TBD

The Calculus of Political Power
by Mitch Ratcliffe

Networks and their effects on human relationships have been the subject of intense study for only a few years, yet theorists propose a wide range of laws that describe the behavior of connected people, networked groups and organizations. These laws are double-edged blades for the aspiring social theorist since a "law" in the scientific sense when applied to groups of people is an appeal to reason in nature that may not exist in the population one is describing, since people can act irrationally or inconsistently, even in similar circumstances. The laws discussed in this essay are valuable because they are descriptive and can be used in retrospect to understand human events, but should not be understood as proscriptive of human behavior.

Albert Camus wrote that when Lucretius first suggested that atoms clump to together randomly to form matter "the great problem of modern times arises: the discovery that to rescue man from destiny is to deliver him to chance." If the laws discussed here are to become useful in the socio-political arena, they need to be refined into tools for increasing the probability that action based on an analysis of resources and the configuration of society will lead to the accomplishment of a social goal.

Despite the fact that the mathematics of networks are generally couched in value-neutrality, this absence of influence and the notion of frictionless transactions popularized in recent years, conclusions about what *can* happen in given circumstances are projected onto value-filled social networks of influence characterized by many forms of friction. What we shall see, however, is that network theory is useful, because it highlights the singular importance of influence and leadership within social and political networks.

Let us begin with the idea of scale[1], which in mathematics describes the place of any numerical expression relative to a chosen base. For example, a base ten system, the scale describing any value is demarcated by 10s; think of a topological map, on which a mountain range's height can be determined by counting the number of lines from the base elevation and multiplying the steps by the number of feet they represent. In social situations, we can think of scale as the number of steps it takes to accomplish a goal, how many people in city hall do you have to talk to in order to get your sidewalk repaired? How many people can fit into the local Starbucks before you have to build another one? Scaling issues are very important to any investment of social, political or economic capital. If an additional step consumes more resources than it creates, society loses.

In political networks, we are familiar with and react against the notion of power as exercised by individuals for their own benefit. Everyone has a story of a politician who, seeing only their own wellbeing, sacrificed the common good to maintain their power and privilege. Everyone knows someone who has monopolized connections for their benefit at the expense of others. Everyone knows any number of abuses. But experience does prove that people when they have little at stake tend to remember the affronts to good behavior more often than good behavior. When there is something at stake, such as in a lottery or at the craps table, people focus on the few moments of good luck. You've seen people win in Las Vegas, right? You remember those moments more than the losses despite the overwhelming preponderance of losing going on around you because we want to win or see people win. Casinos, like the mediascape, are designed to enhance the impression of success. When a player at the craps table is handed the dice, the chances are only 2.675 percent that they will be able to set a point on the first role and throw a seven to win on the subsequent roll.[2] Awful chances, but the room is open and carries sound well in order to broadcast the sound of success from one of the hundred tables in the casino, along with the ringing bells of slot machines, all to reinforce the sense that everyone wins at least some of the time. This reduces the sense that the odds are against you, just as intense media coverage of unusual stories of bad works, good works, luck and profit

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[1] Barabási, Albert-László, Linked, How Everything Is Connected to Everything Else and What It means for Business, Science, and Everyday Life, Plume Penguin, 2003. P. 70.

[2] Krigman, Alan, Why It's Easy to Believe Rare Events Happen All the Time, Casino City Times, July 8, 2003: "The likelihood that a shooter will establish a point and throw a seven on the subsequent roll is 24/36 multiplied by 6/36. This equals 11.11 percent. In round numbers, it's 11 chances out of 100 for any shooter. And the probability it'll take place several times in a row is 12 out of 1,000 for two, 14 out of 10,000 for three, and 15 out of 100,000 for four. Chances are lower of Come bettors getting up on three numbers in consecutive rolls, then striking out on the fourth. Probability is 2.675 percent. This is roughly 27 chances out of 1,000 for any shooter, 7 out of 10,000 for two in a row, and 2 out of 100,000 for a terrible trifecta."

(especially the state lottery, which features a winner on the weekly drawing, but ignores the millions of losers) reduce life to a series of apparently black-and-white choices.

Although the news focuses on bad news (e.g., "if it bleeds it leads"), good people do step up regularly and volunteer for the good of others. Cincinnatus, a patrician farmer, was called to be dictator of Rome and set the example for the office, which held total power, by finishing the task of defending Rome and foregoing power to return to his farm. Livy relates this act that thousands of years later seems extraordinary, yet people make these kinds of selfless sacrifices in many ways all the time. In the United States, people pull together and have invested in public resources, like roads and schools, that benefit everyone even though the burden of these projects falls unevenly on individuals.

There is an important distinction between the notion of a mass media and an egalitarian press controlled by many different contributors. The mass media, which Clay Shirky described as "media we've gotten used to,"[3] is much more than the information and entertainment sources with which we are familiar and comfortable. It is an institutional structure owned by relatively few people who exercise a heavy hand on the tone and scope of coverage. It is a significant locus of power and funding for the research that produces excellent journalism—the owner of a major media empire can cut budgets for programming with which it disagrees. These owners are often a single family or a tightly knit group of investors, because the press and broadcasting businesses have their genesis in a kind of cottage industry in which small players accumulated distribution points. In broadcasting, one or more of the limited number of spectrum licenses available in a region or in print, one of the few viable economic niches in a market for expensive general coverage publications. The Cumulus Media decision to remove the band The Dixie Chicks from airplay after the singers criticized American foreign policy on stage was issued by the executives of the company ostensibly because of consumer demand. But, under examination by Senator John McCain of Arizona, Lewis W. Dickey Jr., chairman of Cumulus Media, admitted that if the decision had been handled democratically, local station managers would have been free to make the call themselves; meanwhile, the Dixie Chicks album sales skyrocketed, demonstrating there was no general consumer consensus about the band.

It is accurate to describe the mass media as autocratic. Clay Shirky suggests that some webloggers, writers of easy-to-update Web sites who tend to focus on narrow areas of interest, will "join the mainstream media…. as a blogger's audience grows large, more people read her work than she can possibly read, she can't link to everyone who wants attention, and she can't answer all her incoming mail or follow up to comments on her site." This presumes a very

[3] Shirky, Clay, Power Laws, Weblogs, and Inequality, http://shirky.com/writings/powerlaw-weblog.html, February 10, 2003

rigid definition of what "blogging is," which contradicts Shirky's other claim that "blogging will stop referring to any particularly coherent activity," while underscoring the salient characteristic of mainstream media: it is unresponsive or, more accurately, staff is not paid to be responsive and must concentrate on filling available page space or broadcast time rather than taking time to reflect and debate with the audience. This has been the rule in commercial media except at a few extraordinary moments in history, such as the heyday of CBS News or the Washington Post's risk-taking on the coverage of Watergate under Katherine Graham's stewardship of the paper. What is known as "enterprise reporting" these days, which is just old-fashioned research, which takes time and money, is a rare beast in the media menagerie.

