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Two ways to emerge, and how to tell the difference between them by Steven Johnson

Four years ago, when I first started writing about emergence and political movements, it was much easier to find instances of self-organizing behavior in ant colonies and video game simulations than it was in the world of political struggle. But you could sense even then that the times were changing. The bottom-up communities that had emerged on the web over the preceding years were a clear sign of things to come: if the Slashdot demographic could coalesce into such a powerful collective force in a matter of years, it was easy to see how a group organized around political values rather than Linux could arise without the usual building blocks of money and infrastructure to support it. Indeed, some of this had already been visible on the streets of Seattle and other cities, thanks to the anti-globalization protests of the late nineties, which deliberately modeled themselves on swarm systems. I ended my 2001 book, *Emergence*, with a hopeful look at those protestors:

To some older progressives, steeped in the more hierarchical tradition of past labor movements, those diverse "affinity groups" seemed hopelessly scattered and unfocused, with no common language or ideology uniting them. It's almost impossible to think of another political movement that generated as much public attention without producing a genuine leader—a Jesse Jackson or Cesar Chavez—if only for the benefit of the television cameras. The images that we associate with the anti-globalization protests are never those of an adoring crowd raising its fists in solidarity with an impassioned speaker on a podium. That is the iconography of an earlier model of protest. What we see again and again with the new wave are images

of disparate groups: satirical puppets, black-clad anarchists, sit-ins and performance art—but no leaders. To old-school progressives, the Seattle protestors appeared to be headless, out of control, a swarm of small causes with no organizing principle—and to a certain extent they're right in their assessment. What they fail to recognize is that there can be power and intelligence in a swarm, and if you're trying to do battle against a distributed network like global capitalism, you're better off becoming a distributed network yourself.

Emergence, as it happened, was released in early September, 2001. It was, needless to say, an interesting time to have made a prediction about the liberating power of decentralized, cell-structure political movements. What I'd imagined a blueprint for future grassroots struggle turned out to be a remarkably apt description of the organizational strategies used by Al Qaeda. I had imagined emergent political movements as the last great hope for democracy, and here they were being hijacked by deeply reactionary, anti-democratic terrorists. Post 9/11 it was impossible to read those closing pages of my book, and not think of global terror, and in fact, I began hearing somewhat unnerving reports that the book was being widely read in the Defense Department and Homeland Security. Books invariably have a life of their own, where they depart from their author's intentions in all sorts of unusual ways, but this was a particularly cruel twist. My little manual for creating emergent political movements was being used to better understand how to shut them down.

But as 9/11 began to have less of a stranglehold on the American consciousness, and we began attacking old-fashioned, top-down dictatorships, another model of emergent political organization began to dominate the news: the leaderless activism of moveon.org, the instant collectives of meetup.com, and of course the revolutionary—if ultimately unsuccessful—Presidential campaign of Howard Dean. Swarm systems stopped being a strategy for overthrowing the Great Satan, and became a tool for "taking back democracy." Which was where I'd imagined them to be all along.

Watching the Dean campaign's meteoric rise and fall helped me to see some of my original ideas about emergence with a new clarity, particularly as they related to collective behavior among humans. I think now that I was really forcing two kinds of emergence to coexist under a single umbrella term. Imagine it as the difference between clustering and coping. Some simpler emergent systems are good at forming crowds; other, more complex ones, are good at regulating the overall state of the system, adapting to new challenges, evolving in response to opportunities. Sometimes, I suspect, it's helpful to blur the distinctions between clustering and coping for simplicity's sake. But when you subject them to the intense scrutiny and pressure of a national political campaign, the fault lines inevitably appear. Right now, emergent politics is brilliant at clustering, but clustering is not enough to get a national candidate elected. In fact, without the right coping mechanisms in place, clustering can sometimes work against your interests. You need

crowds to get elected to public office, but without more complex forms of self-regulation, crowds can quickly turn into riots. And riots don't win elections.

Clustering

One of the funny things about the literature of emergence is that it is strangely obsessed with slime. Slime *mold*, to be precise, thanks to researchers who have investigated this strange creature's capacity to oscillate between one organism and many: hundreds of free-floating cells that under the right circumstances will gang up together and become a single unit. For a long time, experts believed that there had to be a single "pacemaker" cell that initiated the clustering activity, a general calling the troops into formation. But researchers now believe that the clustering is a self-organizing phenomenon: no single cell is in charge of the slime mold system. Instead, the cells signal to each other using deposits of pheromone; in certain circumstances, the cells will follow pheromone trails, and when those trails reach a certain density—a tipping point—the cells begin to cluster together into a single unit. There are now wonderful computer simulations of slime model behavior available where you can experiment with different lengths and persistence of pheromone trails. Within a certain range, the cells remain free-floating agents, roaming aimlessly across the screen. But make the trails long enough, or make them decay at a slower rate, and the slime mold cells will quickly start to group together in large bodies.

