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Other Non-Naturalistic Methodologies in Modern Practice

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Abstract

Some fields already incorporate alternatives to methodological naturalism. However, few people outside the field are familiar with these alternatives or how they are used. Sometimes these non-naturalistic methodologies are being used without the participants' cognizance that the methodology is not methodologically naturalistic. Here, we show a smattering of fields that we are aware of that have touched upon methodologies that don't depend on naturalism.

1 Introduction

While methodological naturalism has become the de facto standard in many fields, there have been a number of subfields of different disciplines that operate according to different rules. In some cases, the disconnect with methodological naturalism is not made explicit and, in fact, may be unknown to the participants. In other cases, the disconnect with methodological naturalism is clear and explicit.

The goals of this paper are:

1. to show that academic inquiry can be effective outside of naturalism
2. to promote non-naturalistic approaches from some fields to inspire similar techniques in other fields
3. to show how non-naturalistic thinking makes better sense of fields that are not aware of their use of non-naturalism, and how making their non-naturalistic aspects explicit can deepen their results

Hopefully, this paper provides inspiration and ideas for moving the non-naturalistic program forward in a variety of fields.

2 Methodological Dualism in Austrian Economics

One of the places where methodological naturalism has had an explicit challenge is in economics. In the late 1800s, a dispute arose within economics as to the role of history and the role of individuals. Menger (1883) criticized the so-called "historical" school of thought that considered economic activity entirely the result of preceding history. It could be viewed simply as a necessary outgrowth of what came before. Menger, instead, believed that it was the circumstances and choices of individuals (both as individuals and corporately) that drove the economy. According to Menger, the so-called "historical" school did not understand history and was of the opinion that while history had parallels and worked *within* useful theoretical systems, the historical school's simplistic view over-emphasized the degree to which corporate economic patterns were similar.

Menger noted that various parts of society could be separated into things that were comparable to *organisms* and things that were comparable to *mechanisms*. Those comparable to organisms were essentially ineffable to the science of economics, but those comparable to mechanisms were amenable to calculation. Therefore, humans are able to use their will to achieve ends by making mechanisms, and groups of humans are able to use their collective will to achieve ends by making social mechanisms. While economics can properly measure the effects and results of the *mechanisms* that are established by these acts of will, economics does not have access to the originating choices that instantiated them.

This idea of a separation of will and mechanism was more formally defined in von Mises (1949). Here, Mises defines what he calls *methodological dualism*. In this understanding, human choices are irreducible to physical phenomena and must be considered as first-class entities. Furthermore, even if human choices *could* be reduced to other phenomena, in our present state of understanding, we do not have access to this, and therefore, as a matter of *methodology*, choice must be considered an irreducible entity. As Mises explains:

> Concrete value judgments and definite human actions are not open to further analysis. We may fairly assume or believe that they are absolutely dependent upon and conditioned by their causes. But as long as we do not know how external facts—physical and physiological—produce in a human mind definite thoughts and volitions resulting in concrete acts, we have to face an insurmountable *methodological dualism*. In the present state of our knowledge the fundamental statements of positivism, monism and panphysicalism are mere metaphysical postulates devoid of any scientific foundation and both meaningless and useless for scientific research.

> Reason and experience show us two separate realms: the external world of physical, chemical, and physiological phenomena and the internal world of thought, feeling, valuation, and purposeful action. No bridge connects—as far as we can see today—these two spheres. Identical external events result sometimes in different human responses, and different external events produce sometimes the same human response. We do not know why.
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> In the face of this state of affairs we cannot help withholding judgment on the essential statements of monism and materialism. We may or may not believe that the natural sciences will succeed one day in explaining the production of definite ideas, judgments of value, and actions in the same way in which they explain the production of a chemical compound as the necessary and unavoidable outcome of a certain combination of elements. In the meantime we are bound to acquiesce in a methodological dualism.

