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The Ghosts of Hayek in Orthodox Microeconomics: Markets as Information Processors

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In media studies, there is recurrent fascination with how communication, especially when couched in terms of "information," tends to influence many spheres of social life and intellectual endeavor. Some of the key figures in that discipline have been especially attentive to the implications for politics of the modern advent of the "information economy." Nevertheless, we think that there has been little impetus among media scholars to explore how other disciplines, and in this case orthodox economics, have been providing competing accounts of the nature and importance of information over the same rough time frame. Furthermore, we think they might be surprised to learn that Friedrich Hayek and the neoliberals have been important in framing inquiry into the information economy for the larger culture for a couple of generations. This essay is a preliminary report on what would happen to intellectual history if media studies took the early development of the "economics of information" into account.

32 We devote this chapter to asking what "deep impact" Hayek registered on the economics profession. The Austrians, as the caretakers of Hayek's legacy, have tended to subscribe to a unitary Hayek account; the economics orthodoxy has claimed there to be two Hayeks—one good, one bad. Perhaps this is a bit too crude, but we believe that attending more carefully to all the positions Hayek took on agent epistemology and information will lead us to revise the count upward. When we review the history, it becomes apparent that Hayek advanced *three* distinct views. Significantly, each one found its echo in a school of economic thought (the Walrasian School, the Bayes-Nash School, and the Experimentalist School) and informed a corresponding view on the appropriate role for the economist to play in the setup of markets—the most important development within microeconomics over the past two decades. Contrary to both orthodox economists and Austrians, neoliberalism has occupied the profession's heartland, and has planted its flag.

Today, market designers celebrate the market as omnipotent information processor while conflating the pervasive ignorance of market agents with virtue. Against proposals from certain scholars in science and technology studies who promote a "constructivist" approach to markets and seek a potential alliance with market designers (see Mirowski and Nik-Khah 2008), we offer this account of information economics and market design to media studies scholars, in order for them to consider both the dangers of equating the market with the computer as information processor and the more serious epistemological challenges these developments pose for thinking about the role of human–machine relations in society more generally.

Hayek: The Good, the Bad, and the Unitary

Sometimes it is easy to see the beginnings of things and harder to see the ends. During the 1940s, Friedrich Hayek challenged the practicality of central economic planning on informational grounds,

providing the impetus for an impressive roster of mathematical neoclassical economists to join in efforts to rebut him. Some may additionally note that it is "interesting" that so many of these figures would go on to play leading roles in the various and sundry research programs that came to be known as "information economics." Even so, the interest has apparently been fleeting: there has been little sober reflection on the full significance of Hayek's role in this episode, and none whatsoever on whether, and in what capacity, he reprised it.

Specifically, most economists would think it absurd to even entertain the thought that Hayek's later work—including not only his scholarship but also the establishment of the Mont Pèlerin Society (MPS), as well as the subsequent development of neoliberalism—was relevant in any way to the historical development of information economics. We know this because a few have felt the need to state for the record that the MPS and the neoliberalism it has espoused has come nowhere near the core of the economics orthodoxy. Of course, the very fact that anyone would feel compelled to defend economics from this charge is an interesting matter in its own right—due in part to the recent appearance of scholarship casting professional economists as important players in the postwar revival of the Right, the outsized representation of MPS members in the roster of Bank of Sweden prizewinners, and the sad cooptation of the profession during the Crisis (see Mirowski and Nik-Khah 2017). Nevertheless, those who have taken it as their business to educate the public on such matters have warranted that there is nothing to see here—perhaps in the macroeconomic hinterlands, but not where the serious science is done.

Take the 1987 Bank of Sweden prizewinner, Robert Solow. Prompted by the publication of one recent history of the postwar rise of "pro-market" thinking, Solow said the following:

> Outside the economics profession, [the MPS] was invisible. The MPS was no more influential inside the economics profession. There were no publications to be

> discussed. The American membership was apparently limited to economists of the Chicago School and its scattered university outposts, plus a few transplanted Europeans. "Some of my best friends" belonged. There was, of course, continuing research and debate among economists on the good and bad properties of competitive and non-competitive markets, and the capacities and limitations of corrective regulation. But these would have gone on in the same way had the MPS not existed. (Solow 2012)

Of course, it would be absurd to claim that politics were entirely absent from postwar disputes over matters of economic doctrine—but to many, such disputes seem quaint, the holdover of a bygone era and confined to questionable subsets of the profession. Recently, Noah Smith has taken it as his duty and mission to challenge the unprecedented enmity directed at the economics profession suffusing the blogosphere in the wake of the worldwide financial crisis by drawing attention to what he believes to be praiseworthy recent developments; not hiding behind impenetrable mathematics and jargon, Smith assumes the responsibility of taking his argument directly to the public. The title of a recent post of his accurately conveys his central point: "Economists used to be the priests of free markets—now they're just a bunch of engineers" (N. Smith 2014b). According to Smith's understanding of the profession, most economists are prone to focus on small, solvable problems, and uninterested in making sweeping contributions to policy:

> I have the vague sense that if you were an idealistic, brilliant young libertarian in the 1960s and '70s, you might naturally dream of growing up to be an economist. You might watch a rousing speech by Milton Friedman, and you might imagine that one day you, too, would use the power of logic and rationality and mathematics to ward off the insanity of socialism. Well, America still has some idealistic, brilliant young libertarians, and some of them probably still dream of becoming economists. But now they will be in the minority. They will be joined by quite a

> few—maybe more—idealistic brilliant young liberals, who recognize the power of markets but also want to figure out how to fix things when markets go wrong. And they will also be joined by quite a few brilliant engineers, for whom political ideals take a back seat to the solving of practical, real-world problems. Econ isn't what it used to be. (N. Smith 2014b)

He is willing to grant the point, but only for macroeconomists:

> So if you really feel you must get out your rake or pitchfork and storm the gates of the economists who fiddled while our economy burned, go ahead. Just make sure that the people whose heads you are calling for are not in that vast silent majority who are working diligently on the small but solvable problems of "microeconomics." The people at whom you are angry are called "macroeconomists." (N. Smith 2014a)

While one might rightly lament the susceptibility of macroeconomics to ideological capture, the important point for Smith is that microeconomics remains hermetically sealed, protected from anything unsavory.

Economists who acknowledge the significance of Hayek's scholarly contributions while denying that of his assiduous political and organizational efforts face a challenge. Reading the aforementioned Solow provides some indication of how the orthodox economist manages to meet it:

> The Good Hayek was a serious scholar who was particularly interested in the role of knowledge in the economy . . . All economists know that a system of competitive markets is a remarkably efficient way to aggregate all that knowledge while preserving decentralization. (Solow 2012)

The "bad" of Hayek is easily and safely excised: Hayek possessed "intuition" but little else, whereas the modern economist comes equipped with a bracing rigor. Hayek may have posed some

interesting questions, but his lack of mathematical sophistication permitted his politics to mar the enterprise. Since then, economists have scrubbed away all its traces. Perhaps true, but Solow provides us no example of how this worked.

