

## The Social Atom

why the rich get richer, cheaters get caught, and your neighbor usually looks like you

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### Preface

loc87 Schelling's segregation game (1971): Paradoxically, people's innocent preference to avoid living in an extreme minority ends up. obliterating mixed communities altogether.

[C] 1. The asymmetry between attractive and repulsive interactions should be paid attention.

2. If there are some people who love being minority (or don't care), what happens? What is the personality/peculiarity effect?

Schelling's work also offers a positive message—that a good way to get some insight into the human world is to step back from our usual fixation on the nuances of individual human psychology and to follow a more simpleminded approach.

### 1. Think patterns, not people

loc173 The one thing that makes Kerala different is education. Not education about birth control and family planning, as you might expect, but general education, in reading, writing, and arithmetic, and especially for women.

Economists and social researchers now agree that in Kerala, women's education is the magic bullet that has taken the air out of the great balloon of population growth—a balloon that had been ascending steadily for thousands of years.

loc188 There's an old way of thinking that says the social world is complicated because people are complicated. That's why, many people think, we've never been able to understand the human world with theories as reliable as those of physics and chemistry. Atoms are simple, people aren't, end of story.

loc296 Even though people are a lot more complicated than atoms or stones, I hope it's clear that the basic project of social science does really seem a lot like physics. First you have to understand the character of the social atoms, then learn what happens when many such atoms interact, creating a rich world of collective patterns and outcomes.

### 2. The “human” problem

loc660 it is likely that much of our confusion about the human world arises not from human separation from nature but in our mistaken belief in such separation. We've failed to be objective enough about ourselves.

### 3. Our thinking instincts

loc776 Political scientist Robert Axelrod of the University of Michigan has suggested that economists have remained devoted to the rational perspective for one simple reason -without it they wouldn't know what to do.

loc848 We seem genetically hardwired for error.

[C] Then, this must be beneficial; including irrationality illusions must be understood more rationally.

918 when it comes to understanding the social atom, the single most important fact is that  
our ancestors, for 99 percent of human history, lived in small nomadic bands of hunter-  
gatherers—typically a few dozen people.

937 Another peculiar human behavioral habit is “loss aversion.” (found in other primates as  
well)

978 To make a rough summary, we could say that Kahneman’s “two systems” correspond to  
two essential principles that account for an awful lot of human behavior, at least when it  
comes to solving problems.

First, we’re not rational calculators, but crafty gamblers. Gut feelings, emotions suspicions—  
where do they come from? From the hunter-gatherers locked inside who see and sense in  
ways our conscious minds do not.

Second, we are adaptive opportunists.

987 Part of our mind does work with reason and logic, and it can help keep our instinctual  
system from getting us into trouble. Even so, what really makes the conscious part of our  
mind powerful isn’t logic but the ability to adapt—to take a step. based on one rule, idea,  
or belief, then to adjust depending on the outcome.

#### 4. The adaptive atom

1211 What sets this modern thinking apart from long tradition is the !belief that it is not individ-  
ual human complexity that makes markets hard to understand, but the delicate order and  
organization among the many people within any market. It is, again, pattern rather than  
people.

[C] Human interactions perhaps make the collective behavior simpler, by exclusion principle.

1242 Their results show that in the Minority Game—and by implication, in the El Farol game, or  
in any of the adaptive market models based around it—things should work very differently  
depending on the number of people who participate. When few people take part, they found,  
the limited number o strategies in play isn’t enough to cover the space of possible patterns.

In contrast, if enough players participate, their strategies will cover all possibilities. Any  
pattern in the sequence of outcomes will be noticed and jumped on immediately. In the  
former case, the collective outcome (or the movement of the price in the market) will follow  
predictable patterns. In the latter, all predictable patterns should dissolve into unpredictable  
randomness. Surprisingly, Challet and Zhang showed that the transition from one regime  
into the other works much like a ”phase transition.”

#### 5. The imitating atom

1356 Rumors and episodes of mass panic illustrate wha seems to be a pervasive tendency among  
human !beings to copy the behavior of others.

Why are humans as a species so susceptible to self-propelling waves of mass behavior?

1404 Our conformist tendencies may have much deeper biological roots.

“Social setting alters the individual’s perception of the world.” Burns and colleagues also  
found that on occasions when people successfully resisted the group pressure, brain activity

took place mainly in regions associated with emotion, as if they instinctively felt risk in breaking with the group.

1451 In 1995, when two writers on management theory, Michael Treacy and Fred Wiersema, published a book entitled *The Discipline of the Market Leaders*, they bought up fifty thousand copies of their own book, especially from bookstores where sales were monitored to determine the New York Times' best-sellers lists. Even though the book had only mediocre reviews, it shot right onto the list. What's more, being there was enough to generate further sales that kept it there.