(von Mises, 1949, pgs. 17–18)

Thus, while methodological naturalism presumes that all events have causes that are reducible to mechanisms, methodological dualism takes as a methodological presumption the idea that human will is not reducible in this way. Similar to methodological naturalism, this does not directly *impose* the metaphysical viewpoint of dualism on the practitioner, but merely adopts it as a methodological requirement. However, such methodology certainly sits more comfortably with those who have a matching metaphysic.

This viewpoint has been extended in recent years through the work of Gilder (2013) and Thiel and Masters (2014). Gilder (2013) extends methodological dualism by adding a new component—human *creativity*. While traditional Austrian economics focuses on human *choices*, Gilder focuses on the creativity that is required for macroeconomic growth. According to Gilder, typical macroeconomic models that leave out human creativity and try to reduce the operation of the economy to an equation miss the mark entirely. The economy is not a grand equation such that if we put in the right values in the right places we will get economic growth. Bagus (2016) shows that perceiving the economy in this (naturalistic) way is what has led to the economic catastrophes of the twentieth and twenty-first centuries.

Instead, Gilder (2013) shows that the economy grows when individual creativity, which is not reducible to equations, is allowed to flourish and is given proper feedback. Therefore, the goal of economics is not to explicitly grow the economy (since we cannot, in principle, predict creativity), but rather to enable the conditions that allow creativity to operate most effectively—provide enough freedom, stability, and feedback to allow the creative operation to work. In other words, any attempt to dictate the performance of the economy will be fundamentally flawed. Instead, one needs to prepare the economy to better nurture and incorporate the unpredictable creativity of the economy's members.

Thus, this view of economics relies on a distinction between what can be known through mechanism (i.e., equations) and what requires non-mechanical input (i.e., creativity). Only by recognizing this distinction can economics properly aid in the growth of the economy.

Thiel and Masters (2014) provides a further expansion of this idea into microeconomics. In his book, Thiel recognizes the difference between what can be done on an individual basis via human cognition and what can be done via algorithm (i.e., equation). Thiel states:

> computers are far more different from people than any two people are different from each other; men and machines are good at fundamentally different things. People have intentionality—we form plans and make decisions in complicated situations. We're less good at making sense of enormous amounts of data. Computers are exactly the opposite: they excel at efficient data processing, but they struggle to make basic judgments that would be simple for any human....
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> In 2012, one of [Google's] supercomputers made headlines when, after scanning 10 million thumbnails of YouTube videos, it learned to identify a cat with 75% accuracy. That seems impressive—until you remember that an average four-year-old can do it flawlessly. When a cheap laptop beats the smartest mathematicians at some tasks but even a supercomputer with 16,000 CPUs can't beat a child at others, you can tell that humans and computers are not just more or less powerful than each other—they are categorically different. (Thiel and Masters, 2014, pgs. 143–144)

Thiel uses this categorical difference between humans and computers to recognize that one of the most powerful ways to achieve high profits is to identify axioms that other people aren't aware of, which he illustrates in his question, "What important truth do very few people agree with you on?" (Thiel and Masters, 2014, pg. 12).

According to Thiel, developing new axioms is what leads to economic growth. Businesses based on existing knowledge and ideas move the economy from 1 to N, but an axiom can move the economy from 0 to 1. In other words, new axioms allow the creation of completely new areas for economic development. Once the axiom is developed, it can then be replicated and used by others throughout the economy, but the primary *driver* for growth is attaining the axiom in the first place. This idea was also indicated in theoretical studies in the *Engineering and Metaphysics* conference (Bartlett, 2014b,a).

As indicated by Robertson (1999) and Bartlett (2014b), the development of new axioms cannot be understood in a naturalistic way. Thus, we can see that in economics non-naturalistic methodologies allow us to better recognize the types of phenomena we are seeing as well as better understand their relationships.

3 Human Computation and Artificial Artificial Intelligence

The commitment to methodology is a double edged sword. On the one hand, it can enforce a point of view that ignores facts, but on the other hand, a fact-based methodology can enforce a point of view that is contrary to the reigning paradigm. We have seen this in economics, where necessity forces economists to adopt a dualistic perspective regarding the human and mechanical realms of the economy.