A network's power and efficacy, then, is in large part the result of leadership and economic backing for particular ideas or, switching to the mechanics of connectivity, creation of important hubs that can influence the availability of resources needed to collect information. Most network theorists start from the suggestion that the capability of a node in a network is essentially equal and that is true if one ignores how a node can be augmented to increase its influence in the network.

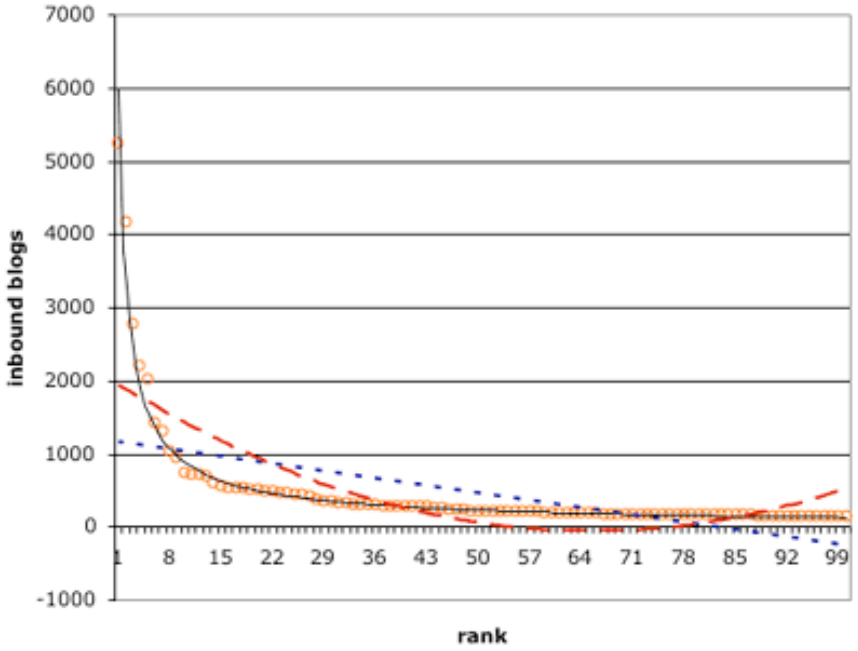
According to physicist and network researcher Albert-László Barabási:

> "In a random network the peak of distribution implies that the vast majority of nodes have the same number of links and that nodes deviating from the average are extremely rare. Therefore, a random network has a characteristic scale in its node connectivity, embodied by the average node and fixed peak of the degree distribution. In contrast the average nod and fixed by the peak of the degree distribution implies that in a real network there is no such thing as a characteristic node. We see a continuous hierarchy of nodes, spanning the rare hubs to the numerous tiny nodes. The largest hub is closely followed by two or three somewhat smaller hubs, followed by dozens that are even smaller, and so on, eventually arriving at the numerous small nodes."

This paragraph from Barabási's book, *Linked*, describes the full range of phenomena at the center of network research today. Many network theorists argue scale is eliminated in dynamic networks, that these systems are "scale-free" and can add new nodes without incurring any additional inefficiency or cost in terms of the complexity users of the network must undertake to use the network.

Key to Barabási's argument is that because of power laws, the predictable pattern of connections within a network that ensure some nodes will rise to the top, visits to the most-trafficked node will exceed the traffic of the next by an order of magnitude and the rest trailing off rapidly into a large population of nodes with relatively few connections and very little traffic. In a graph, it looks like this:

Figure 1: Technorati link distribution



Source: Jason Kottke, Kottke.org

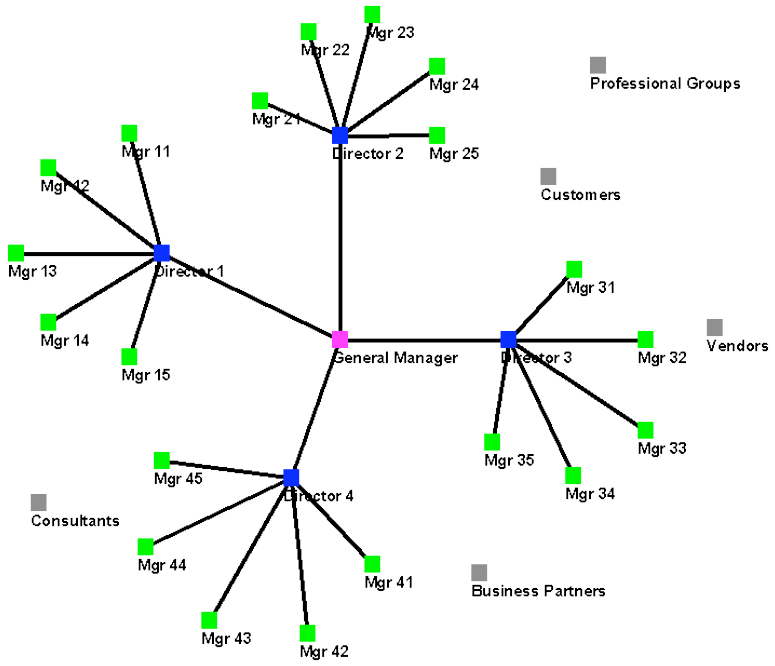
Barabási and Clay Shirky[4] argue that this distribution is inevitable and it is if you consider only the connections and not the context of the connections within a network. The assumption is that any new player in a network will benefit from emerging early and enduring, wracking up additional connections and influence through a dogged determination to succeed or deep pockets—an echo of the Internet bubble era idea that if you build an audience it will eventually become profitable. The power law is a phenomenon of the whole, but not the specific way that people rely on networks for communication and information. The power law graph is

[4] Shirky, Clay, Power Laws, Weblogs, and Inequality, http://shirky.com/writings/powerlaw-weblog.html, February 10, 2003: "Inequality occurs in large and unconstrained social systems for the same reasons stop-and-go traffic occurs on busy roads, not because anyone's goal, but because it is a reliable property that emerges from the normal functioning of the system." What this fails to acknowledge metaphorically is that no one moves fast in a traffic jam, except those who have prepared to do so, by taking a rider along if a carpool lane is available; otherwise, everyone sits in traffic. It is simplistic to reduce the argument to this kind of metaphor and I acknowledge Clay Shirky's basic point that there are differences in the distribution of links within a network, but I do not agree they are permanent qualities of the early participants in a network that remain defiantly advantaged if they simply continue to play their role in the network.

discouraging to look at, because it implies an inequality that, once established, seems insurmountably permanent for newcomers to the network who might want to exercise influence and power. However, it is precisely the will to exercise influence and power that can set a "node," an individual in a densely connected society apart as a contender for leadership.

Why should the insurmountable curve of the power law be susceptible to conquest? The answer lies in the visualization and statistical limitations of a two-dimensional view of a network. When we draw a network, it invariable looks like a flatland with nodes distributed across its face (see Figure 2), when there is a third variable that adds a real-world dimension that makes the single peak of the power law an impossibility.