For one such example, we may turn to the 2007 Bank of Sweden prizewinner, Eric Maskin:

> Hayek had a remarkable intuitive understanding of some major propositions in mechanism design—and the assumptions they rest on—long before their precise formulation. Indeed, his understanding seems to have been a guiding influence in their formulation. (Maskin 2015, 251)

Maskin's two "Hayekian" propositions are, first, that "competitive markets are informationally efficient" and, second, that "the market mechanism is uniquely incentive compatible." Notwithstanding Hayek's intuition, a firm grasp of formal economic analysis (particularly game theory) eluded him, preventing him from grasping the nettle ("he did not anticipate—as far as I can tell—the Vickrey-Clarke-Groves mechanism for determining a Pareto optimal public goods allocation" (Maskin 2015, 251)). Nevertheless, Maskin describes him as "precursor" (247) and "guiding influence" (251) (as if these would serve as the same thing), even going so far as to make the interesting suggestion that those most involved in developing the game theoretic literature on markets did so with Hayek in mind. Unfortunately, Maskin never seriously pursued this idea any further: probably because he exhibits no more than a bare-bones understanding of the corpus of Hayek's work. Unsurprisingly, both passages Maskin cites in support of his interpretation of Hayek were taken from the same article, "The Use of Knowledge in Society"; neither says anything about "incentive compatibility"; nor does Maskin feel impelled to provide a single specific example of Hayek's guidance.

While the orthodoxy's lack of curiosity concerning its history is in no way surprising, one might have hoped for better when it came to the self-appointed caretakers of Hayek's legacy, the Austrians. But to date, their efforts to address Hayek's influence on the

orthodoxy have proved no more insightful. This was nowhere more apparent than in the aftermath of the award of the 2007 Bank of Sweden Prize to Leonid Hurwicz, Maskin, and Roger Myerson. Hurwicz was a chief Walrasian market socialist; his award celebrated his work following a repudiation of his earlier enthusiasms. Initially, some Austrians greeted the occasion with applause, as an acknowledgement of Hayek's worth so incontrovertible as to be undeniable by even the most blinkered orthodox economist.[1] But this position apparently ran up against the perceived need to maintain the distinctiveness of the Austrian approach, not to mention the traditional insistence upon the "articulate" versus "inarticulate" knowledge distinction (which was often used precisely to upbraid Walrasians such as Hurwicz).[2]

So, subsequently, some Austrians executed an about-face and now accused both Walrasians and Bayes-Nash game theorists (such as Maskin and Myerson) alike of "failed appropriation" of Hayek (Boettke and O'Donnell 2013). One might expect that this turnabout would stimulate an interest in pinpointing exactly what it was game theorists sought to appropriate and why.[3] To that end, some Austrians did organize a conference at George Mason, with the laudable intention "to examine and provide us with insights into the impact of Hayek's work on the research direction of other scholars in economics and political economy . . . [to] stimulate a conversation about the deep impact of Hayek's ideas" (Boettke and Coyne 2015).[4] But so far this project was hampered by a commitment to a single monolithic "Hayekian framework," which mainstream approaches to the "economics of information," putatively characterized by a flawed adherence to the "omniscience" of economic agents, could be said to have misunderstood. Unfortunately, the ahistoricity of their approach has induced Austrians to miss the most direct avenues of Hayek's "deep impact" on orthodox economics.

Perceiving this impact will require us to move beyond the 1940s, and to observe how both Hayek and the economics orthodoxy alike grappled with epistemic issues over the subsequent half century.

Hayek Changes His Mind

We begin by recapping a relatively well-known set of events: Austrian neoliberals such as Friedrich Hayek kicked off something known as the "Socialist Calculation Controversy" with an argument that government planners could never know enough to adequately plan any reasonably elaborate economic system. The error of Socialism, said Hayek, was to try and accomplish something through planning that had already been solved by The Market. Hayek suggested that it would be too difficult to collect all the disparate and sundry information to engage in economy-wide planning. We cannot reprise those events here; all we wish to do is highlight that the subsequent disputes tended to get sidetracked into a set of parallel considerations of what it meant for markets to convey "information" to the relevant actors. By the 1940s, the neoliberal argument was largely being promoted by international members of the newly founded Mont Pèlerin Society, while their opponents were primarily located (contrary to modern impressions) at something called the Cowles Commission, located from 1938 to 1952 at the University of Chicago, and thereafter at Yale.

What trace remains of this dispute in the mental maps of the modal economist is found in Hayek's "Use of Knowledge in Society," and aptly summarized by that article's most famous passage:

> What is the problem we try to solve when we try to construct a rational economic order? On certain familiar assumptions the answer is simple enough. *If* we possess all the relevant information, *if* we can start out from a given system of preferences and *if* we command complete knowledge of available means, the problem which remains is purely one of logic . . . This, however, is emphatically *not* the economic problem which society faces . . . The peculiar character of the problem of a rational economic order is determined precisely by the fact that the knowledge of the circumstances of which we must make use never exists in concentrated or integrated form but

> solely as the dispersed bits of incomplete and frequently contradictory knowledge which all the separate individuals possess. The economic problem of society is thus not merely a problem how to allocate "given" resources . . . it is a problem of the utilization of knowledge which is not given to anyone in its totality. (Hayek 1945, 519-20)

The typical attitude toward this passage is exemplified by Maskin (quoted above): it is right and proper that the Bank of Sweden honored him. But 1945 was a long time ago, and the memory of socialism recedes further with every day. Goodbye to all that.

Only recently, with the explosion of historical literature on Hayek, have we begun to encounter serious scholarly work on Hayek's struggles with epistemology.[5] As with almost every other major intellectual figure, Hayek changed his position on key theoretical terms over the course of his career; and none was more consequential than his treatment of knowledge. Interestingly, in Hayek's last book, *The Fatal Conceit,* he admits,

> I confess that it took me too a long time from my first breakthrough, in my essay on "Economics and Knowledge" through the recognition of "Competition as a Discovery Procedure" and my essay on "The Pretense of Knowledge" to state my theory of the dispersal of information, from which follows my conclusions about the superiority of spontaneous formations to central direction. (Hayek 1988, 88)

So while we have his frank admission that his system did not congeal around the concept of *information* until rather late in his career, at least in his own mind, we do not have a corresponding historical schematic of how it changed from his own hand. Leaning on the secondary literature, we will proceed to summarize it as a symphony in three movements.

In the first movement, Hayek displaced the rather cryptic position of Ludwig von Mises in the Socialist Calculation controversy, that

all "calculation" whatsoever would be impossible under socialism, and replaced it with the seemingly more credible proposition that it would be impossible to collate and deploy all the knowledge required to coordinate the economy as successfully as the market managed to do in practice. In other words, he transformed what Mises had portrayed as a breakdown of (Max) Weberian zweckrationality under socialism into something initially far less threatening, a species of epistemological difficulty endemic under socialism.[6] For the early Hayek, knowledge was "dispersed" in such a way that bringing it all together in a central planning authority would be difficult—but, note well, *not impossible.* There seemed to be a special kind of slippery knowledge, a sticky goo qualitatively different from more conventional scientific conceptions, that was *local,* characterized by special conditions of time and place.