Similarly, computer science is faced with the necessity of methodological dualism. In the age of widespread social technologies, such as the personal computer, the Internet, and Facebook, humans are both the consumer and the product. Computer scientists will give lip service to the monism of computer science, General Artificial Intelligence (GAI), but agree that until GAI arrives it is much more useful to include the human in the loop. There is great disillusionment with the promise of GAI because it has been 'imminent' since Alan Turing invented the Turing machine more than half a century ago.

Methodological dualism in computer science is particularly apparent in the rise of Human Computation (HC) and Artificial Artificial Intelligence (AAI) (The Economist, 2006). Human computation is the use of human generated solutions to tasks for which there is no known algorithmic solution. The tasks are normally micro-tasks, which can be completed quickly by most Internet users with minimal-to-no training. Examples of these tasks are identifying objects in images, identifying parts of speech in sentences, and transcribing audio recordings. These tasks are trivial for a child but elude the most powerful supercomputers.

The micro-tasks are aggregated algorithmically and/or using further human input (Dai, Mausam, and Weld, 2011), and the resulting hybrid system is termed Artificial Artificial Intelligence. The system gives the appearance of algorithmically solving a particularly problem by looking like traditional artificial intelligence, but the inner workings are fundamentally dependent upon continuous human interaction.

The concept of human computation first caught the public's attention through the pioneering work of Luis Von Ahn's now ubiquitous CAPTCHAs (Law and von Ahn, 2011) and the scientific breakthroughs of the Foldit project. One of the most well-known breakthroughs made headlines because amateurs reverse engineered the crystalline structure of an HIV protease, a feat that has escaped the most powerful supercomputers and experts (Khatib, DiMaio, Cooper, Kazmierczyk, Gilski, Krzywda, Zabranska, Pichova, Thompson, Popović, Jaskolski, and Baker, 2011).

Capitalizing upon these successes, Amazon has released a public micro-task platform, Mechanical Turk (named after "The Turk," an eighteenth century HC originator), that is widely used by academic researchers and Internet companies (Bolt, 2005). However, human computation is not merely a niche interest. Companies such as Google, Facebook, and Microsoft are so reliant on HC to make their algorithms run that they have created their own internal platforms (Marcus and Parameswaran, 2015). Arguably, HC is the fuel powering the entire Internet revolution. It is human-produced information that is so widely sought after on all Internet platforms.

In retrospect, it is ironic that artificial intelligence has become even more hyped as the necessity of methodological dualism becomes ever more pronounced. AI is the corollary of methodological naturalism in computer science since AI is predicated upon reducing the mind to hardware. Yet, as a quote widely attributed to Yogi Berra has told us, "In theory there is no difference between theory and practice. In practice there is."[1] The need for practitioners to discard methodological naturalism in favor of dualism to get things done cautions us that methodological open-mindedness is more pragmatic than methodological dogmatism.

4 Moral Philosophy in Online Transaction Analysis

One of the main pitfalls in online commerce platforms is the issue of detecting fraudulent charges. The difference between whether an online enterprise is profitable or unprofitable often rests on the platform's ability to prevent or catch fraudulent transactions. The Internet creates an especially problematic source for fraud as there is no distance on the Internet between the person perpetrating the fraud and the company being defrauded. While in the physical world there is a limit to the how much fraud can occur in a given locality based on the number of people willing to commit fraud, on the Internet there is not a similar natural barrier. Because of this, fraud detection and prevention have become very problematic areas for high-profile commercial websites.