Figure 2: Network Mapping



Source: Valdis Krebs, Orgnet.com[5]

Two-dimensional analysis focuses attention on the connections without providing the flavor of those connections. By stripping the links of their meaning, the analysis of networks suggests that all links are equal. Barabási

[5] http://www.orgnet.com/decisions.html

writes that modeling a growing network is a relatively straightforward exercise because "[a]t each moment all nodes have an equal chance to be linked to, resulting in a clear advantage for senior nodes."[6] This aptly describes what happens in the random networks, which Barabási says are not guaranteed to produce highly ordered networks, yet they often do. The reason is, he acknowledges, is that there is competition for links between nodes in a network. Competition is based on differentiation between what nodes have to offer, otherwise the choice between any two nodes in the network would be irrelevant and random because any choice would provide the same results.

Nevertheless, Barabási's early research focused solely on the number of links possessed by any node in the network. This leads to an oversimplification of network topologies, because, it seems to me, he wants to generalize about the applications of his research.[7] One of the most important ideas Barabási concentrates on is the notion of hubs that link nodes in a network. Google is his most prominent example of an Internet node and in the software business (and economics in general), he puts forth the idea that the rich-get-richer is an enduring law, using Microsoft as an example of a company that owns the entire market. Certainly, those with the capital to invest are better positioned to get richer, but the fact that markets are made up of people who lose the money others gain suggests that the rich who bet everything on one idea, one company or one node in a networked economy are more likely to get poorer—portfolio theory, which urges diversification on investors, proves this conclusively.

Network theory, however, concentrates on specific instances of connectivity rather than the general experience of living in a network; it is quantum mechanics to the largely Newtonian world we exist in. This makes the reading of network theory a landmine for anyone inclined to apply analogy or metaphor promiscuously, because Barabási and others, in an attempt to generalize their laws, apply a shifting definition of "nodes" and "links" that conflate two very different types of networks. Though there are similarities between the ways networks grow, the way a physical network built on actual connections between points in space and time and the way that a network of relationships between people develops and endures are very, very different.

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[6] Barabási, p. 83

[7] Barabási, p. 80: "If two networks as different as the Web and the Hollywood acting community both display power-law degree distribution, then some universal law or mechanism must be responsible. If such a law existed, it could potentially apply to all networks." For a field that is only about a half decade old, the establishment of a law that defines all networks is creating a kind of dogma that must be defended.

Physical versus logical; growth versus evolution

Physical networks grow through interconnections that are largely scale-free for two reasons: there are always new nodes coming online and the geometric increase in the capacity of copper and fiber optic cables and switching semiconductor equipment erase the friction that would slow the delivery of data as the network grows. If the progress of Moore's Law, which describes the constant doubling of computer capacity and halving of pricing of components every 18 months, were not an integral part of the technology environment the Internet would never have been built; it would have been too expensive and too slow. Anyone who has used a personal computer for more than two years while continuing to upgrade the software that runs on the PC knows the slowing performance of aging information technology. The Internet was built on waves of innovation that, to many, appeared frivolously expensive, yet those sunk costs got us what we have today and it is a very good thing.

But what, exactly, is a "link" on the Internet? Is it a physical connection between two sites or the logical connection between information on two Web sites? It is both, actually. The example of Google as a hub of connections is misleading, because it is doing nothing more than examining the Web for the number of sites making logical links to particular sites in order to assemble a one-stop location for finding the information most often linked to by others. Remove Google and there is no severing of connections between the sites Google is pointing to, only the link from the Google search results to the target information is lost.

A physical connection, or more accurately several physical connections made this Web of logical links possible, but they exist at another lower level of connectivity that provides the foundation on which all the informational or "virtual" structures of the Internet are constructed. Mapping the physical Internet and the logical Web produces an overlay that look largely similar, because Web sites and services that are most heavily trafficked tend to sit on or near the largest interconnections of physical networks. This ensures better performance, but it creates the misleading impression that the two kinds of links are the same thing. Physical networks, however, are expensive to build and maintain; they tend to stay largely intact and, while other links grow around existing physical links, the system has a sedimentary quality that gives it the permanence of an ancient seabed while logical networks flow like water above.

Why Google is successful tells us much more about the nature of the logical network. Google came into the market late and well behind the established players, Inktomi, which provided search results of Yahoo!, AltaVista and several other large search engines. Today, Google surpassed Inktomi in a few years and replaced it as Yahoo!'s search provider, only to see Yahoo! buy Inktomi when Google's business became a threat and restore Inktomi as its search engine. Barabási attributes Google's "new kid on the block" success to its "fitness," which he describes using the analogy of the social

environment in which people who are more able to make friends produce larger social networks. Today, it is the most connected node of the network, because people point to a variety of types of Google search results.

"The fitness model predicts a very different behavior [than the scale-free network model]," Barabási writes. "It tells us that nodes still acquire links following a power law, t^b." That is, a node's connectivity increases as a function of time, though the pace of growth is a function of how early the node joined the network, according to the rich-get-richer model. But in the fitness model, "the dynamic exponent, b, which measures how fast a node grabs new links, is different for each node. It is proportional to the node's fitness, such that a node that is twice as fit as any other node will acquire links faster because its dynamic exponent is twice as large. Therefore, the speed at which nodes acquire links is no longer a matter of seniority."

What has happened to Barabási's formula is that everything has become dynamic. From an analytical perspective, it can describe anything, which isn't very useful, since the nature of fitness is vague. It has none of the virtue of Einstein's E=mc2 which very specifically describes the amount of energy in any body of matter (there is a whole lot more than anyone thought). The age of a node will differ and its fitness will differ, so that every node performs differently and, because the fitness of a node can be manipulated, the system will not behave predictably. If I invest in building my node of a social network based on these vague dynamic variables, I have no indication what I will get, because fitness, especially, can be augmented in a number of ways, from making one's node more prominent to those who might know about it (marketing) to publishing a seminal article that gets picked up and pointed to by many other sites (luck); both require an investment, but I cannot hope to know what the result will be, since so many undefined factors, such as the influence of other events of the day when I market or publish my paper could distract the world. Woe to the airline mileage program credit card that launched on September 11, 2001, for example.

What is useful to know based on Barabási's model is that no node is ensured success or doomed to obscurity in this model, which brings us unavoidably to the realm of the real world, where cunning, skill, brute force and all sorts of characteristics can change the outcome of a competition. From the perspective of the emergent polity or any other self-organizing entity, this is where the rubber meets the road and any predictions about what will come to pass in an evolving network are fruitless without God-like perfect knowledge.

We can learn from market-based solutions that the whole system does not matter, only the choices we make in specific circumstances. Lanchester's First Law, developed to guide combat planning at the dawn of the air age by British engineer Frederick Lanchester, is a pragmatic approach to choosing a path to success in a complex system, especially where there are stronger competitors. It doesn't guarantee success, but provides guidance.