It was almost as if this species of knowledge was something *entropic*: an energy that grew too diffuse to be readily gathered up and consolidated into a useful form.[7] Not all knowledge shared this character, said Hayek; but the mere fact it existed at all was a club he could use to beat on the Langes and Marschaks of this world. Sometimes Hayek hinted that the dispersed character had something to do with subjective experience, but at this stage he steered well clear of issues of cognitive capacities or capacities to articulate this knowledge to others. In this movement, there was very little in the way of actual epistemology or formal psychology standing behind the concept. Instead, in his famous paper "Use of Knowledge in Society" (1945), he proposes to reconceive the market as a "mechanism for communicating information." Perhaps this is one reason it seemed to appeal to some neoclassical economists, who were more readily inclined to interpret knowledge of this ilk as a "thing" scattered about the landscape, rather like pixie dust too fine to pick up. Indeed, most of the favorable citations of Hayek by neoclassical economists date from this period.

The next movement in Hayek's Surprise Symphony happened sometime around his own return to psychology published in 1952 as *The Sensory Order.* At this stage, Hayek entertained the notion

that much of human knowledge is not only inarticulable but also tacit and inaccessible to self-examination. Much of his revised attitudes concerning knowledge seems to have occurred during his stint at the Committee on Social Thought at the University of Chicago. In brief, Hayek there sought to revive the old discredited associationist psychology of the late eighteenth and early nineteenth century, by suggesting mind was little more than sets of hierarchies of systems of classifier algorithms that were opaque to the thinker.[8] He also had been in contact with Michael Polanyi at the early MPS meetings and had come across Gilbert Ryle's distinction between "knowing how" and "knowing that" in Ryle's *Concept of Mind* (1949). He began to explore variations on "tacit" or nonarticulable knowledge, not so much by explicitly following Polanyi or Ryle on this topic as through building his own idiosyncratic theory of mind upon a foundation of classifier systems about which the subject was not even aware of knowing but regularly made use of in order to interact with the environment.[9]

From this point forward, Hayek began to play fast and loose with the concept of consciousness, inverting the then-popular Freudian frame tale that the unconscious was a soup of barely accessible urges upon which rested a fragile vessel of rational thought; for Hayek, it was *rationality that was largely unconscious,* with conscious perception and drives constituting the thin veneer of intentionality and desires floating on top of the sea of obscure and inaccessible rule structures. Thus the types of knowledge that mattered most were inarticulate and largely inaccessible to the thinking agent. It was also precisely at this juncture that Hayek began making explicit references to evolutionary theory as the basis of his entire philosophy. The reason behind this shift was that Hayek sought to propound that the individual mind did not actually choose the rules that worked the best: that was done either through a sort of quasi-evolutionary selection of life success at the individual level reinforcing the relevant classifier rules or, more frequently, natural selection weeding out the individuals with unfit rules in favor of those individuals lucky enough to come previously equipped with

superior classifiers. It was, not to mince words, a harsh version of social Darwinism.

It is important to understand how this refracted the very notion of radical ignorance as a natural state of being for mankind in the later political economy of Hayek.[10] In this conception, the process of coming-to-know became largely disengaged from the knower, with most of the action happening at the subconscious level. As he wrote in his "Primacy of the Abstract," "the formation of a new abstraction seems *never* to be the outcome of a conscious process, not something at which the mind can deliberately aim, but always a discovery of something which *already* guides its operation" (1978, 46). Here, the celebrated philosopher of freedom postulated a grim species of predestination that would make even Calvin blush. The political implication was clear: if an individual mind could not even reliably plan or organize its own pathway of learning through life, it would exhibit contemptible *hubris* to think it could ever plan the lives of others, much less a whole economy. Knowledge here was no longer like entropy, or pixie dust; now it resembled a great submerged iceberg, nine-tenths invisible, and frozen into place aeons ago, with only minor changes around the margins when it jostled up against other similar icebergs.

How did these lumbering monads ever manage to communicate, much less live in societies that displayed any reliable level of organization? That question was finally answered in the third movement of Hayek's Surprise Symphony. Strangely for a doctrine that started out so concerned over respect for the inviolate individual and his or her subjectivity, the late Hayek rendered his system internally coherent by admitting that knowledge did not really persist in the level of the individual mind, for the most part, but was processed and invested with meaning at the suprapersonal level. In a catchphrase, since so much that people actually knew was inaccessible to them, the only entity that really was capable of judging and validating human knowledge was The Market. The key turning point, as Hayek informs us in *The Fatal Conceit,* was his 1968 essay "Competition as a Discovery Procedure":

> [Epistemology is governed by] competition as a procedure for the discovery of such facts as, without resort to it, *would not be known to anyone* . . . The knowledge of which I speak consists rather of a capacity to find out the particular circumstances, which becomes effective *only if the possessors of this knowledge are informed by the market* which kinds of things or services are wanted, and how urgently they are wanted . . . Knowledge that is used [in a market] is that of *all its members*. Ends that it serves are the separate ends of those individuals, in all their variety and contrariness. (1978, 179, 182–83; emphasis added)

No longer was knowledge being treated as an elusive thing by Hayek, scattered about in an inconvenient matter, because in this version not only is much human knowledge unable to be retrieved from within by the individual in question but, indeed, there exists a species of *knowledge not "known" by any individual human being at all.* Here we are cosseted in the realm of Donald Rumsfeld's infamous "unknown unknowns."[11]

> Now what is the message there? The message is that there are no "knowns." There are things we know that we know. There are known unknowns. That is to say there are things that we now know we don't know. But there are also unknown unknowns. There are things we don't know we don't know. So when we do the best we can and we pull all this information together, and we then say well that's basically what we see as the situation, that is really only the known knowns and the known unknowns. (Rumsfeld 2010)

The only recourse of the rational individual in this subpar situation is primarily to acquiesce in the dictates of signals conveyed by The Market, which hint at deeper truths than most humans will ever know.

But what is this depersonalized and deracinated suprahuman knowledge but a new virtual kind of *information*? This, we think,

explains Hayek's rather uncharacteristic reversion to replacing the term "knowledge" with "information" in his last work, *Fatal Conceit.* Sometimes, when it came to this ectoplasmic information, the late Hayek lapsed into his scientistic mode, where evolution had winnowed the elusive truth out of human frailty; but other times, he reverted to full religious mystery: "spontaneous order . . . cannot be properly said to have a purpose . . . known to any single person, or relatively small group of persons" (1978, 183). Some latter-day Austrians have argued that entrepreneurs are just "smarter" than any dedicated intellectual, since they are marinated in this information and thus quicker to respond to market signals.[12] Almost by definition, there is no instrument available to mankind to "test" this proposition. As with all the great world religions, the sole and final terminus for the skeptic was to surrender to Faith: The Market as Super Information Processor knows more than we could ever begin to divine.

One might aver that this is an egregiously idiosyncratic trajectory, the ruinous road to the conflation of pervasive ignorance with virtue, something that would never ever be followed by any prudent rational-choice orthodoxy in economics, nor indeed, any scientific thinker whatsoever.[13] The modern economist often claims to like the early Hayek but thinks he or she tends to studiously avoid the later Hayek. We beg to disagree: the historical record is far richer than that.

