

Commentaries on Albert-László Barabási's *Links*

Networks101Link12.1 The Fragmented Web ©frederick david abraham, 14 November 2013¹
(My subtitle: the geopolitics and topology of the Net.)

PART I (SECTIONS 1-4 OF LINK 12).

Broder *et al.*, (2000), described the topology of the web as divided into four 'continents' . Barabási explains the reasons why most of these are not navigable, that is not reachable by most browsers using various spiders and crawlers, due to the directedness of the links among web pages. He also explains why this makes estimating the size of the web impossible (first attempted by Lawrence & Giles (1998), who thus inaugurated the web as an object of research itself). This means, as of his 2002 writing, that most browsers of that era were only reaching 2-40% of the WWW, that within the core continent, which was a connected cluster². Even after Google took the lead (June 2000 with over 500 million pages, a year later one billion) as having the most complete coverage, coverage was low. About half the WWW can be reached in either the Core continent, or by starting in the Core and going to the OUT continent. The OUT and Island Continent can only be reached if the address of a web site is submitted to the search engine. "All directed networks break into the same four continents." (p. 169.) "As long as the links remain directed ...homogenization will never occur." (pp. 168-9). An example of a network that demonstrates this architecture/topology is illustrated in a recent article on brain architecture (Markov *et al.*, 2013)³. Well, this is all cut and dried, but illuminating to those of us just clicking away with our favorite browsers.

Barabási next views finer structure within the continents, where clusters, i.e., communities of people with common interests congregate, creating a self-organizing "emerging universe [that] encourages segregation and social fragmentation." (p. 170.) Does this tendency defy or contribute to democracy on the WWW as Hiltz & Turoff (1978) proposed? Mitina, Houston, and I took up these issues within the context of whether social conformity or social divergence would prevail on the Internet, viewed from the viewpoint of a twist of chaos in a glass of post-modern theory which stressed that open discussion is a prerequisite for social justice and progress (Abraham, Mitina, & Houston, 2000; also Abraham, 2010-2011).

"We want to examine a simple question for which there is no answer. Or maybe the answer is too obvious. We view almost every psychological or social system as "chaotic", in the sense that forces of convergence toward central ideologies and forces of divergence away from

¹ I resumed my work on this commentary upon my return to the US. While rereading this chapter I also picked up *Time* magazine which had an article on the deep web, which could be considered a sequel to this Link. I take this up at the end of this commentary.

² *Time* reports the current figures as the Web we know at 19 terabytes; everything else not indexed by search engines at 7,500 terabytes (Grossman, 2013, p. 31).

³ Thanks to Ted Hoppe, fellow member of Google Group Chaopsych, for bringing this exciting article to my attention, it is a good follow-up to Sporns (2011) as well as Link 12.

central tendencies resolve themselves in patterns of activity of varying complexity that contain elements of both order and disorder. So the question we pose is, to what extent does electronic communication tend to favor one or the other of these tendencies?

“Hiltz & Turoff’s book recognized that communicating via computer networks could be used for good or evil, for expression or repression of human potential and opinion. They hoped that it would represent a forum for free expression and interchange of ideas, and for social progress. Their book was remarkably prescient considering that in the late 70s very few people were using the computer for global communication. The Internet and the World Wide Web had their explosion in the mid 90s. Very recent.

“[Mark Poster \(1989\)](#) observed that many social analysts saw electronic communications as creating “enormous social transformations. . . A right-wing contingent envisions a benign automated world of material plenty ([Naisbitt, 1982](#)), . . . A left-wing contingent, equally sanguine, foresees radical democracy as the outcome of the new technologies ([Masuda, 1981](#)).” Also, according to Poster, many people see daily lives as improved, but many others dispute that claim and point out that there is increasing isolation with the increasing dependency on global communications.” (Abraham, Mitina, & Houston, 2000.)

Barabási next brings up the problems of finding those foci given the billions of pages on the WWW, and of defining such a community; a web page can be fuzzy sometimes, it could be used by several communities.