Lanchester, who was trying to figure out how the British air force could win in a totally new battle environment narrowed the difference between two forces of equal size to the efficiency of their weapons. Winning depends on the fitness of the army's weapons for destroying their opponents, the reverse image of Barabási's fitness for making connections. Google's weapon, even though it was vastly outnumbered in terms of existing connections, was much more efficient than its competitors because of its constantly evolving search algorithms, which reduced the gaming of search results that other search engines suffered from since they focused on the content of sites rather than the links pointing at sites (in short, the utility identified by people who took the time to read pages and decide to link to them was scraped and aggregated by Google to provide more efficacious search results). Google compounded the efficiency of its search engine with a set of application programming interfaces that allowed programmers to use Google as a platform for adding Web search to their applications. The result was easily predictable based on Lanchester's First law. Therefore, Lanchester-based strategies, which have proved effective in warfare and marketing, are a more reliable approach than a dynamic variable that could describe any number of actual characteristics of a node on a network.

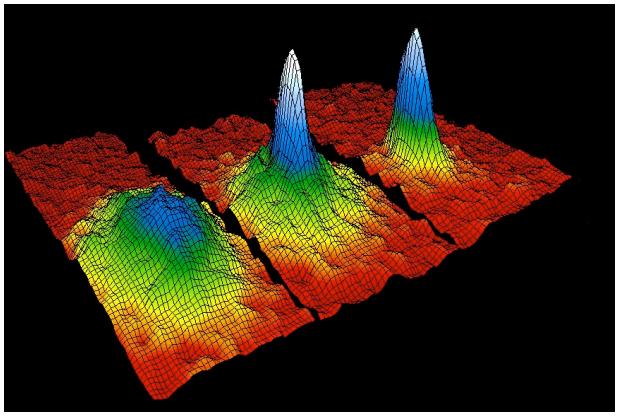
A second rule for planning combat based on Lanchester's theories, which has been applied by Japanese businesses in marketing with significant success, is the Law of Stochastic Warfare derived from scenarios in which weapons can fire randomly, allowing each member of a smaller force to kill more of the enemy in less time. In a nutshell, all the factors in the first law are squared, meaning that advantages in numbers, skill and weapons efficiency are amplified. But so are the costs of competing, since these weapons are more expensive. Google had solid venture capital backers who, seeing a powerful tool, gave Google the resources it needed to amplify the value of that tool in the marketplace, so that today Google is the most trafficked site on the Internet.

Finally, Lanchester's rules describe the scale problem that is inherent in any set of interactions. At a certain point, Lanchester equations suggest around 74 percent, it becomes more expensive to win new customers than those customers are worth. Competitors in niche markets pick off the customers who want, for example, better hardware designs (Apple) or more robust publishing tools (Adobe) and so on. Porsche, BMW and Lexus exist in similar niches of the automotive market. The evidence that Microsoft is well past that point with Windows is the low-cost licenses sold to PC manufacturers and the increasingly costly upgrades of those licenses made available to consumers. It is difficult to keep a Windows installation intact because the system is checking for changes to the hardware configuration to determine if it is running on the PC on which it was originally installed. This translates into a less pleasing experience for all Windows customers, meaning the company must pile additional features into its software to try to please everyone.

Here is where Barabási's conclusion about Microsoft, that "essentially Microsoft takes it all," is challenged. Networks seem to crave diversity or, at least, novelty, eating away at monopoly positions on small fronts rather than taking the whole monopoly position in one fell swoop. Microsoft knows that its position in the market is tenuous, because in order to take advantage of its 85 percent-plus market share it must hold the number-one position in each and every market it enters to justify the expense of its core monopoly. While the Windows operating system and Microsoft Office, the two dominant products Microsoft relies on to force its way into new markets, such as the Internet browser, email servers, Web servers, streaming media, and so forth, are robust and profitable, Microsoft loses money on virtually everything else it does. It must give away product to win market share, which it can do because it is a monopoly. Yet, as it gives away products it also lowers the price point it can charge for those products in the future once it has eliminated most competition. This has given rise to a low-cost approach to programming, open source software, that turns Microsoft's willingness to lower retail prices and raise future revenues from selling support, into a weapon that can be used against Microsoft in each of the markets it occupies. With open source software, users can download and modify application code to create robust alternatives to Microsoft products, often at no charge. The makers of open source software, usually distributed teams collaborating via the Net to assemble code much more rapidly than Microsoft ever could, is indicative of the small front challenges that can eat away at a dominant hub in the market.

Barabási and his colleagues searched high and low for formulas that could account for what he describes as the winner-take-all network and settled on the rather dense concept of the Bose-Einstein condensate, a physical phenomenon that was not observed until 1995 and yielded the observers a Nobel prize. A Bose-Einstein condensate occurs when you lower the temperature of matter very close to absolute zero and all particles condense at the lowest energy level, they become still and pile up at the center of a field like a mountain in the midst of a convoluted topographical region (Figure 3).

Figure 3: Bose-Einstein condensate



The white center, which rises as the temperature is lowered from 400 billionths of a degree Kelvin (left) to 200 billionths of degree (center) and, ultimately to 50 billionths of a degree above absolute zero, is the densest concentration of particles. Source: University of Colorado Atomic Lab,
http://www.colorado.edu/physics/2000/bec/three_peaks.html

> "…[S]ome networks can undergo Bose-Einstein condensation. The consequence of this prediction can be understood without knowing anything about quantum mechanics: It is, simply, that in some networks the winner can take it all. Just as in a Bose-Einstein condensate all particles crowd into the lowest energy level, leaving the rest of the energy levels unpopulated, in some networks the fittest node could theoretically grab all the links, leaving none for the rest of the nodes. The winner takes all…. Bianconi's calculation indicated that in terms of topology all networks fall into one of only two possible categories. In most networks the competition does not have an easily noticeable impact on the networks topology. In some networks, however, the winner takes all the links, a clear signature of Bose-Einstein condensation"[8]

This is a powerful analogy, but hardly descriptive of the roiling character of the exchange of information on the Internet. A network that became as still as the gases cooled to near absolute zero to create a Bose-Einstein condensate would be useless in a world where both people and physical connections are constantly changing, because it is the proverbial sure thing in which one node wins and always wins. The activity of adding new nodes on a network would never allow a network to approach the stasis that would erect a massive power law in the center of the network. Rather, it would tend toward dynamism that distributed the topology of connections and power more evenly. And it is this third dimension that provides a rich topology of peaks and valleys under normal circumstances that best describes why power laws are of limited importance to the functional destiny of any node on a network.