When you see these clusters emerge for the first time, there's something undeniably magical in the sight. The brain somehow wants to find a leader in the collective, despite the fact that it knows intellectually that the pattern is forming via the laws of self-organization. Clusters of this sort can take a number of forms: the flocking patterns of birds (or boids, as in their computer doppelgangers), the orderly, single-file lines of ants marching across a picnic blanket. Behind each formation lies a shared group logic: following simple rules of signaling, systems of individual agents can organize themselves into higher-level shapes without any individual agent calling the shots. For the most part, these systems rely on the runaway amplification of positive feedback: create a pheromone trail strong enough to attract another ant, who lays down another layer of pheromone, thus making the trail strong enough to attract two ants, who then thicken the trail even more. Positive feedback loops are often the turbines of biological growth, and all emergent systems rely on them at least in part. But they lack a certain subtlety, a certain responsiveness. They're great at conjuring up crowds. But they're lousy at coping.

Coping

The collective behavior of the social insects—ants, bees, termites—is so marvelously orchestrated that many observers have suggested that the colony itself should be considered the organism proper, with the individual ants or termites functioning as so many cells in a body. (Hence the term supra-organism, sometimes used to describe colonies of social insects.) A swarm of social insects has far more personality and agility than a simple self-organizing cluster. Clusters just mass together in a big lump; colonies solve problems. They manage food resources through feast and famine; they allocate tasks with an almost Taylorite efficiency. As anyone who has ever battled termites know, they pull off dazzling—if destructive—feats of engineering, building nests out of the most unlikely of materials. Most importantly, perhaps, colonies are adaptive to changing circumstances. I don't mean "adaptive" in the sense of having evolved as a product of natural selection, though they are certainly that too. I mean "adaptive" in the sense of being able to respond quickly and effectively to new situations, to both opportunities and threats. Distribute three pieces of food within a few feet of a harvester ant colony, and the ants will 1) locate all three items, and 2) dedicate resources to collecting the nearest food first, followed by the second-nearest, and then ending with the most remote food. Try it again with food dispersed in different locations, and they'll solve the puzzle all over again.

This kind of emergent behavior is crucial to an organism's—or a group's—homeostasis, its ability to keep itself intact and healthy in unpredictable environments. Clustering is, ultimately, a more dynamic version of the beautiful crystal shapes generated by snowflakes: amazing patterns generated out of simple rules. Coping systems, on the other hand, have the spontaneity and intelligence of life: they seem to learn from experience; they probe and explore the environments; they keep themselves healthy and well-fed in sometimes hostile conditions. To do this, they require two key elements that are not necessary in clustering systems. First, they need a relatively complex semiotic code to communicate between agents. E. O. Wilson estimates that the pheromone signaling system used by ants contains as much as two dozen "words": "food this way," "danger," "help wanted," etc. The second key ingredient is in a sense built out of the first: coping systems need meta-information about the state of the collective. Traditionally this information is conveyed via indirect means, precisely because the system itself lacks a command control apparatus that can broadcast data to the entire swarm. Task allocation, for instance, seems to emerge through individual ants tracking the frequency with which they encounter other ants doing specific tasks. Instead of a system-wide alarm announcing that there are too many foragers, individual ants sense indirectly that there may be too many foragers by counting the ratio of foragers-to-nest-builders, and changing their activity if the ratio gets too far out of whack. Instead of the runaway amplifications of positive feedback, you get a system of checks and balances, driving the

system towards an equilibrium point, even as it encounters unforeseen situations.

The Madness Of Crowds

How does the opposition between clustering and coping map onto emergent politics? I would argue that almost all the tools we've developed—and almost all the tools exploited by the Dean campaign—were fundamentally about clustering: new ways of forming crowds, whether online or off. Meetup.com is of course the ultimate example of this. As Clay Shirky adroitly suggests, Meetup is fundamentally about "lowering the cost of organizing real-world gatherings." That's not a bad way of describing the evolutionary strategies of systems that self-organize into clusters. In the case of our slime molds, the lowered cost comes in the form of not having to evolve a higher-level intelligence capable of assessing the entire state of the collective and making an executive decision to form a cluster. There's an evolutionary cost in creating a central nervous system, and the simple positive feedback mechanism of the cluster enabled the slime mold collective to avoid that cost. In the case of the Dean campaign, of course, Meetup enabled Dean supporters to organize themselves without requiring the headquarters in Vermont to arrange and keep track of all those gatherings, which in itself creating a higher-level form of positive feedback: it became a national news story that all those groups were spontaneously forming all over the country, which led directly to the formation of new, and larger, clusters.

