# *The heart pumps. Or does it? The politics of biomedicine, the objectivity of science and the way we know the world*

# "The heart is a pump. Or is it?"

## The politics of biomedicine, the objectivity of science and the way we know the world

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This paper evaluates the present understanding of the heart-pump model as a fact of life and the mechanisms that sustain it to examine parallels to and implications for the study of politics and international relations. It argues that the heart-pump model is a unique metaphor and model for the development of important concepts of political order and the study of war and peace. Yet the evidence at the core of the heart-pump model shows it to be outdated, sustained by political and economic incentives and the nature of scientific research practices, reinforcing existing power structures. The same observations hold for key concepts and assumptions in politics and IR. Jointly, they demonstrate parallels in thinking that raise concerns over the present emphasis of making the social sciences more 'scientific'. There is a need for politics and IR to examine political forces that shape the production of knowledge and to critically evaluate rather than merely adopt allegedly objective scientific methods.

“The heart is a pump.” To anybody who has sat through basic cardiovascular principles taught in physiology classes and medical schools around the world, the idea that the heart may not be a pump would appear to be about as logical as suggesting that the earth is flat or that water flows uphill. Indeed, since the introduction of extracorporeal circulation into clinical practice in the 1950s, whereby the heart could temporarily be replaced by a mechanical device, the notion that “the heart is a pump” has been fixed in the collective unconsciousness of physicians and non-physicians alike. Yet a closer look at the assumptions that underlie the heart-pump model – one of the fundamental workings of physiology and of human life itself – reveals comprehensive evidence that renders it outdated if not obsolete, and raises important questions about the politics of biomedicine and the supposed objectivity of scientific research. In spite of evidence to the contrary, why does the heart-pump model persist? Are there connections between the way we think about the workings of the heart and widely-held truth claims and approaches to key concepts in the social dimensions of human life - the forces that regulate in this case not the interplay of cells, but human co-existence, order and disorder; war and peace? The exploration of these questions that began as an attempt to think creatively across traditional disciplinary boundaries, is of particular interest at a time when there is a renewed drive to make the study of politics and international relations more ‘scientific’, with its implications of increasing methodological rigor and sophistication.

A meaningful investigation of these questions begins with a brief summary of the most widely accepted model of circulation to date. Put simply, the heart, i.e. the “pump”, located in the upper third of the human body, pushes the blood through an intricate

system of blood vessels. Oxygenated blood goes through the arteries up to the brain, then u-turns to make its way down to hands and feet, slowing down on its path. Once all the oxygen has been passed on, the blood u-turns again, picking up speed as it travels through the veins back up to the heart. What sounds like a simple process is in fact a major undertaking: If all of a human's blood vessels were laid out in a straight line, they would be about 60,000 miles long. In practice, this means that the heart is pumping a sticky fluid more than twice around the world, slowing down a bit after the first loop. Moreover, the heart sends the blood on this journey thousands of times a day, for an average of some sixty-plus years. More than just difficult to imagine, the model defies some basic physical principles. For example, the circulatory system is predominantly downhill at first (blood leaving the heart), and predominantly uphill on the way back (blood coming back in). Why is the pump close to the "top" when the body might take advantage of gravity to draw the blood "down""? One would assume that the "getting back up" is the part that needs pumping. Furthermore, the arteries through which the blood leaves the heart resemble a flexible tube – similar to a garden hose – that is bent into a pronounced curve. If water is pushed with great force through a garden hose, what happens to any curves in the hose? They would straighten out temporarily. But when the heart "pumps," the aortic arch stubbornly bends backwards and downhill. From the perspective of fluid dynamics, and indeed many others, the model does not hold up.

Why should this be of interest to social scientists, especially to those in the fields of politics and international relations? At one level, the heart-pump model and the controversy that surrounds it speak to fundamental assumptions about the forces that

regulate human life. For example, a core assumption of the heart-as-pump model can be expressed this way: it theorizes that if we want to go one way, we should start off in the opposite direction. There are many examples of key ideas both in the study and the conduct of politics and international relations that appear to follow a similar logic: "The way to achieve peace is through war." "If we capture or kill enough bad people, a peaceful world will result." "Military intervention will end terrorism". Of course, past and present experiences of war, from the early wars in Iraq during the 1980s and 1990s to the many battles conducted in the name of the war on terror, show that these assumptions are not nearly as robust as they at first appear. While these are familiar observations for a social scientist, one would be less inclined to expect similar patterns in the allegedly more objective area of biomedicine.