Powerless law

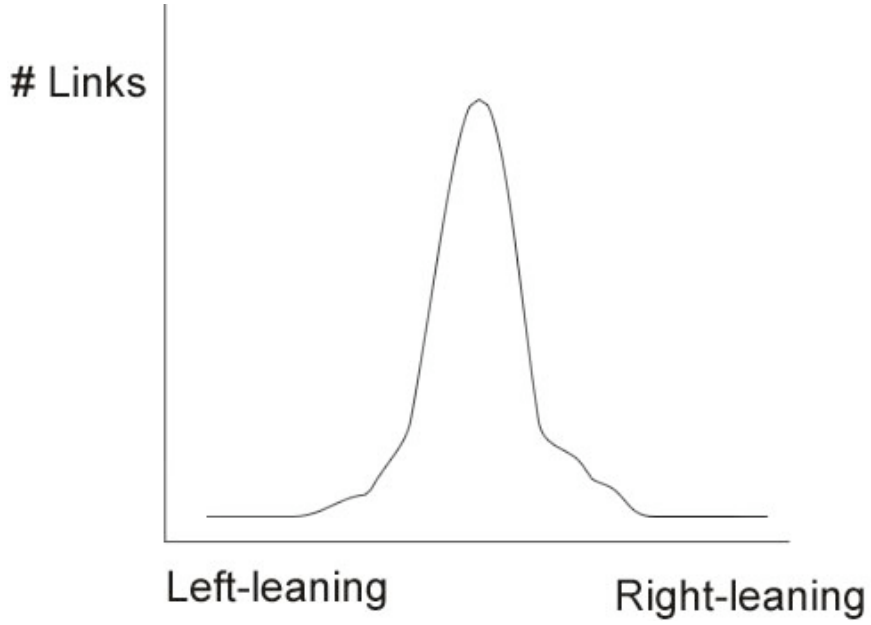
Let us reexamine the notion of the power law in light of the third dimension and the way logical links are used by people on the Internet. A power law describes the blunt edge of the question of connectivity, measuring the number of links pointing to a site or the number of visits to a site. As Clay Shirky points out, any review of a the log files for a site will show that a few pages attract most of the traffic; this is partly an artifact of the design

[8] Barabási, p. 103-104

decisions made when the site was built, since the home or index page may be the first place people visit in order to orient themselves and find what new content they are looking for. Likewise, some pages will attract more links simply because they are more popular. In any case, the distribution will look the graph in Figure 1, above.

Imagine that we are looking now for another variable, this representing the ideological character of weblogs, which we will distribute across the base vector from left to right according to a simple assignment of sites to "left" or "right" categories. Some of each of the sites will be more popular and most less so, the result looking more like a normal bell curve (Figure 4). However, it is actually two power laws, one describing the popularity of left-leaning and the other of right-leaning weblogs, placed in opposition; in other words, power laws describe any one-dimensional distribution of network connectivity and the addition of another variable, ideology, produces a normal distribution of sites by popularity and ideology. In Figure 4, you will note that right-leaning sites have a few more sites that are popular than the left-leaning sites. This reflects the finding by Kevin A. Hill and John E. Hughes that although people who use the Internet for political activity tend to be more liberal, the right tends to produce more content.[9]

Figure 4: Distribution of left- and right-leaning sites by number of links



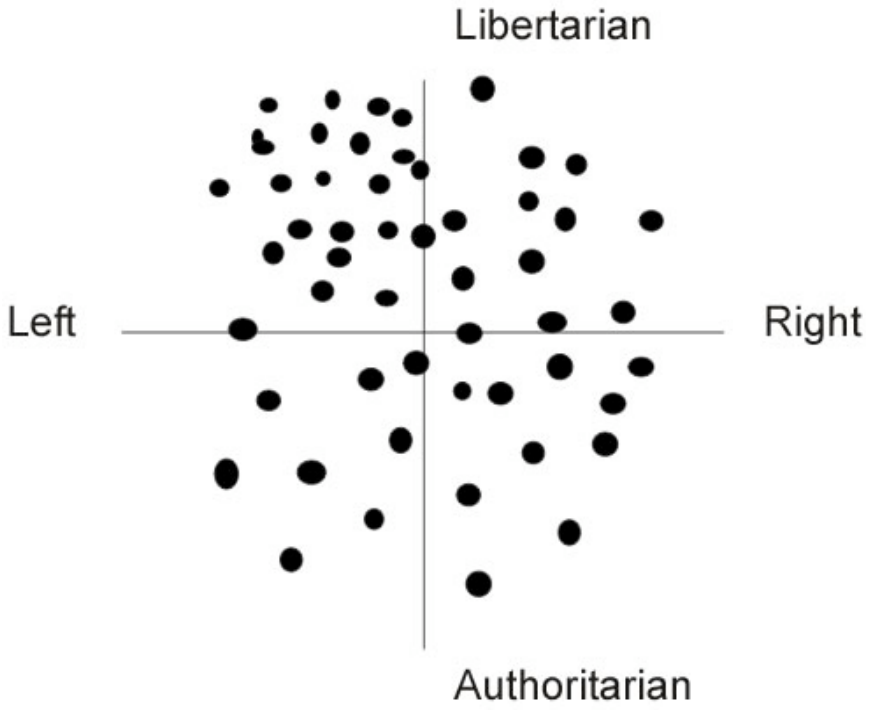
Of course, we know that there are far more grades of ideology than right- and left-leaningness, so being to think in three dimensions and the

[9] Hill, Kevin A., and Hughes, John E., Cyberpolitics: Citizen Activism in the Age of the Internet, Rowan & Littlefield Publishers, Lanham, Maryland, 1998. P. 4.

convoluted topology of the real Web begins to emerge from the details. Figure 5 (below) shows the distribution of ideology with a second ideological vector, describing sites as being left-libertarian or left-authoritarian and right-libertarian or right-authoritarian. This graph still does not show the traffic relating to different topics, only the distribution of traffic by two factors which could be applied to any topic, including abortion, the application of government power to redistributing wealth and teaching the Ten Commandments in school. We are still topic-neutral, although the values-related characteristics are beginning to pile up.

The sites described in figure five may represent any amount of traffic and could be blogs, portals or publications (hence the differently shaped dots), since the graph no longer accounts for the number of links these sites attract. It is as though one is looking down on a crowd of people who have separated themselves into quadrants based on their basic political orientation relative to the power of centralized government to enact social policy. Some of these sites may have hundreds of links that allow them to influence many people and others may be virtual hermits, albeit with strong opinions, isolated from virtually any interaction with other sites on the Web.