Orthodox Epistemologies

Nowadays, one can still find economists that maintain at least some vague awareness that the origins of present-day microeconomics had something to do with Cold War politics—though exactly what may elude them. In discussing the history of the highly influential National Science Foundation / Conference on Econometrics and Mathematical Economics (NSF/CEME) Decentralization Series,[14] the Stanford economist (and former series director) Matthew Jackson (2006) said:

> My impression is that the word decentralization [in the title of the conference] reflects the fact that the starting point in many of the problems addressed by the series is that the necessary information starts in a decentralized state . . . I think that perhaps the history of the conference reflects the fact that these systems were viewed as alternatives to centralized or planned economies when the conference series was first funded, during the cold war.

To fill in a few pertinent details: in the 1950s, economists at Cowles had interpreted Hayek as arguing the relative merit of "free markets" over socialism on informational grounds, and found this argument wanting. In a move that would have vast and enduring ramifications for the future of the economics profession, Leonid Hurwicz and an impressive roster of his colleagues at Cowles responded to Hayek's provocations by reconceiving their own task as external evaluation of the informational properties of economic systems, as if from some great height, claiming soon thereafter that these methods could also inform choice among a plethora of "institutions."[15] Consequently, the Cowlesmen eventually rebranded themselves as experts in "organization," a term that assumed brash capacious dimensions so as to cover such varied phenomena as the internal structuring of large firms, the design of cost-plus contracts for the mobilization of industry during wartime, the evaluation of Soviet central-planning algorithms, and the crafting of commercial regulation.

Indeed, the historian Hunter Heyck has described how a fascination with "organization" became conflated with themes of algorithmic reason and analysis of information across the immediate postwar social sciences.[16] With increasing frequency, these self-identified organization theorists (disproportionately concentrated at Purdue, Caltech, Arizona, and Northwestern in the 1970s) began to contemplate designing *new* institutions, ranging from novel legal regimes to "solutions" for public goods provision to the reorganization of entire economies.[17] And in what turned out to be the most

significant development for the future of the economic profession, they would eventually also claim an ability to reconstruct individual precursor markets themselves. The Cowles pretensions to evaluate organizations in general thus paved the way to what eventually became known within economics as "market design."

What followed was a massive upheaval in the practice of economics. Since roughly 1980, the profession converged upon a more "constructivist" approach to markets. Where economists once placidly contemplated markets from without, situated in a space detached from their subject matter, so to speak, instead now they are much less disciplined about their doctrines concerning the nature of economic agency, and much more inclined to be found down in the trenches with other participants, engaged in making markets.

It can be difficult for the outsider to perceive just how radically transformative this turn was, due in no small part to some economists' penchant to maintain a public impression of continuity with their previous activities. In an article for the *New York Times,* Hal Varian (2002) notes economists' participation in the design of an increasingly wide variety of institutions, ranging from the provision of electricity, to the assignment of medical residencies, to financial exchanges. Although the title of Varian's article ("Avoiding the Pitfalls When Economics Shifts from Science to Engineering") may suggest to the reader a periodization, it is truer to the spirit of the article to interpret "shift" as "application," something that characterizes all science—similarly, engineers apply ideas from physics to design bridges. In Varian's telling, someone such as Karl Marx is reinterpreted as an "economic engineer" ("Karl Marx . . . also had ideas about economic design that ended disastrously"), which tends to have the effect of diminishing the novelty of recent developments in economics.[18]

But every once and again, some economist will reflect on just how much has changed. Mark Thoma, the well-known author of the blog *Economist's View,* stated:

> Today I was thinking about the fact that I mainly got into economics to understand how the world works, not to do policy or try to use the tools of economics to recommend how to change economic institutions, though economic policy was certainly of interest too. But mostly I just wanted to understand it all, like a kid taking apart a toy to figure out how it works. I was particularly interested in understanding how money functions and what effect changes in the money supply would have on the economy. I have no idea why economics interests me so much, but it does.
>
> But once I got here, I realized the demand was not just to explain what we know and to be honest about what we don't. People want to know how to make economic institutions function better and they turn to economists to tell them how to accomplish that task. (2006)

The only provision we might make here is that most would view the adjective "economic" as redundant. Over the past two decades, articles in major economics journals appeared proclaiming the advent of "engineering economics," "market design," "auction theory for privatization," and the like.

For the present purposes, we take for granted the significance of this development, and pose the question: What, if anything, about design is related to Hayek? One obvious answer is that market design shares with Hayek the view that markets don't exist to allocate given physical resources so much as they serve to integrate and disseminate something called "knowledge." Another would attribute to Hayek the very idea that an economy can be "designed": Hayek sought to study the institutional foundations of the "competitive order," as a prelude to constructing an ideal competitive order. Both answers are true enough, but woefully incomplete. Additionally, we wish to insist that Hayek's work on epistemology has left traces on the substantive features of the two dominant approaches to the economics of market design, which

we entitle the Bayes-Nash School and the Experimentalist School, for reasons we will elaborate on presently.

The Bayes-Nash School of Design

This historical origin of this school is located in the work of William Vickrey of Columbia University, winner of the 1994 Bank of Sweden Prize and the namesake of the "Vickrey auction." In a 1960 study, Vickrey noted the "strategic misrepresentation of preferences" might prevent the government from gathering information to construct a social welfare function (Vickrey 1960, 517–19). A year later, he raised a similar concern with the market socialist proposal of Abba Lerner (Vickrey 1961). In his *Economics of Control,* Lerner had proposed a "counterspeculation" method, to be used by a central board to counteract monopolists' (and monopsonists') price-setting power by estimating and guaranteeing a competitive equilibrium price. In other words, Lerner's analysis had suggested to Vickrey that active efforts might be required to gather diffuse information together in one place. In both papers, Vickrey had expressed a novel concern: economists who had hoped to assist the government in gathering dispersed information would encounter a problem. This problem was, in a word, *mendacity*: those holding the crucial information had the capacity to distort it, and for strategic reasons might be expected to do so.

Vickrey responded to this new problem in a way that will by now seem commonplace to the student of economics: he explored the incentive properties of four auction types—the first price and second price sealed bid, the English, and the Dutch auctions—and used Nash game theory to do so. From today's vantage point, it is tempting to become excessively fascinated by Vickrey's appeal to game theory as a generic logic of strategic choice, and consequently to ignore the most significant features of Vickrey's work. For Vickrey's version of epistemology, it was no longer possible to hold tight to one's private information—so long as the analyst crafted a method to get in your head to pry the information out of there.[19]

To do so would require employing one of a handful of "incentive compatible" auctions. We know that this idea would eventually be greeted with much fanfare, but at the time pretty much everyone ignored Vickrey's use of game theory; even Vickrey would downplay its significance, as "one of my digressions into abstract economics, at best of minor significance in terms of human welfare" (Dreze 1998).

It would be left to other scholars sharing Cowles's enthusiasms to make the most significant developments along these lines. The key figure here was Robert Wilson of Stanford's Graduate School of Business who, although not formally affiliated with Cowles or RAND, came to share many of their enthusiasms.[20] Wilson's Stanford department became the first institution devoted to the study of modeling Bayesian actors interacting in markets; along with his students Armando Ortega Reichert, Paul Milgrom, and Peter Cramton, Wilson would form what we call the Bayes-Nash School of Design.[21] The operations researcher Michael Rothkopf was one of the few close observers to put his finger on the true significance of Wilson's innovation:

> Quite recently publications have begun to appear that indicate that operations researchers are starting to construct bidding models that are realistic and that consider simultaneously the optimality of the decisions of all bidders. The new factor taken into consideration in these models is the uncertainty faced by the bidders as to the value of the subject of the auction. In most of this work, the uncertainty of each bidder is restricted to the value of the subject of the auction to his competitors. Only Wilson has begun to take account of the uncertainty of a bidder about the value of the subject of the auction to himself. (Rothkopf 1969, 362)

Agents no longer knew their values—their knowledge could now be *wrong,* and much in need of correction. Economists of the Bayes-Nash tradition would generously offer to help them out.