There was, to be sure, meta-information about the overall state of the Dean supra-organism flowing through the system, but that information primarily took the form of two key indices: people and dollars. The main Dean site— mirrored cheerfully by big media reporters and op-ed writers—was a constant barrage of stats about the number of Meetups held during the past week, and the latest staggering fundraising numbers. All of which created a powerful autocatalytic set, one that seemed likely to propel Dean to the nomination by the time early January rolled around. But as we've seen, clustering usually isn't enough when the environment gets more difficult. You need more responsive, more homeostatic tools to deal with sudden change and challenges. The system needs more than just a positive feedback loop, more than an attractor. It needs to be able to steer.

I'll reserve judgment on what the ultimate cause was behind the Dean campaign's loss in Iowa. The downward spiral of negative campaigning, wasted television ads, a "vast moderate media conspiracy"—choose your poison, the end result was in late January the Dean campaign suddenly had to confront a new reality. It had to cope and not just cluster. It needed information about vulnerabilities in the system, and feedback mechanism that would enable the system to correct itself. But those tools weren't built into the emergent system of the Dean campaign; the tools of the Dean campaign were all about generating increasing amounts of energy: more

people, more dollars. They weren't about responding to new challenges, and altering the direction of the supraorganism accordingly.

You could see this limitation most clearly by following the main Dean blog at blogforamerica.com. For months, the blog had actually been a reliable source of information about the state of the Dean campaign: new meetups and fundraising records, the latest polls, advance word about media appearances, summaries of op-eds about the Governor and the primary race. Spending time at the Dean blog at once made you feel part of a community and at the same time actually gave you relevant news. It was as informative as any political news wire, but it had a grassroots authenticity to it as well. But as it turned out, that authenticity was entirely predicated on a certain external environment: one in which Dean was the frontrunner, and almost all of the news—whether fundraising or polling or media coverage—was positive. When the dynamics of the campaign shifted literally overnight, and the external world began serving up genuinely bad news about Dean's prospects as a candidate, the Dean blog quickly became yet another campaign PR site: willfully ignoring the steady stream of dismal numbers and declining support. The authenticity of the site disappeared, because the authenticity had ultimately been the product of a positive feedback cascade. When the external environment turned negative, all that was left was spin.

It's entirely possible that the Dean campaign could have righted itself in the weeks after January, but I suspect that correction would have only come via a top-down process, not an emergent one, because the tools developed to support Dean were clustering in nature, not coping. (Dean seems to have hit upon the same insight during that period, in his famous call for a more centralized campaign after Trippi's departure.) A clustering emergent system is ultimately focused on doing more of what the system is already doing: how can we get a bigger crowd? How can we raise even more money? A coping system is just as often about patching holes—looking for weaknesses and figuring out ways to compensate for them. When Dean fared so poorly in Iowa—even before the Scream—there was no way for the system to make an assessment about what went wrong, and institute the proper repairs.

I suspect that such a system may well be fundamentally incompatible with the necessary structure of a national political campaign, at least for the foreseeable future. Emergent systems that excel at coping do so out of truly local information; they take their random walks through their neighborhoods and record patterns in what they find. National campaigns, on the other hand, work at a macro scale, and they are necessarily wedded to the broadcast amplifications of the national media. Whatever local disturbances or opportunities they discover are quickly uploaded to the world of network TV and satellite feeds, where they undergo all sorts of distortions. And national campaigns, by definition, have to have leaders, at least in the form of the politicians themselves. From my perspective, at least, one of the crucial failings of the Dean campaign is that the energy unleashed by the clustering tools distracted both the country and the campaign from problems in the

candidate himself, problems which ultimately became visible when voters actually sat down to decide who to vote for.

Is there an emergent politics capable of a more subtle form of self-regulation? If there is, I think it will first take shape, not as a political campaign, but as a more local, day-to-day affair: more *polis* than politics. With the right tools, local communities should be able to create emergent systems that help govern and shape their own development in new kinds of ways: the "eyes on the street" that Jane Jacobs celebrated in her classic works on urbanism, now amplified by the communications and pattern-recognition tools of the networked age. Just as the ants find their way to new food sources and switch tasks with impressive flexibility, our community tools should help us locate and improve troubled schools, up-and-coming playgrounds, areas lacking crucial services, areas with an abundance of services, blocks that feel safe at night and blocks that don't—all the subtle patterns of community life now made public in a new form. That kind of politics—the kind built from the ground up, without leaders—is truly within our grasp right now, if we can just build the right tools. To me, that's the real promise of emergent democracies, and not the dream of collaboratively steering a politician to the White House. Think local, act local.