1461 For the most part, economic theorists have generally tried to ignore the influence of human imitation altogether.

1489 Logically speaking, in any specific situation, we all must have some threshold, although it may be rather difficult to determine in practice.

The mere existence of such thresholds, reflecting the power of interpersonal influence over behavior, can make a group's behavior extremely difficult to predict.

But notice how delicately the outcome depends on the precise interlocking of these thresholds.

So a tiny difference in the character of just one person can have a dramatic effect on the overall group. As Granovetter noted, however, a storytelling explanation would miss this subtlety and make the representative-agent mistake of attributing the outcome to the "character" of the crowd. In the former case, the story might say "a crowd of radicals engaged in riotous behavior," while in the latter it might instead report "a demented troublemaker broke a window while a group of solid citizens looked on." <sup>1</sup>

The "atomic physics" of social cascades suggests that there is no easy way around this problem. Tiny differences in a crowd, the presence or absence of a few people of the right type, might be the difference between a couple of broken windows and entire blocks in flame.

1527 Granovetter's way of thinking makes it clear that understanding the consequences of interpersonal influence is tricky indeed. Yet it also suggests that the workings of social transformations driven by such influences may not be completely beyond mathematical science. Researchers have recently taken Granovetter's ideas further. In so doing, they've found that the flip side of contingency is a surprisingly universal law—a striking example of the hidden physics of the social world.

Prying into this weird connection in greater detail, Bouchaud, along with colleague Quentin Michard found a way to build similar theories for people.

Analyzing data for cell-phone adoption during the 1990s, they found that the rate of adoption precisely follows the mathematical pattern Predicted by the magnetic model. This is about peer pressure. <sup>2</sup>

1578 In further mathematical analysis, Bouchaud and Michard found that when the influence of one [person on another is sufficiently strong, one should in fact expect social changes to take Place not just rapidly but discontinuously—with a large fraction of the population changing from one behavior or opinion to another at almost the same moment.

As an amusing aside, the two physicists tested their model to see how well it [predicts

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<sup>1</sup>M Granovetter, Threshold models of collective behavior, Am J of Sociology 83 1420 (1978).

<sup>2</sup>EPJB 47 151

the way episodes of clapping begin, and then abruptly end, following a concert. You know, a few people start it off, everyone then joins in, and then, finally, the clapping tapers off with a few late clappers, and then silence. Not surprisingly, the model works beautifully in this case, as this phenomenon is driven almost entirely by imitation.

if you put the data for clapping-recorded from various concerts-next to the data for birthrates and cell phones, and correct them for the natural but unimportant difference in timescales, you find that all three phenomena fall onto precisely the same mathematical curve.

1615 As the philosopher Eric Hoffer once noted, “When [people are free to do as they please, they usually imitate each other . . . . A society which gives unlimited freedom to the individual, more often than not attains a disconcerting sameness.”

1621 But, an awful lot of what is most important in the social world is still missing from all this-the stronger social interactions associated with trust and distrust, spite and envy directed hatred and animosity, feelings of devotion and responsibility.

## 6. The cooperative atom

1683 Research over the past decade appears finally to have put the nail in the coffin of the theory of self-interest. As it turns out, self-interest accounts for only part of our interactions with others, and many of us are not nearly so greedy as economic theorists have long assumed. Moreover, something like true, unspoiled human altruism does really seem to exist, and quite commonly.

As we shall see, our “prosocial” disposition and our noblest altruistic tendencies have deep roots in the physics of social self-organization and are probably responsible for our species’ unparalleled success in coordinating large groups and institutions.

[C] parochial altruism must be paid due attention.

1708 In essence, everything changes if two people meet repeatedly.

If social theorists have learned one thing in the past two decades, it is that real people do not always act as tidy theories say they should. The logic of pure self-interest implies that all altruism should completely disappear if people have no hope<sup>3</sup> whatsoever of gaining anything in the future. But as it now appears, this is simply not true-some of us seem to be “true altruists” after all.

1779 If you’re a true rationalist,<sup>4</sup> and if you’re convinced that all human behavior is ultimately based on the rational pursuit of self-interest, the choice is dead easy. You are only meeting once, and the stranger, being self-interested, doesn’t have much of a choice.

1792 Ultimatum game: most people, when “proposers,” offer about 40 percent of the money, either because they feel this is fair or because they worry that a smaller offer will be rejected. Meanwhile, about half of all “receivers” reject offers at the 20 percent level, even if the stakes rise up to several hundred dollars.

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<sup>3</sup>[C] but this may not be trustworthy information

<sup>4</sup>[C] however, the assumptions may not be trustworthy. Also someone gaining disproportionate gain could weaken your position in the future because, e.g., his offspring may be stronger than you kids.