This correction would take place within the context of an auction game. This school portrays all bidders as viewing the auction game in the same way—the structure of the game is purportedly "common knowledge." Bidding against other bidders immediately raised the specter of having to take competing bidders' beliefs into account, and therefore the complexity of dealing with "beliefs about beliefs." The complex hierarchies of "beliefs about beliefs" are collapsed into a single statistic, dubbed a "type." Initially, I am presumed to know only my own "type," and will assume that I am the same as my opponents (i.e., we are the same "types"). As information is released over the course of the auction, I come to appreciate how my opponents differ from myself. This appreciation matters not only for strategic reasons but also for epistemic reasons: because the roster of types is presumed to be stochastically distributed around a true-valued mean, it is only by participating in an auction that I come to know my own value. How this works can best be understood by considering a typical model of an "English Auction" conducted for a single item for sale.

In an English Auction, the price of the item for sale starts out low and rises until all bidders drop out save one. The lone bidder remaining "wins" the item, and pays an amount equal to the price prevailing at the time the second-to-last bidder dropped out. According to the Bayes-Nash approach, bidders should use the information released by their competitors dropping out of the auction to reconsider and recalibrate their own valuations, and should continue to bid so long as the expected value of winning the auction conditional upon all remaining bidders dropping out is greater than or equal to the price of the good.[22]

Significantly, the informational claims of Hayek were also foremost in the consideration of members of the Bayes-Nash School of Design. Consider Wilson:

> A half-century ago, Friedrich von Hayek offered a new perspective on markets, prices, and the invisible hand. In his view, the fundamental process of a market economy

> is price formation. He interprets prices resulting from competing bids and offers as summaries of information dispersed among traders . . . A quarter-century later, the developers of the Economics of Information discovered that market imperfections attributable to informational asymmetries can cause serious inefficiencies . . . Initially, the main analytical tool was price theory, but more recently it has been game theory. In particular, it is the flavor of game theory that originates in the work of . . . John Harsanyi. (Wilson 1996, 296)

And, in a survey article on the Bayes-Nash School, consider the more specific reference linking a result of the school to the work of Hayek:

> It is often pointed out (for example, by Hayek [in "The Use of Knowledge in Society"]) that one of the remarkable and important features of the price system is its ability to convey information efficiently. All that a buyer or a seller needs to know about a commodity's supply or demand is summarized by a single number, its price. Does the process of price formation by competitive bidding have such information efficiencies? In the common-value model, the bidders lack complete information about the item's true value; each bidder has different partial information. However, even though no single bidder has perfect information, it can be shown that, if there is perfect competition in the bidding, the selling price reflects all of the bidders' private information . . . Thus the selling price conveys information about the item's true value. With perfect competition, the price is equal to the true value even though no individual in the economy knows what this true value is and no communication among the bidders takes place. (McAfee and McMillan 1987, 721–22)

Note well that these leading members of the Bayes-Nash School made reference to the work of Hayek in the context of interpreting

the significance of their own achievements. Agents' knowledge was portrayed as difficult to access by the auctioneer/central planner; but it was also difficult for the agents themselves to access: in contrast to the conventional Walrasian view, agents' knowledge was *untrustworthy.* But while agents' knowledge was deemed untrustworthy, they were still able to incorporate more information into their valuations, and therefore were deemed capable of highly sophisticated reasoning. The market would provide the information needed to carry out such sophisticated reasoning.

Now, markets could be enlisted to help agents think. "Truth" was now located both "out there" and "in here"—at least once the market had done its work. Truth was "out there" in that the market was designed in such a way that the price of an appropriately designed auction equaled the putative objective monetary value of an item for sale; it was "in here" in that bidders were sophisticated enough to infer this value from the "signals" conveyed by other bidders during the auction process, avoiding any behavior they would later regret, at least in equilibrium.

The Experimentalist School of Design

Let us first acknowledge the obvious: claiming that experimental economics constitutes a distinct school of market design is likely to strike some contemporaries as rather odd. After all, isn't experimentation about making economics more scientific by subjecting theoretical claims to controlled testing? But experimentalists have harbored far more vaunting ambitions. One gets a sense of these ambitions by examining the backgrounds of Vernon Smith, Charles Plott, Stephen Rassenti, Robert Bulfin, and Alvin Roth. The first thing to notice about this crew is that they did not trace their genealogy out of some well-established social scientific experimental tradition, such as that found in psychology, but instead hailed from engineering and operations research. In light of this background, it begins to make sense that such figures would also occupy themselves with problems of economic design. And then there are additional reasons.

The Experimentalist School of Design has roots in the earlier work of the Walrasian mechanism designers, the development in engineering departments of optimization routines, the development within economic laboratories of computerized experimental methods, and the neoliberal field of "public choice." The first contribution of experimentalists to attract the rapt attention of the orthodoxy (perhaps we should call it experimental economics' "killer app") was *not* the testing of economic theory, but instead the development and deployment of novel market forms to displace bureaucratic decision making. Under the new regime, the market, including its rules and participants, would now be explicitly conceived as a "person-machine system," a hybrid computational device.[23]

Experimentalists nowadays proclaim that everywhere, from the trading pit to the regulator's office to the corporate boardroom, can benefit from a little "economic system design."[24] In one respect, the first adjective is a bit of a misnomer, or at least imprecise, since for modern experimentalists there is no delimited "economy" that serves to circumscribe their attentions; hence, for the Experimentalist School, unlike in the cases of our previous schools, there can be no canonical model of the economy. There is, however, a generic "set packing problem" that results in complications that must be addressed in order to successfully design an economic system. The distinctive mathematical feature of this maximization problem is that because bids for packages are permitted, solving the maximization problem involves properly assigning prices to disjoint sets of items.

One feature of this approach is an intensified and more sophisticated focus on the algorithmic properties of the market than previously available.[25] When stressing the computational properties of market operations, these market designers appeal to the "computational efficiency" of algorithms. When focusing on the algorithmic properties of markets, this approach recommends substituting less computationally burdensome procedures, often by shifting part—though not very much—of the computational burden onto the

"human persons" (bidders, in the case of markets) to assist in the search process (Porter et al. 2003, 11154). Markets, once conflated with the act of exchange, are now credited with being able to solve immensely complex maximization problems of any provenance. The relative status of humans versus "mechanisms" in this process becomes inverted in the quest to overcome complexity.