The book *Start-Up Nation* Senor and Singer (2011) recounted the story of how an enterprising company, Fraud Sciences, used moral philosophy to quickly and accurately detect fraudulent transactions on PayPal. It describes the meeting between Fraud Sciences' Shvat Shaked and PayPal's Scott Thompson, as going something like this:

> "So what's your model, Shvat?" Thompson asked, eager to get the meeting over with. Shifting around a bit like someone who hadn't quite perfected his one-minute "elevator pitch," Shaked began quietly: "Our idea is simple. We believe that the world is divided between good people and bad people, and the trick to beating fraud is to distinguish between them on the Web."

[1] This quote was first attributed to an anonymous source in Savitch (1984) (overheard at a computer science conference) and was later attributed to both Yogi Berra (improbable) and Jan L. A. van de Snepscheut (more likely).

> Thompson suppressed his frustration. This was too much, even as a favor to Benchmark. Before PayPal, Thompson had been a top executive at credit card giant Visa, an even bigger company that was no less obsessed with combating fraud. A large part of the team at most credit card companies and online vendors is devoted to vetting new customers and fighting fraud and identity theft, because that's where profit margins can be largely determined and where customer trust is built or lost.
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> Visa and the banks it partnered with together had tens of thousands of people working to beat fraud. PayPal had two thousand, including some fifty of their best PhD engineers, trying to stay ahead of the crooks. And this kid was talking about "good guys and bad guys," as if he were the first to discover the problem.
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> "Sounds good," Thompson said, not without restraint. "How do you do that?"
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> "Good people leave traces of themselves on the Internet—digital footprints—because they have nothing to hide," Shvat continued in his accented English. "Bad people don't, because they try to hide themselves. All we do is look for footprints. If you can find them, you can minimize risk to an acceptable level and underwrite it. It is really that simple.
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> Thompson was beginning to think that this guy with the strange name had flown in not from a different country but rather a different planet. Didn't he know that fighting fraud is a painstaking process of checking backgrounds, wading through credit histories, building sophisticated algorithms to determine trustworthiness? You wouldn't walk into NASA and say, "Why build all those fancy spaceships when all you need is a slingshot?"
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> (Senor and Singer, 2011, pgs. 24–25)

In the end, the Fraud Sciences model performed both faster and more accurately than PayPal's own system using less data. Fraud Sciences was able to score 17% better on PayPal's most troubling category—good customers that are mistakenly flagged as bad.

This shocked PayPal executives precisely because PayPal had the most advanced system for fraud checking in the world, yet their data scientists were easily defeated by a no-name startup talking about "good guys" and "bad guys."

At the end of the day, what enabled Fraud Sciences to better analyze transactions was not their ability to make *computer models* of fraud, but rather to engage in *moral philosophy* to determine which pieces of data they needed. Because they were able to recognize an important fact about evil—that it likes to hide in the dark—they were able to understand what all the other models missed. That is, if someone is living their life in the full light of day, it is unlikely that they are engaging in fraud.

Large-scale businesses have no choice but to operate based on data and algorithms. However, the story of Fraud Sciences shows that approaching problems with a philosophy-first attitude can often yield quantitative benefits.

5 Engineering Principles in Systems Biology

In the nineteenth and twentieth centuries, biologists increasingly began studying organisms using naturalistic methodologies. Since naturalism connects all events through a historical framework, biology itself started to become entirely enmeshed in the historical framework of evolution. Likewise, since naturalism breaks all events down into their constituent components, this was done in biology as well.

Thus, in the nineteenth and twentieth centuries, biology was characterized by reference to evolutionary history and physico-chemical reductionism. The former attempted to understand every part of an organism in terms of the historical accidents and selective constraints that happened within the ancestry of the organism. The latter attempted to understand the organism's every action in terms of smaller actions on lower and lower levels.

I do not mean to say here that these were necessarily problematic. As a matter of fact, the nineteenth and twentieth centuries can boast of great advances along both of these lines. The problem, as always, stems from looking at only certain types of causes and ignoring others. As the saying goes, "If all you have is a hammer, everything starts to look like a nail." It is the result of taking Occam's Razor to extremes where it is not appropriate to do so.