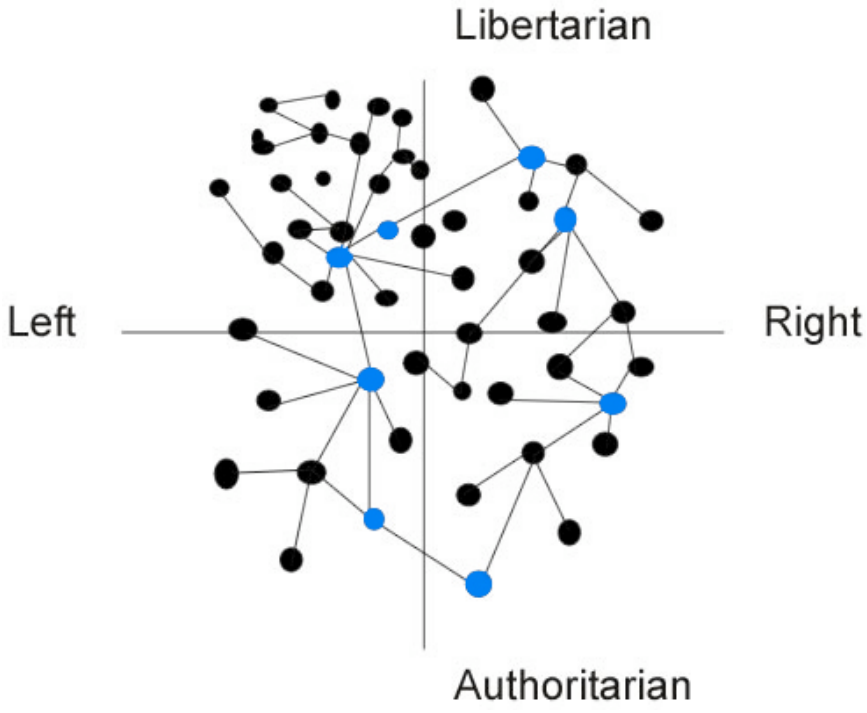
Figure 5: Distribution of ideology and views of the exercise of government power



It turns out that some of these sites are very strong connectors between their ideological neighbors and, in a few cases, bridging the boundaries between

ideological groupings. These sites are the hubs, the "connectors" in the Malcolm Gladwell's terms,[10] that provide the glue that holds society together and knits it anew each time the site ventures into a new topical area. (See Figure 6). These links, indicated in blue, are the conduits of public debate about the direction of society that can cause whole nations to slide in one political direction or another. They are as rare as a candidates' debate in terms of their statistical frequency and sit atop the power law graph in terms of their connectivity—they are everyone's source of information or friend, whether close or casual acquaintance, that they turn to for an introduction. Much of the actual discussion of social and political options happens in isolation from the hubs and is connected to opportunistically by hubs in order to wield influence. Hubs are in the position to lead in society, but don't necessarily do so, as we shall see later. They may have many connections or a few key links that allow them to bridge an existing barrier; this view is contrary to general view of hubs in network research, where it is assumed that a hub must have many connections. I argue that, especially in political situations, the ability to make a key connection is more important than having many connections, albeit having many available certainly gives the connector a larger inventory of options.

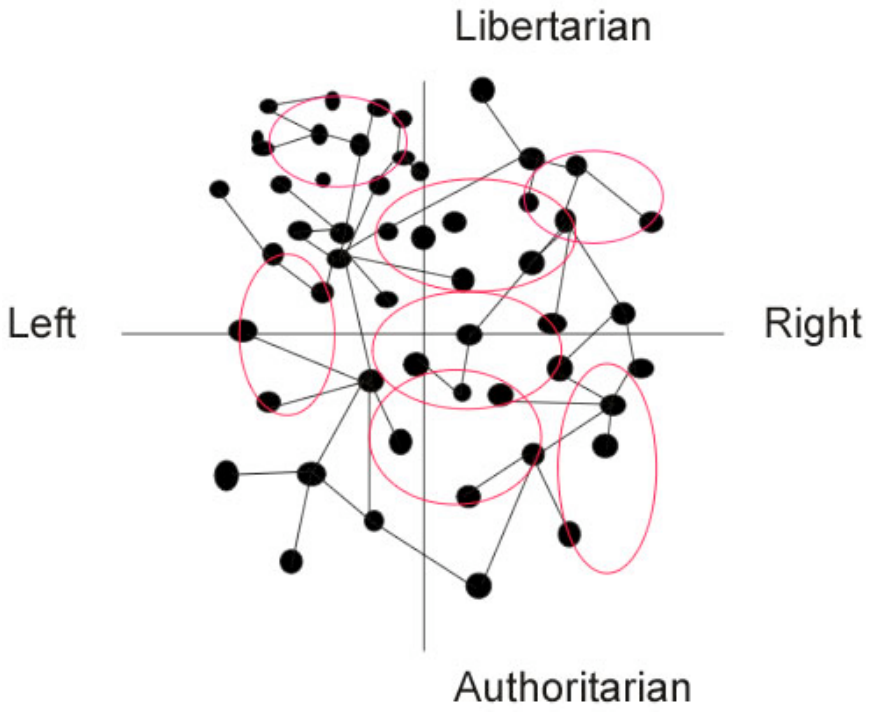
Figure 6: The Left-Right, Libertarian-Authoritarian network of hubs



[10] Gladwell, Malcolm, The Tipping Point, Little Brown & Co., Boston, 2002. Gladwell's description of how social trends are catalyzed relies on three key types of people, connectors, mavens and persuaders. Putting these three qualities together to raise the profile of a single Web site, brand or trend has powerful results.

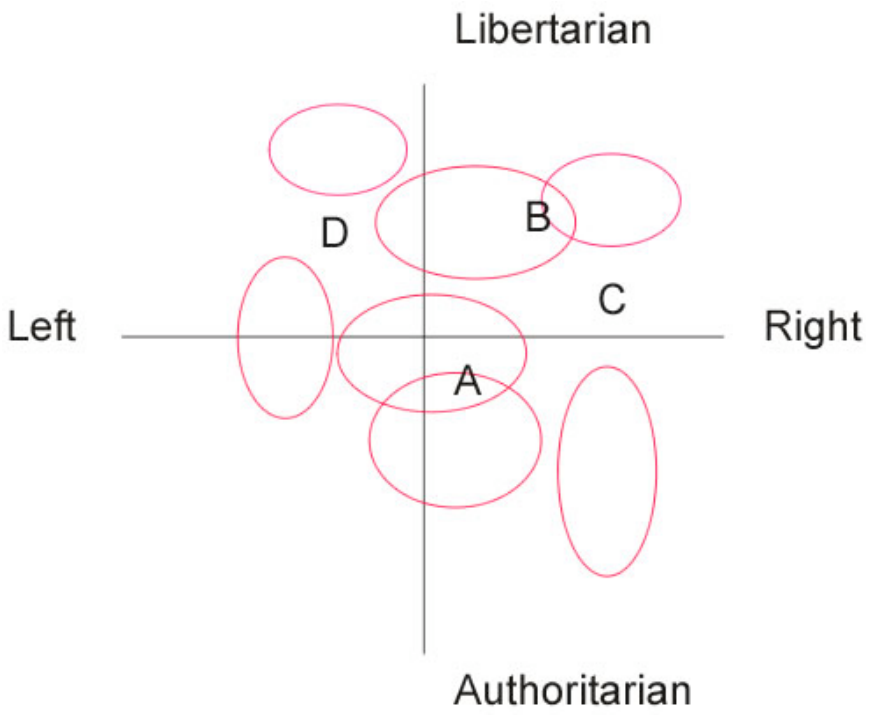
Now, let's account for traffic. In Figure 7, red circles indicate the clusters of sites in the ideological scatter graph that represent the most traffic. These circles include several sites that are unconnected to other participants in the network webs described in Figure 6. Here is where we can begin to see the complexity of topic-based discussions, as there may be very popular ideological sites that fall into a particular range on this scatter graph but do not deal with an issue that is being discussed by many other sites. For example, the right-libertarian site that sits unconnected to any other node on the graph might be dedicated to fiscal responsibility and would not link to sites that are primarily concerned with social issues, such as abortion. Nevertheless, they represent important peaks in the distribution of traffic.