Although they did talk about offloading some of the computational burden onto agents, market designers did not view the "person" part of this "person-machine system" with much in the way of cognitive capacity. Perhaps some of this attitude derived from the experience of manipulating students in experimental settings. The dreaded hive mind of collective consciousness had finally made its appearance in economics. Agents are shape-shifters; sometimes viewed as incapable of coping with the substantial computational requirements imposed on them by Bayesian inference; in some other cases they can't think at all. People may be smart, stupid, or anywhere in between in the New New Economics. But prudence dictates it is best to assume the worst, and to ensure that the performance of markets is robust to the cognitive capacities of agents, or lack thereof. Such robustness is accomplished by offloading most of the task of information processing entirely onto the market mechanisms. The economist's task is now to build markets to handle the cognition that agents cannot—or, to use the highly appropriate term favored by experimentalists, to build "smart markets."

Experimentalists also framed their interventions by referring to the ideas of Hayek. One observes such framing in experimentalists' activities in making smart markets:

> The objective is to combine the information advantages of decentralized ownership with the coordination advantages of central processing . . . In effect we offer a solution to the Lange-Lerner-Hayek controversy of the 1930s. (V. Smith 1991, 811)

In discussing "information advantages," the importance of "central processing" is paramount. Central processing enables the completion of trades too complicated for individuals to complete on their own: "There is a puzzle as to the processes whereby our brains have [market exchange] and other skills so deeply hidden from our calculating self-aware minds" (V. Smith 2010, 5). At the hands of the Experimentalist School, the market is redescribed as a "price discovery" process, in almost direct parallel to Hayek's late discussion of competition as a discovery process. For example, Charles Plott titled the second volume of his collected papers *Market Institutions and Price Discovery* and characterized the lessons emerging from the work comprising a substantial part of the volume as follows:

> It is focused on the mysterious process through which markets find price. From Vernon Smith's early discovery of the ability of the law of supply and demand to predict price, the mechanism that produces the market price has been a mystery. In many senses the market operates like a set of computers, operating in parallel to compute the equilibrium price, which is unknown to everyone in the market before the market produces the answer. In this sense, the concept of "price discovery" as it is used in the work of market-makers is appropriate. (Plott 2001, xxiv)

The change in language reflects the Experimentalist view that only skillfully designed markets—"smart markets"—can find the economic knowledge that cognitively limited agents are *incapable* of knowing. This view is highly compatible with the notion that markets have the power to know things that agents cannot, the position taken by Hayek during his third period:

> In a 1968 lecture, "Competition as a Discovery Procedure," Hayek says ". . . I propose to consider competition as a procedure for the discovery of such facts as . . . (otherwise) would not be known to anyone . . ." Great insight; experiments have long demonstrated Hayek's

> proposition. People discover a price that they didn't know existed. (V. Smith 2015, 242)

And in direct reference to the ability of skillfully defined markets to substitute for human cognition:

> Human interactive experiments governed by a computer network enabled the accommodation of far larger message spaces, opened the way to the application of coordination and optimization algorithms to the messages of subjects, and facilitated their capacity to reach sophisticated equilibrium outcomes they did not need to understand. (V. Smith 2006, xii)

Economic designers had managed to convince themselves that they had faithfully come to grips with Hayek's concerns.[26] The early Cowles-based designers viewed themselves as assisting the government in a number of areas—proposing planning rules and suggesting the information to gather. Agents knew their "private" information, but the government did not. This established for them the task of "rational design of the institutional framework," which would amount to a novel kind of economic-cum-communication system—not central planning, but not quite like the market, either. Initially, economists conceived themselves as designing various methods to help gather information; knowledge was held by dispersed agents, and the job of the economic designer was to figure out how best to transport knowledge from where it was to where it wasn't—lest the economy not operate properly. Designers of the Bayes-Nash School tasked themselves with helping agents to come to know *their own* values. This they would do by helping agents to correctly infer values, then by recommending the use of knowledge-enhancing auction forms. In an environment where economists increasingly found themselves selling their expertise, such ambitions carried considerable appeal. Although game theorists attributed immensely impressive prodigious rationality to the agent, nevertheless economists managed to carve out a special

role for their own activities. Finally, the Experimentalist School viewed the task of designers as constructing machines to discover knowledge that individuals could not discover or otherwise comprehend themselves. These "smart markets" would include people, but in practice would substitute for the judgment of people—for example, by replacing regulatory bureaucracies. The Ghost of Hayek haunted them all.

Organizational Possibilities for Our Grandchildren

Over the past twenty years, economists of all stripes have found themselves engaged in the provision of boutique markets, deployed for a variety of purposes.[27] The economist is now just an engineer, as Noah Smith put it, and engineers qua engineers don't do politics: they just want the bridge to hold. Of course, Vernon Smith and Charles Plott make for uncomfortable counterexamples to this position, given that they are card-carrying MPS members and wear their politics on their sleeves. But for economists who herald the engineering turn, neither Smith nor Plott is the first one to come to mind.[28]

That nonideological personage would be 2012 Bank of Sweden prizewinner Alvin Roth. Roth's renown comes not merely or even primarily from exercises in theorem proving, or in devising a set of protocols for subjecting some proposition to a controlled empirical test (though he certainly has done both). Instead, to quote the Bank of Sweden's press release upon the announcement of his prize, his recognition comes from "the practice of market design," including the development of "systems for matching doctors with hospitals, school pupils with schools, and organ donors with patients" (Nobel Media AB 2014). To the public, Roth is often held out as the exemplary new model economist: the most visible face of a profession that leverages expertise not to advance an ideology, but to engineer ingenious practical solutions to difficult and important problems.

Because these solutions must actually work in the real world, ideologues need not apply. In a blog post entitled "Not all economists are neoliberal, honest," Diane Coyle voices this attitude perfectly:

> Where it is appropriate to prioritize efficiency, or to use market processes to achieve either efficiency or other outcomes, should always be a matter of public and political debate. Most of the economists I hang out with—applied micro people—think it will depend on both people's political choices and on the exact circumstances: the US trade in S02 emissions works well, the EU market in carbon emissions does not; Alvin Roth's matching markets for kidneys or medical jobs are magical (and no money changes hands). My kind of economists tend to be pragmatists, unlike those in politics who argue the market is always best. (Coyle 2015)[29]

Recent years have seen the term "freshwater versus saltwater" recycled for public use, yet no one would think to suggest that Roth belonged to either camp: upon his receipt of the Bank of Sweden Prize, "freshwater" and "saltwater" alike heaped praise on Roth's work (see, for example, Levitt 2012). Among the Micro, Roth assumed a nearly unparalleled stature: after posing the question "What is market design?" one well-respected game theorist quipped (only partly in jest), "Whatever Alvin Roth says it is" (Vohra 2014). If ever there were a person who could wrest market design from the "bad Hayek," it would be Roth.