1804 They found that people in some cultures were incredibly generous. More important, however, all cultures were alike in deviating systematically from the economic “ideal” of strict self-interest, even the stingiest offering at least 25 percent of the stake on average.

the culture of modern economic theory may have an insidious influence on how economists themselves behave in comparison to “normal” people. In effect, studying economics—at least economics as it has been taught in the past—seems to make people greedy.

1842 The imaging monitor showed that when the players cooperated, the most active parts of their brains included the nucleus accumbens and the orbitofrontal cortex—areas associated with processing emotional rewards.<sup>5</sup>

In 2004, economist Ernst Fehr and psychologist Dominique de Quervain of the University of Zurich discovered in similar experiments that we get a mental buzz when we punish cheaters, even when it means incurring a personal monetary cost.<sup>6</sup>

1854 Eight hundred life spans can bridge more than 80,000 years. But of these 800 people, 650 spent their lives in caves or worse; only the last 70 had any truly effective means of communicating with one another, only the last 6 ever saw a printed word or had any real means of measuring heat or cold, only the last 4 could measure time with any precision; only the last 2 used an electric motor; and the vast majority of the items that make up our material world were developed within the life span of the 800th person.

/Anthropologists refer to this period as the environment of Evolutionary Adaptiveness—the environment in which our ancestors lived for 99 percent of human history. During this time, what would have happened daily, throughout countless human lives over thousands of generations, was repeated interactions among the members of these small groups. In other words, it is a certainty that our ancestors were steeped, through unending real-world experience in the logic of reciprocal altruism.

1930 reciprocal altruism and other ways to establish cooperation among self-interested actors seem to work only in groups of a handful of people.

1962 Gintis and Boyd have shown that if this group-level competition is strong enough—as it plausibly was in those times—it would have been enough to keep a high fraction of strong reciprocators around in the general human population.

These findings suggest that true altruism, far from being a maladaptation, may in fact be the key to our species’ success by providing the social glue that allowed our ancestors to form strong, resilient groups.

1993 we are beginning to see why—it appears that selfless behavior may exist precisely because it is a key characteristic of the social atom that makes such large-scale cooperation readily possible. Throughout the ages, groups endowed with such altruists have outperformed those without them, leading naturally to such behavior being spread more widely.

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<sup>5</sup>J Rilling et al., A neural basis for social cooperation, *Neuron* 35, 395 (2002). Terrence Burnham and Dominic Johnson, “The Biological and Evolutionary Logic of Human Cooperation,” *Analyse & Kritik* 27 113 (2005).

<sup>6</sup>Neural basis of altruistic punishment, *S* 305, 1254 (2004).

2012 The flip side of this coin is a deeply ingrained tendency in many of us to fear and distrust. Perhaps, even despise those from other groups.

## 7. Together, apart

2051 After all, the tragedy in Bosnia was hardly unique in human history. Many such disasters-in Rwanda in 1994, or in Armenia in 1915, or in Nazi Germany-were brought about by the energies of millions of ordinary people most of whom, afterward went back to ordinary lives. As the Austrian economist Friedrich von Hayek noted during the Second World War, “The supreme tragedy is still not seen that in Germany it was largely people of goodwill, men who were admired and held up as models in the country, who prepared the way, if they did not actually create, the forces which now stand for everything they detest.”

2096 Such blind hostility to outsiders is clearly “maladaptive” in the modern world, but has served the Sentinelese well in the past, as it would have for all of our ancestors.

This isn’t so far away from the blind and deadly animosity of the Bloods and Crips, notorious gangs of South Central Los Angeles.

2139 Obviously, this model isn’t like our world. We normally<sup>7</sup> assume that the deepest and most important differences among people lie in their personality, character, and intelligence, in their skills and experience. It’s on the basis of these important traits that we generally try to learn about people and come to an informed decision about whom we can trust.

2164 To find out, Axelrod and Hammond devised a simple computer model of this artificial world (= colored people). ...The researchers started out with an equal number of all four colors and also doled out the four strategies in equal numbers, again at random. ... Cooperation always with those of your own color always spread through the population.

Natural segregation emerges.

What is really bizarre is that while these labels are meaningless to begin with, they come to carry real meaning.

rmp2237But the process cannot be understood by looking at the particular individuals involved, on their cultures neither of which are inherently barbaric. It is, again, a question of pattern, not of people.

2250 But ethnic hatred and distrust do not have to lead to pillaging and violence. The conditions of social poverty are not enough to kick -start ethnic cleansing. second common element in all genocidal events is the decisive action of some political leader or party that uses the dynamics of ethnic hatred for strategic ends, a process that goes beyond anything described in Axelrod and Hammond’s color game.