Carl Woese has reflected on the problems that this mode of biology has presented:

> Molecular biology's success over the last century has come solely from looking at certain ones of the problems biology poses (the gene and the nature of the cell) and looking at them from a purely reductionist point of view. It has produced an astounding harvest. The other problems, evolution and the nature of biological form, molecular biology chose to ignore, either failing outright to recognize them or dismissing them as inconsequential, as historical accidents, fundamentally inexplicable and irrelevant to our understanding of biology. Now, this should be cause for pause.
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> (Woese, 2004, pg. 175)

Woese comes from a position of methodological naturalism, and he is not proposing any deviation from this. Nonetheless, it is interesting that the timeframe that most missed out on the big questions of biology in exchange for the little ones was also the era most dominated by methodological naturalism.

The new science of *systems biology* is an attempt to pursue biology without the constraints of historicism and reductionist mechanisms. In systems biology, biological systems are analyzed as holistic units without heavy regard for their history. Instead, systems biologists seek the top-level design principles of a biological system. Systems biology analyzes biology at multiple scales showing how the patterns at one scale interact with patterns at another scale.

Unlike naturalism, which privileges the lowest-scale causes and their mechanics, systems biology privileges the design principles by which systems operate. Naturalism, likewise, favors explanations of a system in terms of historical causes, such evolving through previous systems, while systems biology favors holistic explanations focused on the purposes of the systems in question.

As such, while systems biology does not itself explicitly exclude methodological naturalism, it seems that a non-naturalist perspective makes the study of systems biology more cohesive and understandable. Physics does not have a category of "design principles," so if a design principle is found, in what sense could it be a part of naturalism? However, if design is considered a causative principle in and of itself (contra naturalism), then it makes much more sense of what is happening in systems biology. As Nelson (2016) points out, in designed systems, knowing the purpose of the design bears directly on the question of how it is designed to work.

An additional principle noted by Nelson (2016) is what he calls the *inference from system-level functional necessity*. Oftentimes, biologists are faced with systems where the operation is only partially known. There are two ways that inferences are generally made about the unknown parts of biological systems—historical and system-level functional necessity. Nelson points out that, on the historical viewpoint, biologists frequently make assumptions about the operation of systems that stem from their knowledge of the natural history of the system and the kinds of changes that natural selection (or other evolutionary mechanisms) are likely to impart to a given biological system. On the other hand, the inference from system-level functional necessity uses the top-level design *requirements* of the system as a guide to the parts that are unknown. In other words, if we imagine that we are given a top-level description of the biological system, we can often infer the parts we don't know from that description. This method of inference privileges design above historicism and bottom-up mechanism, the pillars of naturalism. What Nelson shows is that, when the inferences from history and system-level functional necessity are in conflict, the inference from system-level functional necessity has almost always been shown to be correct in the long run.

In an even more explicit end-run around naturalism, Halsmer, Gewecke, Gewecke, Roman, Todd, and Fitzgerald (2014) shows that the biological sciences, when they are most successful, perform the same type of work that engineers do when reverse-engineering machines built by other designers. Halsmer suggests that making this role of reverse-engineer more explicit in biology—by explicitly studying and adopting the reverse-engineering literature from engineering sciences—would serve to improve the ways that biologists perform their tasks.

6 Conclusion

As can be seen, many areas of inquiry can benefit and are already benefitting from looking beyond methodological naturalism. This is usually taken in the form of recognizing non-physical phenomena explicitly as a first-class, causally real principle. In economics and computer science, it is by establishing human choices and creativity as fundamental causal principles. In online transaction analysis, it is recognizing that moral philosophical categories are prior and more fundamental to the bits of data being collected. In biology, it is recognizing design principles as being more fundamental than the history or the physical reductions themselves.

In some cases the recognition that this type of study goes beyond methodological naturalism is explicit, and in some cases the break with methodological naturalism, while real, is not yet recognized or understood. Hopefully, these examples can serve as templates for further exploration into non-naturalistic methodologies.

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