All of which makes Roth's discussions of Hayek so noteworthy. In his much-lauded post- prize book-length popularization of his work, *Who Gets What—and Why,* Roth links market design to Hayek in the following way:

> I made the analogy between a free market with effective rules and a wheel that can rotate freely because it has an axle and well-oiled bearings. I could have been paraphrasing the iconic free-market economist Friedrich Hayek . . . He understood that markets need effective rules to work

> freely. Hayek also understood that there is a place for economists to help in understanding how to design markets . . . Debates about markets often use the phrase "free markets" as a slogan, sometimes as if markets work best without any rules other than property rights. Hayek had something to say about that, too: "Probably nothing has done so much harm to the liberal cause as the wooden insistence of some liberals on certain rules of thumb, above all the principle of laissez faire." (Roth 2015, 226–27)

We take this passage not as some smoking-gun evidence that Roth intended to set out to craft a high-tech Hayekianism, but rather as providing some indication of how pervasive neoliberal ideas are. From these words, one can almost sense Roth's surprise upon picking up Hayek for the first time and finding so much of what he said to be so amenable to his own views: Hayek was opposed to laissez faire, held that markets are constructed entities, and that careful attention must be paid to institutional structure. So, too, for Roth.[30]

The reader might well think of Roth's words here as indicative of nothing more than a recognition in Hayek's work of constructivist and informational themes, with none of the attendant epistemology, or certainly his politics. It is, after all, a good distance between the design of a clearinghouse for medical residents and, say, articulating a rationale for authoritarian liberalism or, more to the point, designing a constitution. Hence, we are fortunate that Alvin Roth has also speculated in print on a variety of political and economic matters—the occasion for which was his participation in a volume wherein "leading economists" were asked to speculate on what the world will look like in 100 years (Palacios-Huerta 2014). While the recent performance of the economics profession should inspire no confidence whatsoever in the predictions of its members, closely reading Roth's fantasies can give insight into the state of economics today.

At first glance, Roth's essay might strike one as the musings of an engineer who is optimistic in his estimation of humanity's ability

to answer the "big questions" facing it, but humble in the role he reserves for economists in providing the answers. Indeed, Roth favorably quotes Keynes's famous passage from "Economic Possibilities for Our Grandchildren," wherein Keynes counseled that economists accept this kind of role: "If economists could manage to get themselves thought of as humble, competent people, on a level with dentists, that would be splendid!" Roth then adds, "Perhaps if we replace *dentists* with *engineers,* that is still a good goal for the next hundred years" (Roth 2014, 119). And yet, Roth's engineer-economist is entrusted with far more than routine cleanings, filling cavities, or the occasional root canal. According to Roth:

> As computers and computer science continue to advance, artificial intelligence will have crossed the barrier so that some parts of technology will be self-directing—able to operate not merely without direct human supervision but able to formulate intermediate goals as well as plans of action to achieve them . . . As computer assistance becomes more ubiquitous in all aspects of life, some of that assistance will be in markets, helping us piece together things we need . . . without the time-consuming personal attention that some person would have to give to the task. (Roth 2014, 117)

No longer will the market necessarily give people what they say they want—instead it is designed to operate regardless of their wants. An ever-increasing amount of thinking will be offloaded onto smart markets, which will then be commodified and sold. Some of market design will be deskilled, but no matter because the unbounded scope of "design economics" will offer inexhaustible opportunities for the economist-engineer. According to Roth:

> Computerized markets will make market design more important, as many market details will have to be embodied in computer code. But many kinds of market design that are today crafted by specialists will have passed from frontier knowledge to whatever is then the equivalent of

> shrink-wrapped software, much the way that techniques of mathematical optimization that once were the domain of PhDs in operations research have become available in software packages. But there will still be unsolved problems of organization and coordination, so market design (or, more generally, design economics dealing not just with markets but with the design of all forms of organizing, transacting, and allocating) will have become and will remain an important part of economics. (Roth 2014, 117–18)

But the future is now. As we noted in the previous section, economists, beginning with those at Cowles but rapidly spreading outward, have styled themselves as experts in the design of organizations for at least four decades. And, indeed, returning to *Who Gets What,* Roth offers the following *present* account of market design: "Successful designs depend greatly on the details of the market, including the culture and psychology of the participants" (Roth 2015, 78). And, more specifically, "if you really want to operate at digital speeds, you need to take people out of the middle of the process" (Roth 2015, 101). This is *today's* reality: the market is a person-machine system, with the thinking offloaded onto things. If anything has changed, it is the scope of the economists' ambitions.

When listing all the domains and stuff of modern social life that could be conceptualized as markets, Roth works himself into a frenzy:

> Amazon couldn't have become the marketplace it is without the Internet, which couldn't have become a marketplace without first computers and then smartphones. And smartphones couldn't have become marketplaces without a way to pay for purchases over the phone . . . On the Internet, it's convenient to pay with a credit card. And a credit card is also a marketplace . . . [M]arkets include not only our experiences at the supermarket or phone store but also those in getting into college, finding a job, eating

breakfast—even getting a kidney transplant. (Roth 2015, 22–23, 27)

In Roth's vision, markets will have spread into every nook and cranny of human existence: reproduction will be commodified and separated from sexual intercourse; performance-enhancing drugs will become as common as milk for children and coffee for adults; parents will fork out big bucks to purchase better genetic endowments for their children.

Although Roth does acknowledge that some of these developments might make the present day reader squeamish, this too shall pass, as future generations will come to marvel at why anyone ever thought purchasing organs was a big deal. More to the point, such squeamishness becomes just another topic of study for the market designer, who casts an unsentimental eye upon "repugnant transactions," and sets to the task of creating workarounds. Roth's "100 years" essay serves less as prognostication than as a window into the thinking of the present-day market designer, for which everything becomes a market—down to the very quiddity of the self.

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Market design was the unintended consequence of orthodox economists grappling with themes introduced by Hayek. None of the preceding should be taken to suggest that neoliberals concocted market design, only to impose it upon unsuspecting economists, thereby foisting neoliberalism upon them. Indeed, not all card-carrying neoliberal economists liked what they saw. To take but one example, in Roth's Bank of Sweden lecture (Roth 2012), Roth tweaked George Stigler, who in his capacity as editor of the *Journal of Political Economy* rejected early work of Roth on market design as "not economics." For the most part, though, neoliberals came around. They have wanted to link their prescriptions to the most recent ideas about how markets work, and those ideas have fit neoliberal politics to a "T".

Slowly at first, but then with astonishing rapidity, the aspirations of economists and policymakers converged on the task of thoroughly

redesigning the organizations of the economic lifeworld from bottom to top. Market designers offered to lend their expertise (for a price), and with increasing frequency policymakers took them up on their offer. This convergence was no accident. Policymaker and economist alike came to appreciate how real-world markets came to increasingly resemble information processors, and adjusted their aspirations in light of this; both would come to attribute immense epistemic capacities to these markets. As a practical matter, this justified the piecemeal marketization of government functions and ultimately full privatization; as a theoretical matter, this served to degrade the cognitive capacities of the agent. Market design turned out to be a perfect "fit" for its time, because it constitutes the precepts of neoliberalism taken to their logical conclusion.[31]

Now The Market is not merely an information processor but an *omnipotent* processor of information: That Than Which No Greater Can Be Conceived. Markets are somehow both more transparent than bureaucracy and yet their design is both too important a matter and too opaque to leave to democratic deliberation, since the democratic public is incapable of comprehending the operation of markets. As market participants, people are regarded as the weak link in this complex technology, their severe cognitive limitations a clear threat to its proper functioning. Consequently, markets are less and less conceived as being about giving people what they may think they want, and increasingly about operating regardless of their wants. Here one finds the terminus of Hayek's struggles with epistemology, with the full neoliberalization of information economics.

