



## the consilient observer

applying cross-discipline frameworks to investing

# The Janitor's Dream

## Why Listening to Individuals Can be Hazardous to Your Wealth

*"In the existing sciences much of the emphasis over the past century or so has been on breaking systems down to find their underlying parts, then trying to analyze these parts in as much detail as possible . . . But just how these components act together to produce even some of the most obvious features of the overall behavior we see has in the past remained an almost complete mystery."*

Stephen Wolfram  
*A New Kind of Science*

### Beyond Newton

Where does consciousness come from? This question has bedeviled philosophers and scientists for centuries. We have cured diseases, put men on the moon, and probed many details of our physical world. Yet even the best thinkers today have difficulty *defining* consciousness, let alone *explaining* it. Why have we had so much success in some scientific realms and so little in others, like unveiling the mysteries of consciousness?

Not all systems are alike, and we can't understand the workings of all systems on the same level. Let's start with the systems that we *do* understand. Many of science's triumphs over the past few centuries are rooted in Isaac Newton's principles. Newton's world is a mechanical one, where cause and effect are clear and systems follow universal laws. With sufficient understanding of a system's underlying components, we can predict precisely how the system will behave.

Reductionism is the cornerstone of discovery in the Newtonian world, the basis for much of science's breathtaking advance in the 17th-19th centuries. As scientist John Holland explains, "The idea is that you could understand the world, all of nature, by examining smaller and smaller pieces of it. When assembled, the small pieces would explain the whole."<sup>1</sup> In many systems, reductionism works brilliantly.

But reductionism has its limits. In systems that rely on complex interaction of many components, the whole system often has properties and characteristics that are distinct from the aggregation of the underlying components. Since the whole of the system *emerges* from the interaction of the components, we cannot understand the whole simply by looking at the parts. Reductionism fails.

Neuroscientist William Calvin, who is in the thick of the consciousness dialogue, notes that we can approach the problem in various ways but that the key to understanding consciousness certainly is not in the "basement" of neural chemistry or the "subbasement" of quantum mechanics. There are too many layers of interaction in the brain. The parts don't explain the whole. Calvin calls the leap from the subbasement of quantum mechanics directly to the penthouse of consciousness the *janitor's dream*.<sup>2</sup>

Why should investors care about the janitor's dream? If the stock market is a system that emerges from the interaction of many different investors then reductionism—understanding individuals—does not give a good picture of how the market works. *Investors and corporate*

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executives who pay too much attention to individuals are trying to understand markets at the wrong level. An inappropriate perspective of the market can lead to poor judgments and value-destroying decisions.

## Sorting Systems

When a system has low complexity and we can define interactions linearly, reductionism is very useful. Many engineered systems fit this bill. A skilled artisan can take apart your wristwatch, study the components, and have a complete understanding of how the system works. Such systems also lend themselves to centralized decision making. Many companies in the industrial revolution were good examples of engineered systems—a product went down a manufacturing line and each worker contributed to the end product. Through scientific refinement, managers could continually improve the system's performance.

On the other hand, centralized control fails for systems with sufficient complexity. Scientists call these complex adaptive systems, and refer to the components of the system as agents. Complex adaptive systems exhibit a number of essential properties and mechanisms:<sup>3</sup>

- **Aggregation.** Aggregation is the emergence of complex, large-scale behavior from the collective interactions of many less-complex agents.
- **Adaptive decision rules.** Agents within a complex adaptive system take information from the environment, combine it with their own interaction with the environment, and derive decision rules. In turn, various decision rules compete with one another based on their fitness, with the most effective rules surviving.
- **Nonlinearity.** In a linear model, the whole equals the sum of the parts. In nonlinear systems, the aggregate behavior is more complicated than would be predicted by totaling the parts.
- **Feedback loops.** A feedback system is one in which the output of one iteration becomes the input of the next iteration. Feedback loops can amplify or dampen an effect.<sup>4</sup>

Complex adaptive systems include governments, many corporations, and capital markets. Efforts to assert top-down control of these systems generally leads to failure, as we saw with the former Soviet Union. Figure 1 contrasts the two types of systems.

