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Fifth Column — The Science of Better Than What?

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Abstract. This essay interrogates INFORMS' onetime slogan for operations research: "The Science of Better." The phrase, I argue, runs headlong into the is–ought divide that thinkers from Hume to Einstein placed at the boundary of science. The standard retreat, that OR neutrally optimizes objectives supplied by others, sits uneasily with both the moral reckonings of the field's founding generation and the question of whose "better" the field serves today. I suggest reading the slogan not as a boast of technical superiority but as an unmet aspiration: that the training of operations researchers might extend beyond method toward the question of what better means.

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The OR community as a whole has periodically struggled to explain itself to outsiders, producing waves of redefinition, subtle repositioning, and occasional rebranding efforts meant to make the field legible to those beyond its boundaries.[1]

One of the more memorable of these attempts, popular when I was a PhD student (in the mid-2000s), was the slogan that the Institute for Operations Research and Management Science (INFORMS) used to describe OR: "The Science of Better".[2] It was not merely a slogan; it came with a website (scienceofbetter.org) and the confidence that "the world's most successful executives are making bolder decisions — and running everyday operations — with less risk and better outcomes" because of OR.[3]

I have to admit, I was always uncomfortable with the notion of the "Science of Better". To say that something is "better" seems to require at least some minimal understanding of the status quo for comparison. Yet much of my training focused on tools for proving optimality of mathematical

programs, not so much the status quo operations "out there" in the world. I learned how to demonstrate improvement within a model far more than how to understand the situation the model represented.

So I found myself asking questions that felt almost impolite in polite OR company. How could I say with any integrity that my approaches were "better"? How could I know that I might not, in some circumstances, make things worse?

But this unease is only the beginning of the problem with the notion of the "Science of Better". The phrase brushes up against one of the most persistent challenges in the history and philosophy of science: the so-called *is–ought divide*. On the one hand, "science" deals with what "is" and ethics (or the humanities generally) deals with what "ought" to be; that is, what is "best", and by implication, "better". By conflating the two, the "Science of Better" at first glance appears to show either blatant disregard for the "is-ought" challenge or a thoroughgoing ignorance of it.

But you might be thinking, is the "is-ought" thing really that serious? Let's look into a bit of the backstory. David Hume (1711–1776) is the thinker most associated with the distinction. He criticized writers who begin with statements describing what is — axioms, observations, data — and then, almost imperceptibly, shifting toward claims about what ought to be. An opinion about how the world might be made "better" is thus dressed in the language of science, even though science was designed to describe the world as it is. Hume's point was not that values are unimportant, but that the transition from fact to value requires justification. He was far from alone.

Famed mathematician Henri Poincaré wrote in 1905: "There can no more be moral science than a scientific morals" (Poincaré 2001, p. 190). Noted economist and social theorist Thorstein Veblen insisted in 1906 that science "knows nothing of policy or utility, of better or worse" (Veblen 1906, p. 600), directly undercutting the premise of any "Science of Better". Even Albert Einstein echoed a similar sentiment in 1914: "For the scientist, there is only 'being', but no wishing, no valuing, no good, no evil, no goal" (Einstein 2011, p. 114). And immediately after World War II, James Bryant Conant, president of Harvard College, in his celebrated treatise on curricular reform wrote about the difference between natural sciences and the humanities:

> . . . the former describe, analyze, and explain: the latter praise, judge, and criticize. In the first, a statement is judged as true or false, in the second, a result is judged as good or bad. (Harvard Committee 1945, p. 59)

Is OR a subject in the former (a science) or the latter (a humanity)? Does the "Science of Better" suggest that it's both?

At this point, you might reasonably think I am reading too much into a simple marketing phrase. Perhaps "The Science of Better" was never meant to claim authority over moral judgment. Perhaps it was simply meant to signal that operations researchers help others achieve what they themselves define as "better". You tell us what "better" means, and we will help you deliver it.

In this telling, OR is ethically neutral. We optimize objective functions, whatever they may be. To judge whether the objective itself is appropriate is not science, and therefore not our role. A more precise, though less elegant, slogan might have been: "A Science for Your Better". This is, I suspect, the dominant understanding of the field. Optimization and stochastic models are neutral tools. We provide the machinery; others provide the goals.