Figure 7: Traffic concentrations among Left-Right, Libertarian-Authoritarian sites



For ease of understanding, Figure 8 removes the network of sites and presents just the traffic concentrations on the two-ideology graph. You can see that there are two "twin peaks representing high-traffic sectors of the ideological spectrum indicated by the letters "A" and "B," and a two valleys indicated by the letters "C" and "D." Now, if you will look back at the rich topology of the Bose-Einstein condensate chart, particularly in the left, warmer field, you will see the origin of the many small peaks and valleys is quite clearly the multiplicity of issues and ideologies discussed on the Web. There may be sites about every conceivable variation of every topic, many of which sit at the bottom of valleys in the patterns of traffic, but there are also many peaks of popularity.

Figure 8: Traffic peaks and valleys on the Left-Right, Libertarian-Authoritarian sites



Compared to the mass media, which concentrate output and traffic in a few nodes, the many-dimension view of the densely networked environment of the Web presents many more opportunities for "local dominance" in traffic and influence regarding specific issues.

Beyond statistics: The transformative value of human action

Here, let us return to some of the conclusions already being proposed by network theorists and reconsider them in the light of the many-dimensions view. I do not wish to suggest that there is something supernatural in networks which allows them to transcend physical laws, for I believe we are discovering many physical bases for human behavior. However, I do agree with philosopher Daniel Dennett and sociobiologist E.O. Wilson that human behavior is a dynamic combination of nature and nurture that produces extraordinary results within the confines of a largely deterministic world. We benefit from the fact that gravity exists and that networks tend to produce hubs that reduce the number of steps between any two points on the Web. It is very early, though, in our quest to understand networks and certain conclusions are premature.

Clay Shirky wrote "Inequality occurs in large and unconstrained social systems for the same reasons stop-and-go traffic occurs on busy roads, not because it's anyone's goal, but because it is a reliable property that emerges from the normal functioning of the system. The relatively egalitarian distribution of readers in the early years (of weblogging or, for that matter, the Web itself) had nothing to do with the nature of weblogs or webloggers. There just weren't enough blogs to have really unequal distribution." This comment was very controversial among webloggers, who understandably feel strongly about what they do. Shirky is right about one dimension of the problem, there is naturally going to be inequality in readership and traffic. He is wrong, however, about the nature of that inequality for three reasons:

- Inequality in results in very different than inequality of opportunity. The nature of the Web, which facilitates easy and cheap logical connections between a wide variety of sites ensures that the difference in accessibility between any two sites is an order of magnitude smaller than the difference in reach between two mass media outlets. One need not gain distribution, as is the case in print and broadcast, to be heard; a single link can start a cascade of connections that elevate a particular author or just one article to the heights of popularity.
- The fact that some Web upstarts will become employees of consumer media companies and, consequently, will adopt different ethics, goals and styles that conform to their employer's priorities does not reflect on the nature of the network that elevated them to the attention of mass media. This is a process of cooptation of culture that is ongoing and, ultimately, is the result of individual decisions to conform. Just as there are popular writers and filmmakers who exist outside the mainstream media, there will be many Web content creators who content themselves with the longer, tougher road of building an large audience on their own terms.
- Individual sites do not scale to become general interest services without substantial investment. This has been true in mass media and, based on the evidence of eroding network viewership in broadcast and cable as audiences flee to niche channels or the Web, the increasingly specialized media will create an opportunity for the enmeshing of different audiences for specific topics to create meta-audiences that could, among other things, be a powerful political force, if mobilized to those ends.

Albert-László Barabási makes a number of statements that I agree with and several that do not make practical sense, I believe, because they are based on mathematics that relate to real life in the strange way quantum physics does. The plain fact that the spin of a particular particle can be affected by observing it does not translate to substantial changes in the gross phenomena in the world we live in and so it goes with network theory. Barabási makes a

profoundly counter-intuitive leap from real life to the mathematics of connectivity when he writes:

> "The most intriguing result of our Web-mapping project was the *complete* [italics in orginal] absence of democracy, fairness, and egalitarian values on the Web. We learned that the topology of the Web prevents us from seeing anything but a mere handful of the billion documents out there.
>
> "When it comes to the Web, the key question is no longer whether your views can be published. They can. Once published, they will be instantaneously available to anyone around the world with an Internet connection. Rather, faced with a jungle of a billion documents, the question is, if you post information on the Web, well anybody notice it?"

He has obviously published, but Barabási has apparently never been a publisher. In mass media, specialized media or the Web, it is hard to get attention. As hard as writing, frankly, though I never gave my first publishers credit for what they could accomplish with my work. Then, I took on the job of publisher and learned that, while it is hard to gain attention, it is a skill that can be learned and applied, just like grammar and research skills, whether literary or scientific. In larger organization, particularly in general interest publishing or broadcasting companies, there is such a broad range of choices about what to publish or put on the air that most contributors compete for what space or time they get. This surplus of content acts to create sufficient impetus to keep audiences coming back, even if the offering of writers/contributors may be changing daily.

Clay Shirky's comment that beloved webloggers' sites would disappear if the bloggers stopped writing, meaning that no one would come to read them anymore, is dead-on. Building an audience outside of the mainstream press, where someone is always available to fill in if you can't work or if you are pursuing research that prevents you from writing, keeps people coming to the publication/network/site you work for, preserving your audience. It is not so when working alone in a niche category, nor can computer programmers rest on their laurels for even a minute if they don't have a massive organization pushing out other improvements while they take a sabbatical. Publisher Tim O'Reilly underscored this idea in his keynote at the Open Source Conference in Portland, Oregon in July 2003, when he said that in the current model of software development, there are people inside the software we use, who, if they stopped working to tune and update that software each day, would rapidly lose customers.[11]

The question, then, is not whether, having published, you'll be noticed, but how one organizes to be noticed and the tools at their disposal to keep the

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[11] Ratcliffe, Mitch, Report from the Open Source Conference, Correspondences.org, July 9, 2003: http://www.correspondences.org/archives/000151

attention coming once it is turned, even momentarily toward a particular site or issue. Howard Dean's presidential campaign, for example, has used the Web with success to attract contributors and keep them both coming back and giving more as well as reaching out to others who might contribute even more. Dean is just one of the dozen or so "major" candidates and several hundred minor candidates jockeying for contributions for a 2004 presidential run, but his organization has dedicated tremendous resources to creating an engaging experience for visitors to his site. Yet it is also feeling the strain of providing visitors and would-be supporters more than an initial rush of anti-George W. Bush rhetoric. It remains to be seen, at this writing, whether Dean will catalyze a movement or simply ignite a sense of rebelliousness. Google preserves its traffic and extends it by adding new features to its search constantly. Microsoft piles features into its gigabytes of application and operating system software, hoping to be all things to all people. Heft is an advantage and those with the wealth to buy attention do stand a better chance of getting richer, but they don't any type of guarantee in the sense that the network is suddenly going to cool down into a Bose-Einstein condensate of perpetual traffic and revenue streams.