Thinking about the market as a complex adaptive system is in stark contrast to classical economic and finance theory that depicts the world in Newtonian terms. Economists treat agents as if they are homogenous and build linear models—supply and demand, risk and reward, price and quantity. None of this, of course, much resembles the real world.<sup>4</sup>

**Figure 1: Complexity and Decision-Making**



Illustration by Sente Corporation. See [www.senteco.com](http://www.senteco.com). **The Stock Market as a Complex Adaptive**

## System

The stock market has all of the characteristics of a complex adaptive system. Investors with different investments styles and time horizons (adaptive decision rules) trade with one another (aggregation),<sup>1</sup> and we see fat-tail price distributions (non-linearity) and imitation (feedback loops). An agent-based approach to understanding markets is gaining broader acceptance. But this better descriptive framework does not offer the neat solutions that the current economic models do.<sup>5</sup>

Investors who view the stock market as a complex adaptive system avoid two cognitive traps. The first is the constant search for a cause for all effects. Critical points, where large-scale reactions are the result of small-scale perturbations, are a characteristic of complex adaptive systems. So cause and effect are not always easy to link. Following the stock market crash of 1987, for instance, the government commissioned a study to isolate the “cause” of the crash. After an exhaustive study, the Brady commission was unable to earth a particular cause. The point here is not that cause and effect don’t exist, but rather that not every effect has a proportionate cause. As humans like to identify a cause for every effect, this concept is difficult to internalize.

The second trap is to dwell on the input of any individual at the expense of understanding the market itself. For example, executives often question how it is that the empirical evidence shows the market follows cash flows when most investors talk about accounting results. The answer is that every individual operates with his or her own decision rules,<sup>2</sup> while the market represents the aggregation of these rules. Further, studies of systems with sufficient complexity,<sup>3</sup> show that a collective of diverse individuals tends to solve problems better than individuals can—even individuals that are so-called “experts.”<sup>6</sup>

## Using What You’ve Got

Time-pressured decision-makers often rely on rules-of-thumb, or heuristics, for their decision-making. While heuristics don’t always lead to the best answer in a particular situation, they are often useful precisely because they save time for their users. However, heuristics can also lead investors to make biased decisions. One facet of successful decision-making is gaining an understanding of these biases so as to mitigate their cost.<sup>7</sup>

The *availability heuristic* allows investors to assess the frequency or likely cause of an event by the degree to which similar events are “available” in memory. Ease of recall is one bias that emanates from the availability heuristic. In other words, investors or managers may place greater emphasis on information that is *available* than on information that is *relevant*.

We believe this bias is at the heart of the janitor’s dream problem. Investors and managers spend a lot of time focusing on information that is available, like current earnings and multiples, rather than on information that is more meaningful—i.e., what the *market* reveals about expectations for future performance. Corporate managers see analyst reports that dwell on earnings, and hence incorrectly assume that the market is a simple addition of these agents.

Investors and corporate managers trying to understand the market must recognize that it’s a complex adaptive system. The market’s action reflects the interaction of many agents, each with varying knowledge, resources, and motivation. So a disproportionate focus on individual opinions can be hazardous to wealth creation.

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<sup>1</sup> Sandra Blakeslee, “Scientist at Work: John Henry Holland; Searching for Simple Rules of Complexity,” *The New York Times*, December 26, 1995.

<sup>2</sup> William H. Calvin, *How Brains Think: Evolving Intelligence, Then and Now* (New York: Basic Books, 1996).

<sup>3</sup> John H. Holland, *Hidden Order: How Adaptation Builds Complexity* (Reading, MA: Helix Books, 1995).

<sup>4</sup> Michael J. Mauboussin and Kristen Bartholdson, “Guppy Love: Exploring Imitation in Markets,” *The Consilient Observer*, Credit Suisse First Boston Equity Research, May 22, 2002.

<sup>5</sup> Michael J. Mauboussin, “Revisiting Market Efficiency: The Stock Market as a Complex Adaptive System,” *Journal of Applied Corporate Finance*, Winter 2002, 47-55.

<sup>6</sup> Norman L. Johnson, “Diversity in Decentralized Systems: Enabling Self-Organizing Solutions,” LANL, LA-UR-99-6281, 1999.

<sup>7</sup> Max Bazerman, *Judgment in Managerial Decision Making*, 4th ed. (New York: John Wiley & Son, 1998), 6-17.



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