Indeed, in the light of the shortcomings of the heart-pump model and its social-science correlations, it seems hardly surprising that alternative explanations have developed. Models of the circulatory system have been proposed which emphasize peripheral factors as playing an equal, if not more important role in the control of cardiac output, following key discoveries in a wide variety of fields ranging from early embryonic circulation, comparative phylogeny, and exercise physiology to advanced cardiac imaging and a range of clinical scenarios (Schad 2006; Rohen 2007; Sedmera 2011). A comprehensive review of these findings in the extant literature (Furst 2014) demonstrates that circulation is not the result of the workings of the alleged "heart pump": rather, it shows with remarkable clarity that blood, an organ in its own right which self-regulates flow in response to the metabolic demands of the tissues, is the primary regulator of cardiac

output. The heart, rather than being an organ of blood propulsion, assumes a secondary role and generates pressure by impeding the flow of blood.

If we pause here for a moment to reflect on correlations to the social world, we might observe that the established ”heart as a pump” model and its criticism present a rather unique metaphor illustrating centralized versus decentralized forms of political order. On the one hand, the “accepted” way of thinking about the role of the heart requires us to believe that the reason there is circulation is because of one central organ. Yet if the comprehensive review of research findings in related fields is correct, then the heart is not a pump. Rather, there are billions of independent and cooperatively working units, all making necessary if not vital contributions to the process of circulation. The central organ only has a listening role in this process. Put more generally, the conclusion drawn here applies in equal measure to the physical human body, the social body of the state and the international state system at large. Together they point to the parallel ways of thinking about “order” in the medical sciences and politics and international relations. However, the analysis of parallel conceptual structures in science and social science is not new and many contemporary examples come to mind, ranging from the conceptualization of counter-terrorism as a means for immunizing against terrorism, and counterinsurgency warfare (e.g. in the US Army/Marines’ COIN manual) as a form of triage (Elbe 2010, Howell 2011, Bell 2012). Central to these discussions, albeit not always explicitly addressed, is the question of origin: are scientific frameworks applied to the social world or vice versa? The arguments point in different directions and, while definitive conclusions have yet to be reached, the conceptual structures are remarkably similar.

Beyond such analogies, the heart-pump model raises a number of interesting questions about research methods and objectivity as well as power and 'truth' that are of particular interest to political scientists. In the face of overwhelming evidence against it, why does the heart-pump model persist? Why is it that research findings that do not fit the conventional way of thinking but point to a more complex reality are largely relegated to the sidelines of academic discussion? Several explanations come to mind. Without wanting either to overtheorize or to oversimplify the matter, an important issue is the politicization and commoditisation of medicine and the human body. Data is increasinly viewed as good or useful data if it fits with prevailing political and economic interests. The extent to which nuclear physics has been determined by US military research funding is one of the better known examples of the extent to which political interest has shaped the boundaries of scientific knowledge (Gusterson 2004). In the case of the heart, a huge medical market – from medical devices such as stents and pacemakers to the pharmaceuticals such as beta-blockers and epinephrine – depend and build on the validity of the heart pump model. Arguments that expose the limitations of these remedies and their inability to address the complex nature of disease are unlikely to alter significantly the status quo, especially if meaningful alternatives to existing approaches are not offered. Again, parallels to the world of politics and international relations abound: Insistence on root causes of terrorism when research since the 1970s has shown the lack of predictable profiles, or the persistence of the idea of the "Salafi Jihad" in the face of anthropological evidence that it is a superficial description that bears little relation to reality are only the most contemporary examples (Hellmich 2011; Gunning & Jackson 2012). In both cases,

medical science and political science alike, the shortcomings of the respective approaches and failure to engage with more appropriate alternatives have been widely documented, but still this body of knowledge continues to be marginalized. Similar to the medical field, there is a large terrorism industry that benefits from both the simplification of deeply complex political problems and the advocation of counter-terrorism strategies which stand little chance of producing long-term benefits.