Yet this position would likely have struck many founders of the OR profession as precarious. Especially those who experienced, in the words of Norbert Wiener, "the world of Belsen and Hiroshima" and the realized possibility of powerful technologies falling into the hands of "the most irresponsible and most venal of our engineers" (Wiener 1948, p. 29).[4]

The atomic scientists themselves struggled with this tension. While later thinkers like Feynman celebrated the "social irresponsibility" in the pursuit of knowledge for its own sake displayed by the scientists who developed the atomic bomb during the Manhattan Project (Feynman 1998, p. 16), its leader, J. Robert Oppenheimer, famously reflected on his involvement with the haunting words, "I am become death, the destroyer of worlds",[5] which many observers take as an expression of remorse.

How would you feel if an optimization algorithm you developed was used to help dispense Agent Orange to "optimally" wipe out an ecosystem? What if some of the results you brought to game theory were invoked to justify a pre-emptive nuclear strike — proposals that were not hypothetical at the RAND Corporation of the 1950s (Emery 2021)?[6]

One balm to the conscience of scientists involved in these morally-wrought efforts was the knowledge that an even more nefarious actor (real or imagined) might have come to these technologies before them to wreak even greater havoc. They were justified in developing technologies and learning how to apply them precisely because they get *their* hands on them first, and they are the "good" guys. Under this lens, the slogan might have more accurately been phrased "The Science of *Our* Better — or Else Suffer Catastrophe."

Indeed, the neutrality of OR, of all sciences, seems particularly problematic. Operations Research is not physics or chemistry. Its subject matter is organized human activity — large-scale undertakings

in which values seem inseparable from decision making. The very formulation of a "Science of Better" seems to prevent the field from enjoying the luxury of "social irresponsibility"

The unavoidable question becomes: whose "better" do we choose to further? And if we fail to choose, is the default "better" up for grabs to the highest bidder? Is it a coincidence that some of the hottest topics in OR in recent years — dynamic pricing, assortment planning, algorithmic auctions, online matching on platforms — seem perfectly attuned to the problems of some of our largest and most powerful corporations? This struck me particularly hard one year when at the INFORMS Annual Meeting, the password to the conference Wi-Fi connection was unabashedly and simply: "amazon".

Some influential figures believed that the "Science of Better" should have as much thought put into the "Better" as the "Science". Instead of taking someone else's objective function, we should think carefully about what our own objectives are, or even what the "right" objectives are. For instance, C. West Churchman treated the objective function as conceptually prior to optimization, describing it as a "basic ingredient of the system" (Churchman 1968, p. 223) and arguing that optimality is only made meaningful by choosing a meaningful criterion. Churchman wrote a whole book (Churchman 1961) about how to bring our "values" into our measured objectives. But the objectives that matter most are often difficult to measure. We optimize profit because we can measure it. As W. Edwards Deming, acknowledged luminary of the Total Quality Management (TQM) movement, noted (quoting Lloyd S. Nelson): "the most important figures that one needs for management are unknown or unknowable" (Deming 1986, p. 121).

If "improvement" cannot be easily specified in advance, it must be discovered in practice. The direction of improvement emerges through negotiation among those involved rather than through top-down declaration. George Box captured this spirit when he described TQM as "the democratization of the scientific method" (Box 2006, p. xi). What counts as better is not decided by a small group of analysts but a whole "community of scientists" experiencing the system (Spear and Bowen 1999).

These practical currents had theoretical counterparts. A number of thinkers attempted to build, with full rigor, a science whose subject matter is purpose itself. Norbert Wiener appears in this story once again. In a 1943 paper that helped launch cybernetics, he and his collaborators argued that "purpose" and "teleology", banished from respectable science since the rejection of Aristotle's final causes, could be rehabilitated as scientific concepts if redescribed as feedback behavior directed toward goals (Rosenblueth et al. 1943). Herbert Simon, perhaps the only figure claimed

by the founding mythologies of both OR and artificial intelligence proposed an entire "science of design": "Everyone designs who devises courses of action aimed at changing existing situations into preferred ones" (Simon 1996, p. 111). The operative word is *preferred*. Simon's sciences of the artificial are saturated with oughts, contingent on goals in a way the natural sciences are not. Churchman pressed hardest of all. In *The Systems Approach and Its Enemies*, he argued that the rational planner's worldview cannot be completed from the inside (Churchman 1979). Politics, morality, religion, and aesthetics (the "enemies" of his title) hold knowledge about purposes that the systems approach (a notion that included OR in its broader framework) seemed not to be able to generate for itself.