These "markets" of the market designers were *not* the markets of yore. They might, like conventional markets, rely on prices; but then again, like Roth's kidney exchanges (and Cowlesian central-planning schemes), they might not. Yet nor were they exactly the same as older structures of bureaucracy. They were something else altogether: immensely complex algorithmic procedures, instantiated through the process of *bricolage,* and offered in the spirit of substituting a "reliable" technology of governance for methods that

previously had unfortunately depended on the woefully unreliable human element. Consequently, anywhere humans gathered to resolve anything—the regulatory committee hearing, obviously, but also the voting booth and the corporate boardroom—lurking was a candidate for market design. It was the most ambitious program in the history of economics: petitioning to repeal the Corn Laws, installing a Pigouvian tax, engaging in a bit of macroeconomic fine-tuning, or even thoroughgoing economy-wide central planning appear quaint by comparison. Market designers offered to assume responsibility for reconstructing the nature of Society from top to bottom.

Notes

1 For initial responses to the award, see Boettke (2007) and Tabbarok (2007). For one example of a paper devoted to establishing Hayek's influence on the neoclassical orthodoxy, see Skarbek (2009).

2 Regarding the former, see Boettke (2002). Regarding the latter, see Lavoie (1986).

3 Here and there one encounters the claim that game theory should be viewed as an outgrowth of a broader Austrian tradition, yet such claims are advanced halfheartedly and without reference to Hayek's work. See Foss (2000) and Kiesling (2015).

4 The roster of invitees to the George Mason conference included Israel Kirzner, Edmund Phelps, Vernon Smith, as well as Maskin—which gives some indication of the insights that can be expected from this project.

5 Pride of place goes to Oguz (2010); other useful sources are Kahlil (2002), Lavoie (1985), and Boettke and O'Donnell (2013).

6 The prehistory of neoliberalism growing out of Weberian sociology has been the subject of recent intensive research by Nick Gane (see Ossandón 2014).

7 It may not be amiss to point out this structural similarity to Shannon's use of entropy was one reason the Hayekian "first movement" proved so popular well outside the professional precincts of economics, as in artificial intelligence.

8 On the structure of associationist psychology, see Daston (1978) and Mandelbaum (2015).

9 It has not been clear to subsequent commentators just how different, and even opposed, were Polanyi's and Hayek's philosophies of knowledge. This has been occluded by assertions that they both believed in similar notions of "tacit knowledge." On this, see Mirowski (1998), Oguz (2010), Bateira (in Dolfsma and Soete 2006), and Butos (2010). Nevertheless, the Hayekian version of unconscious rationality was popularized for noneconomists in Gladwell (2005).

10 See Boettke and O'Donnell (2013, 314): "Radical ignorance is a significant element of Hayek's economic thought."

11 Rumsfeld was himself a member in good standing of the neoliberal thought collective, an avowed acolyte of Milton Friedman. For the quote, see Rumsfeld (2010). It has been reported that Donald Rumsfeld, in a speech at Milton Friedman's ninetieth birthday party in 2002, held by the Bush White House to honor Friedman's legacy, said, "Milton [Friedman] is the embodiment of the truth that ideas have consequences."

12 See, for instance, Diamond (2012).

13 Cowan, David, and Foray propose a similar taxonomy—articulated, unarticulated, and inarticulable knowledge—without citing Hayek, only to reject the third category as "not very interesting for the social sciences" (2000, 230). This paper shows just how misguided their judgment was.

14 The NSF/CEME series ran yearly; its roster of participants included nearly every major figure in postwar microeconomics.

15 "The comparative merits of alternative systems are typically being debated under such labels as centralization against decentralization, social control or planning against free markets, or in similar terms. This dichotomy was present in the famous Mises-Hayek-Lange-Lerner controversy concerning the feasibility of socialism . . . A survey of the literature will show that issues concerning the proper internal structure of business and other large organizations involves *[sic]* similar dichotomies" (Hurwicz 1971, 80). For a recollection of this work, see Reiter (2009).

16 He associates what he calls "high modern social science" with "an abiding interest in the means by which systems store, process, and communicate information about themselves and their environments, often expressed through the formal analysis of information" (Heyck 2015, 11).

17 "Problems of economic policy may be grouped in two broad classes which may be loosely described as those involving choice of the value of a 'parameter' within a given system of economic institutions and those involving choice among institutions . . . Examples of the second type include the design of 'new' economic systems, such as were embodied in the Yugoslav economic reform of 1968" (Mount and Reiter 1974, 161).

18 Varian's career may be taken as a better indicator of the profession's changes. Formerly a professor at University of California, Berkeley, and a well-known writer of a widely read graduate textbook in microeconomics, Varian now serves as chief economist for Google.

19 According to Roger Myerson, Vickrey had produced "the one great paper with a truly modern treatment of information before Harsanyi" (2004, 1818).

20 One example of this shared enthusiasm is Wilson's contribution to the study of "decentralization under uncertainty" (Wilson 1969b). For his contributions to Social Choice Theory, see Wilson (1969a; 1969c).

21 Interestingly, Alvin Roth would also study under Wilson. We discuss the work of Roth in more detail below. Later, the center of gravity shifted to Northwestern

University, as the program initiated there by Stanley Reiter came to house an increasing number of game theorists.

22 Milgrom and Weber (1982) is generally regarded as providing the canonical model of the Bayes-Nash approach (Krishna 2002, 83–102; McMillan 1994, 146).

23 One of us has discussed this development in a different context as a shift of economics into the realm of the "cyborg sciences" (Mirowski 2002).

24 During the period it was the epicenter of studies in experimental economics, George Mason University established a graduate certification in economic system design; today, Chapman University (home to Vernon Smith) offers an MS in economic system design.

25 "Mechanism design has matured over the past 20 years by focusing on incentive compatibility and political viability. The analysis has usually been carried out under the working assumption that infinite computing capacity is always available. Any computation required of the individuals or of the system can be instantaneously and correctly completed. Of course, any expert in organizational computing knows this is clearly wrong" (Ledyard 1993, 122). Ledyard devoted the rest of his article to suggesting how to bring together research in organizational computing and the economics of market design.

26 As we have seen, they failed to convince many Austrians of the same, at least regarding the activities of the Walrasian and Bayes-Nash Schools. Their reactions to the design activities of the experimentalists have been more muted, possibly because of formal affiliation with the neoliberal project: both Vernon Smith and Charles Plott are members of the Mont Pèlerin Society.

27 Although this is not the place to rehearse the argument in its entirety, a strong case can be made that the history displays a pronounced tendency in the direction of what we have called the "Experimentalist School of Design" (see Mirowski and Nik-Khah 2017).

28 Characteristically, Noah Smith seems to miss even this point, assuming instead that Smith's belief that markets can generate asset bubbles disqualifies him as a "market-oriented thinker" (N. Smith 2015).

29 See also Hal Varian's (2002) discussion of Roth's work in the *New York Times.*

30 Moreover, Roth makes use of the language of "price discovery," though he tends to waver between the epistemic views of the game theorists and the experimentalists (see, esp. Roth 2015, 185–88).

31 Although we tend to forget it now, pioneers in this effort often wore their neoliberal commitments on their sleeve. For example, Charles Plott credited his work in design to MPS member James Buchanan's "constitutional political economy" (see Lee 2015).

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