The American historian Henry Brooks Adams once suggested that practical politics, “whatever it professes, has always been about the systematic organization of hatreds.” That may take things a little too far, but it touches an important point-that certain individuals can assert terrific power over human history, not because they are actually so powerful, intelligent, or charismatic as individuals, but because they are successful at manipulating

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<sup>7</sup>Within some range around ‘normal state’ close to equilibrium so to speak, these usual ideas work, but under more extreme condition, only universal features matter like under torture or in high energy physics.

social patterns.

2280 Germany became Nazi Germany not only because of Hitler but because the temporary mood and character of the people in Germany made them ready to accept his message. History is controlled by the individual *and* the collective at once and to see how this can be, more precisely, it helps again to think of patterns-and once again to consider physics.

The energy of the collective pattern gives individuals, such as Milosevic, the ability to wield immense power, precisely by understanding the logic of the pattern and being able to direct it for his own ends.

## 8. Conspiracies and numbers

2369 Conspiratorial explanations persist because they suggest interpretations that seem safer or psychologically more acceptable; they often attribute evil doings to one's natural enemies or show how some surprising happening actually fits in with a predetermined view of how the world works.

2385 The only thing that unites these arguments, of course-and unfortunately typifies most political discourse—is the complete triumph of conviction over evidence. As with the more obvious conspiracy theories, conclusions take the stage first and go searching for justification later.

2462 Several years ago, physicists Jean-Philippe Bouchaud and Marc Mezard began exploring the workings of an artificial world based around these facts.<sup>8</sup>

2567 Why does the free market rule outside of a firm's boundaries, but not inside? Free market enthusiasts like to celebrate the power of the marketplace over "central planning," as in the former Soviet Union and other communist countries. But paradoxically, as economist Hal Varian of the University of California has put it, "the primary unit of capitalism, on close inspection, looks a lot like central planning."

2614 Axtell<sup>9</sup>programmed a computer to follow an artificial economy in which individuals could come together into firms. To start off, all were working on their own, but they could change their minds and join with others if that would bring them more income. To make the model just slightly more detailed, Axtell also included some personality differences—some people were ambitious and hardworking, with a high demand for income while others were less ambitious and could accept less to have more free time.

In a small firm, each person's effort has a large impact on the total output, so what a worker gets out depends on what he or she puts in. In small firms, therefore, no one has the incentive to free ride; all have the incentive to work hard. In a large firm, however, any one person's contribution to the overall effort becomes much smaller. In Axtell's simulations, he found that the growing size of some firms indeed induced some individuals, usually the less ambitious to begin cheating. Unfortunately, their example soon spread as hard workers, discontented by seeing their efforts pay off not for themselves, but for the slackers, also began shirking.

2658 Equally important, however, is that these power law patterns offer an aid in getting to

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<sup>8</sup>Bouchaud and Mezard, Wealth condensation in a simple model of economy, P A 282 536 (2000).

<sup>9</sup>R Axtell, Zipf distribution of US firm sizes, S 293 1818 (2001); The emergence of firms in a population of agents, Technical Report CSED, Working Paper No. 3(Brooking Institution, 2001).

grips with systems that simply never seem to settle down, that are always churning and changing and evolving.

## 9. Forward to the past

2693 What the champions of deregulation failed to appreciate, it seems, is that one of the best ways to compete is to drive your competitors out of business.

Under regulation, the big airlines regularly bought newer and more fuel-efficient airplanes, which translated into lower ticket prices for passengers. But under deregulation, financially troubled airlines could seldom risk spending billions for new planes that would be delivered years later. That's why many planes in the sky today are dangerously old.

2746 If both Hume and Smith were alive today, I suspect they would both argue that the level of inequality in wealth—it has dramatically risen in virtually all nations over the past twenty five years—presents a serious challenge to social cohesion.

2856 It certainly won't appeal to any of the countless millions who see in world history the revealed miracles of a divine Creator, and for whom the facts of science can only seem like aggressive intrusions upon divine freedom.

2864 Most of the people in this world believe that the Creator of the Universe has written a book. We have the misfortune of having many such books on hand, each making an exclusive claim as to its infallibility ... Each of these texts urges its readers to adopt a variety of beliefs and practices, some of which are benign, many of which are not.

It seems all too likely that religions exist for a reason; like ethnocentric prejudice, religious faith has, through the energies and devotion it inspires, paid dividends in the past, to our ancestors and the groups to whom they belonged. Many of our brains are, suspect, "prepared" to be religious in much the same way they are prepared to make instinctive decisions about whom to trust, for example.

2874 Our persisting instincts for religion may be our most dangerous "maladaptation."