The implication is not that OR should abandon mathematical rigor, but that it might reconsider what it means by "Science". Maybe something closer to wisdom than method alone. A morally honest and intellectually sophisticated embrace of the phrase "The Science of Better" might require precisely this expansion. Could part of the training of operations researchers include philosophy, spirituality, even religion — not as replacement for mathematics but as contexts for its use?

Better in the age of AI

These thoughts have acquired a new urgency, because the "Science of Better" has new practitioners who have never even heard this slogan. The builders of modern artificial intelligence have inherited our field's central activity, the optimization of specified objectives, along with its favorite alibi: we provide the machinery, others provide the goals. The "alignment problem" that now preoccupies AI research is, at bottom, Churchman's problem in new clothes. It is the recognition that specifying "better" is not a preliminary to the real work but the hardest and most consequential part of it. Here too Wiener anticipated us, warning in 1960 that

> if we use, to achieve our purposes, a mechanical agency with whose operation we cannot efficiently interfere once we have started it . . . we had better be quite sure that the purpose put into the machine is the purpose which we really desire (Wiener 1960).

Two features of our automating present sharpen the old worries. We optimize profit because we can measure it; the platforms of the present optimize engagement because engagement is what their instruments record, with consequences that remain, in Deming's phrase, unknown and unknowable. And when optimization is embedded in autonomous systems, there is no executive left in the room to hand the objective back to. The passage from "is" to "ought" is crossed silently and at machine speed, by systems whose objectives were specified once by someone and then forgotten. The human

advisor who might have paused to ask whether the objective was the right one is precisely the component that automation is designed to remove.

If the machines cannot tell us what better means, the question returns to people. Tolstoy, writing in a very different context, offers a fresh redefinition of science:

> "People must live. But in order to live they must know how to live. And all men always obtained this knowledge— well or ill — and in conformity with it have lived, and progressed ; and this knowledge of how men should live has from the days of Moses, Solon, and Confucius been always considered a science — the very essence of science. And only in our time has it come to be considered that the science telling us how to live, is not a science at all, but that only experimental science — commencing with Mathematics and ending in Sociology — is real science.. . . [we] must return to the only reasonable and fruitful conception of science, which is, that the object of science is to show how people ought to live." (Tolstoy 1904, pp. 221–222)

Might Tolstoy's provocation offer a way to reinterpret the "Science of Better", not as a boast of technical superiority but as an aspiration toward a better way to live? In an age busy automating the pursuit of objectives no one has examined carefully enough, a field that has spent eight decades learning how objectives fail might discover that its most valuable export is not its algorithms but its scars. Have we learned "how people ought to live", people like us, with impressive tools but chastened dreams?

Notes

[1]References that detail this long history of redefinition and repositioning are legion. I have collected 253 references that speak to this topic in *Operations Research, Management Science, Journal of the Operational Research Society*, and *Interfaces*. Here is a small smattering from across the decades: (Kittel 1947, Goodeve 1948, Morse 1955, Johnson 1960, King 1967, Ackoff 1979, Rosenhead and Thunhurst 1982, Woolsey 1993, Kirby 2007, Hopp 2008, Liberatore and Luo 2010, Ormerod 2021). A full reference list is available upon request.

[2]The current slogan of INFORMS is "Smarter Decisions for a Better World", which suffers from many of the same critiques I put forward here, with the possible additional question, "Why should we care about how smart the decisions are as long as they work?"

[3]The website still seems active to this day, although with a decidedly early-2000s design aesthetic and mostly broken links.

[4]Wiener, known to many in OR via the naming of the Wiener process, was an influential scientist during World War II and the postwar era, founding "Cybernetics", a contemporary and sister field of OR.

[5]Quoting the Bhagavad-Gita, as documented in Bird and Sherwin (2005, p. 321).

[6]The pages of this journal has debate around an instructive example where a mixed integer programming was used to justify increasing taxes on low-income households and decreasing taxes on high-income households in the city of Peoria, Illinois (Arthur 1991). The exchange reveals how ethical questions are almost always lying underneath the surface of applications of OR.

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