The upstart needs to learn to see beyond the power laws to the simple insight mass media already possesses: Just get something up on the site according to a schedule your audience wants and make sure it is good, in the sense that you define good. An entertaining column by Dave Barry becomes a regular destination in the newspaper or on the Web, just as the comments of a Glenn Reynolds (InstaPundit and now an MSNBC columnist/blogger) have become for Web surfers. If Dave Barry stops, he might make a comeback some years later with the help of his syndicator and by reigniting the interest of old fans who will pass the word around that Dave is back, but if Glenn Reynolds stops writing today, he will be hard-pressed to comeback without a long track record and deep fan base. This goes to the issue of fitness, in the sense that Barry has earned respect and become reliable to his readers, like an old, familiar sports star who gets cheers just for stepping onto the playing field at an old-timers game. Reynolds is still the young phenom who, if he blows a few games, will be forgotten because he hasn't become reliable.

All this sounds terribly unmathematical, but it leads to the last step in this analysis, the idea of social networks and capital, particular as embodied in the idea of six degrees of separation.

Stanley Milgram's famous, though not most infamous, experiment on social ties, in which he asked people to try to get a letter to one of several targets by going through a network of acquaintances to find a personal connection to the target, provided the well-worn concept of "six degrees of separation." This is the idea that, on average, each person is approximately six social steps away from anyone else in the world. By asking a friend if they know a friend of someone we'd like to meet, according to this idea, we would find that the target was between four and eleven introductions away, with the average being six steps, or degrees. Milgram's 1967 experiment, which identified the "small world problem" (after the "It's a small world" uttered by people who

learn they have an acquaintance in common) as a field ripe for investigation, was the basis of another breakthrough piece of research by Mark Grannovetter, who established that "weak ties," which are not central to the function of groups but happen to link clusters of people, are the primary vectors of the experience of small worlds. As described in Figure 6, above, it is the person who is able to leap barriers between two groups who is critical to the success of a six-degrees chain.

Of the 96 message chains that Milgram initiated, 18 were completed by the delivery of a letter to the intended target, an impressive 18 percent of the total sample. A recent email version of the study, conducted by Duncan Watts, Peter Sheridan Dodds and Roby Muhammad, tried to replicate Milgram's findings by targeting 18 people in 13 countries through more than 24,000 message chains.[12] One of the key findings, from the perspective of the email research team, is that because professional and academic ties tended to account for most of the successful chains, there may be fewer hubs in social networks than Barabåsi's research suggested: "We conclude that social search appears to be largely an egalitarian exercise, not one whose success depends on a small minority of exceptional individuals."

Mark Granovetter, commenting on the email study, suggested that people simply don't understand the importance of social networks or how to navigate them.[13] He isolated the question of the number of hubs in the social network as particularly troublesome issue, since other factors, such as a shared occupation or geographic proximity, were identified as important by participants when choosing the next links in their chains. What is clear, it seems to me, is that there are a number of characteristics that make a person a potential hub. If this is the case, the influence of leadership, marketing and other fitness factors can reshape a social network dramatically. An efficiency variable like the one used in Lanchester theory may available for measuring the potential inputs and outputs, based on specific analysis of a network task, such as organizing a statewide political campaign, in light of the number of available first-degree connections one has the quality of those people's political networks.

The results of the email study, while the successful chains did average 4.05 steps, also raise a very serious question about what incentives are needed to activate social networks for political purposes, because it demonstrates that getting a social chain going is not easy. Compared to the 18 percent success rate Milgram had with paper mail, Watts, et al, had only 324 successful chains out of 24,163 that were initiated—a 1.6 percent success rate. One can speculate that Milgram had a higher success rate because a letter, especially a

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[12] Dodds, Peter Sheridan; Muhammad, Roby; Watts, Duncan J., Science Magazine, 2003 301: 827-829, http://www.sciencemag.org/cgi/content/short/301/5634/827

[13] Granovetter, Mark, Science Magazine, 2003 301: 773, http://www.sciencemag.org/cgi/content/full/301/5634/773

letter in the 1960s compared to today, when junk mail is much more prevalent, carried a greater moral obligation for interim recipients, so that they tended to carry out the requested act of forwarding the message. The email researchers suggested several reasons that chains might have broken, but concluded that "actual success depends sensitively on individual incentives."[14]

Incentives are not subject to mathematical certainty, they vary for every person and change in different situations. At this juncture, we've arrived at the political, again, and can relate network theory to the process of developing an emergent society built on a plurality of polities organized to address individual tasks. We know that social networks can be activated and, in a short series of connections, link people from different backgrounds and geographies. The question is, what keeps these links open and communication flowing once they are established. It is easy, relatively speaking, to tap a social network once and then move on.

Like a single-purpose social network chain, an emergent polity is only one expression of a person's interests. An emergent polity has the virtue of carrying substantial incentives for establishing and maintaining communication and collaboration between people. Bridging individuals, hubs or connectors in network theory terms, can be predicted to identify and initiate links around areas of potential overlapping concern between polities. If a polity is successfully addressing an issue that members of another polity recognize as a pressing need, the incentives for establishing a connection are self-evident. If, for example, I am a member of an emergent polity that provides supplemental retirement income derived from revenues generated by a group investment in local streets for which local businesses pay (e.g., for premium parking spaces near their storefront or for signage on the street) and I meet someone who is a member of a polity that has invested in long-term healthcare facilities, perhaps I can forge an alliance between the two to swap benefits while increasing funds for local road repairs. This is the essence of politics and the foundation of markets.

The interconnectedness of regions due to inexpensive travel, too, creates new opportunities for catalyzing emergent polities through existing social networks by meeting periodically to discuss social issues. Mark Buchanan points out in his book Nexus that the personal space of the typical individual today is ten thousand times larger than it was in 1800, when people traveled about 50 meters a day.[15] These face-to-face encounters, when connectors are gathered, are where the political tradition of the past clearly informs an emergent society.

While I would not conclude that the accessibility of others through networks will lead to an emergent society, but the statistical evidence and practical

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[14] Dodds; Muhammad; Watts, ibid.

[15] Buchanan, Mark, *Nexus: Small Worlds and the Groundbreaking Theory Of Networks*, W. W. Norton & Co., New York, 2002. P. 121.

experience suggests densely networked societies create more and egalitarian opportunities for self-organizing solutions to social problems.