anthropology: An Introductory Reader,* (McGraw-Hill, 2008), 5th ed, 373-374.
[37] Ann McElroy and Patricia K. Townsend. *Medical anthropology in ecological perspective*. (Westview Press, 2014), 30.
[38] Tim Baker, *Tired Eyes*, (Hey Rosetta!, 2008). http://heyrosetta.com/lyrics/tired-eyes/

itself on equal footing with its environment can it be mindful of the quality of its relationship with the environment. Consider for example the shaman in some indigenous cultures that play the role of "ecological broker"[39]. Illness is taken to be the consequence of a person's upsetting an ecological balance[40], and the shaman's role includes managing local resources accordingly. In other words, the healer's role is to make explicit the interdependent relationship between health and environment.

With respect to therapies, medicine accepts this relationship implicitly. Mainstays of western medicine originate from natural products: morphine, opium; aspirin, white willow tree; Coumadin, sweet clover; vinblastine and vincristine, periwinkle plant; ACE-inhibitors, pit viper; statin and penicillin, microbes[41]. Almost 50% of new drugs between 1981–2006 had origins in natural products[42]. Yet medicine is lost in the globalized world. Ingold notes that "the notion of a global environment, far from marking humanity's reintegration into the world, signals the culmination of a process of separation"[43], for now the world as a whole is an object of appropriation for humanity[44]. Medicine is stranded in a capitalist economy where the "cash nexus has become the sole connection between human beings and nature"[45].

In an effort to re-immerse the field of medicine and situate it within its environment, I propose two questions that should accompany every step in the delivery of healthcare. First, how many natural resources are required? Second, where are these resources coming from? Consider the following examples. In the same way

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[39] Gerardo Reichel-Dolmatoff, *Cosmology as ecological analysis: a view from the rain forest,* (Man,1976), 307-318.
[40] Bradley C Bennett, *Plants and people of the Amazonian rainforests*, (BioScience, 1992), 42, no. 8, 599-607.
[41] Eric Chivian and Aaron Bernstein. *How our health depends on biodiversity*. (Centre for Health and the Global Environment, Harvard Medical School, 2010).
[42] David GI Kingston. "Modern natural products drug discovery and its relevance to biodiversity conservation." *Journal of natural products* 74, no. 3 (2010): 496-511.
[43] Ingold, *The Perception of the environment,* 209.
[44] Ibid, 214.
[45] John Bellamy Foster et al, *The vulnerable planet: a short economic history,* (NYU Press, 1994), 121.

physicians know the side effects and financial cost of a given therapy, or the process of pharmaceutical drug development, so too should they know the natural resources required to produce a given therapy, or the origin of the resources required to operate their community hospital. In the same way that scientific journals require disclosures of conflict of interest, so too should there be a required discussion on costs incurred to the environment.

How these questions are answered, and how this information would be conveyed is beyond the scope of this paper. Although these concerns raise exceptional challenges of their own, they are frankly secondary given the striking absence of initiative from the field of medicine in normalizing this discussion of its immersion within the environment.

Conclusion

Western medicine has inherited a worldview characterized by humankind dominating our natural environment. This stance grounded the success of natural science and biomedicine on the one hand, and the societal negligence enabling climate change on the other. For the field of medicine to mitigate the health threats presented by climate change, its relationship with the environment must be founded on trust and immersion. Thanks to the growing appreciation for complexity in our understanding of disease, I argue what is most lacking is an explicit discussion on medicine's immersion within its environment. It is only by acknowledging the many ways in which we ask of the environment can we then learn how to give back.

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