While a more detailed investigation of the medical and counterterrorism industries is beyond the scope of this paper, in both cases the production, prevalence and utilization of outdated concepts and beliefs is better explained by power and interests rather than academic merit. This is not simply a case of financial motives, however. There are many factors at play that range from the initial selection of research methods to the complex dynamics involved in the publication of results – factors which are subtle, and often subconscious and even unintentional, yet can be immensely powerful in the development and reproduction of an established view of the facts. Interestingly, in the case of terrorism studies, for example, detailed investigations of methodological problems have revealed a myriad of issues, including the prevalence of circular research systems and feedback loops; facts that were (falsely) claimed and subsequently cited in proper academic manners; "gate-keeping" – the presence of research groups and editorial teams with preferences for particular views and positions which effectively limit access to high-impact journals, and many more (Reid 1997; Silke 2004; Ranstorp 2007; Hellmich 2011; Stampnitzky 2013). Drawing on Foucault well-known argument of "subjugated knowledge", the result of these processes is what Richard Jackson fittingly describes as

the "known unknowns" in the world of terrorism studies (Jackson, 2012). While awareness of these issues is yet to lead to meaningful change, the mechanisms that produce such outcomes are well documented in the relevant academic literature.

According to a recent article in *Nature*, the same cannot be said about the methodological problems in the bio-medical sciences in the same manner. "Talking to scientists, both in academia and in industry, there seems to be a general impression that many results that are published are hard to reproduce. However, there is an imbalance between this apparently widespread impression and its public recognition and the surprisingly few scientific publications dealing with this topic. Indeed, to our knowledge, so far there has been no published in-depth, systematic analysis that compares reproduced results (Prinz, Schlange and Asadulla 2011)." While insufficient statistical analysis and insufficient sample sizes have been identified as problems, the more obvious "political" reasons are still in need of detailed analysis. For example, Prinz et al. speculated that "there is immense competition among laboratories and a pressure to publish. It is conceivable that this may sometimes result in negligence over the control and reporting of experimental conditions. There is also a bias towards publishing positive results that are more readily accepted in good journals, concerns about hurdles to publishing results that contradict data from high-impact journals or the currently established scientific opinion in a given field, which could lead to the literature supporting a certain hypothesis even if there are many (unpublished) data arguing against it." These are the exact same problems that lead to the marginalization of research findings that contradict and challenge the established discourses in the field of terrorism studies.

The case of the heart-as-a-pump model reveals several parallels between bio medical science and politics that range from metaphors of and models for order and co-existence in cellular systems that can be applied to human societies to complex challenges in research methods and dissemination of results. While interesting in their own right, opening many avenues for research and inquiry, they compel us to revisit basic epistemological questions: is the world that we observe and measure the basis for the world that we theorize and conceptualize, or is it the other way around? What biases and preconceived notions are embedded in the research and thereby reproduced? What are the "known-unknowns" and how can they be brought to light? As Willow Williamson gently reminds us in her honest reflections on the research process, the ever-popular notion of the "objective researcher" diminishes when we acknowledge the nature of human beings and their embededness in the social world that so fundamentally shapes and determines the way we produce knowledge and truth.

Observing these similarities between the study of politics and biomedicine and recalling the broader interdependence between science and social science are of particular value at a time that is marked by renewed efforts to make the social sciences more scientifically rigorous, objective and reliable. For example, the current trend in politics and international relations that prioritizes quantitative research at the expense of qualitative and theoretical work appears to be driven by an idealistic understanding of scientific research methods that does not hold up to reality. Both fields are struggling with

methodological problems and questions over definition, conceptualization and knowledge production that are, at their core, political in nature.

Rather than making the study of politics more scientific, one may wonder, maybe the aim should be to make the sciences less political. But that, in its ultimate application, would be akin to draining the physical body of its blood while still expecting it to operate. The task at hand is not rending science away from politics, but to acknowledge that politics is the blood that delivers oxygen the sciences (and the scientists) breathe. The sciences are so fundamentally shaped by political, military and economic forces that it is not possible or indeed desirable to de-politicize, de-securitize or de-militarize them. Rather, the task at hand is to understand and acknowledge the ways in which the two spheres interact: to question existing models rather than rewarding research that affirms the status quo; to acknowledge that complex issues of power shape research results; to contemplate ways to move beyond the forces and constraints that currently shape the production of knowledge – in science and social science alike. There is a need for scholars of politics and international relations to engage with science – to address issues that range from examining political forces that shape the production of scientific knowledge to critically evaluating rather than merely adopting allegedly objective scientific methods and assumptions as they pertain to issues such as counter-terrorism, foreign policy, identity, etc. In the big picture, acknowledging the close relationship between science and social science renders redundant the notions of the a-political scientist and the social sciences as the refuge for those who don't do math.

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