PART II (SECTIONS 5-7 OF LINK 12 + TOR, SILK ROAD, & BITCOIN).

Now for the heavy stuff. Even some sinister stuff.

November 2000 the French courts ordered that the law forbidding French citizens from buying Nazi memorabilia applied to the auction sites on the WWW, and since Yahoo had the filtering tools. It also, against Yahoo’s contention that the Internet was free of national boundaries, to alter the code (software) shutting off by 70-80% sales to France. Lessig, author of *Code and other laws of cyberspace* (1999), stated “Left to itself, cyberspace is building an architecture will become a perfect tool of control . . . [T]invisible hand of cyberspace is building an architecture that is quite the opposite of what it was at the cyberspace’s birth.” (Quoted in Barabási, p. 173.) What he is saying is that mainly the utopian ideal of Hiltz & Turoff’s post-modern open discourse, that government, business, and other vested interest coalitions will control and collect information; anonymity will be a thing of the past. Or as Barabási put it, “Netizens will lose their anonymous and space-free existence as the technology develops to meet the merchants’ desires.” (pp. 173-4.) We now know that this loss of privacy by big government and big business have cooperated to control most of the accessible Internet of the Core and Out continents, and is making inroads on the IN and Island continents of the WWW. This constitutes a virtual realization of the Bentham-Foucault panopticon (Bentham, 1787; Foucault, 1975).

So what are the main escape routes from this virtual panopticon? This is the subject of the *Time* article (Nov. 11, 2013) which provides a pretty clear picture of how this works, but sensationalizes its sinister aspect of hiding illegal activity such as drug trafficking, pornography, and even the hiring of

assassinations. It is good to supplement a read of it with the more neutral reporting by a rapid-fire browsing of related web sites, especially those on Wikipedia (e.g., Tor (anonymity network)). I will attempt a brief synopsis of the *Time* article and some tidbits from a few of these other sites.

Tor (for The Onion Router) is freeware using an onion routing network announced on 20 September 2002 originally sponsored by the U.S. Naval Research Laboratory who had developed the layered cryptographic (thus 'onion'). The US and other governments have provided most of the funding. It was originally designed to protect government and law enforcement agencies in their pursuit of illegal activities, but was soon adapted by millions of users (now up to million users added per year⁴).

“Using Tor makes it more difficult to trace Internet activity, including "visits to Web sites, online posts, instant messages, and other communication forms", back to the user^[2] and is intended to protect the personal privacy of users, as well as their freedom and ability to conduct confidential business by keeping their internet activities from being monitored.

“Onion Routing’ refers to the layers of the encryption used. The original data, including its destination, are encrypted and re-encrypted multiple times, and are sent through a virtual circuit comprising successive, randomly selected Tor relays. Each relay decrypts a "layer" of encryption to reveal only the next relay in the circuit, in order to pass the remaining encrypted data on to it. The final relay decrypts the last layer of encryption and sends the original data, without revealing or even knowing its sender, to the destination. This method reduces the chance of the original data being understood in transit and, more notably, conceals the routing of it.” (Tor on Wikipedia.)

One online bazaar was the Silk Road (*Silk Road* on Wikipedia, which specialized in illegal goods and services, and was owned and operated by Ross Ulbricht aka ‘Dread Pirate Roberts’ (from the novel/movie *The Princess Bride*⁵; *Dread Pirate Roberts* on Wikipedia). Used Tor and a virtual currency also untraceable, called Bitcoin (Bitcoin). The fact that Ulbricht, along with several other traffickers have been arrested shows that the anonymity of such havens can be penetrated. If you are thinking of using Bitcoin, be advised that when an illegal web site is closed down, you can lose your money. Whistle blowers and public political movements including revolutionary activity such as in the Arab Spring are using Tor, thus realizing some of the liberating potential Deibert (1997) has suggested for the internet. Snowden’s leaks have revealed the extent of FBI and NSA efforts to crack Tor and the deep web. And Snowden himself used Tor to get information on PRISM to *The Guardian* and the *Washington Post*.

Barabási uses the metaphorical image of approaching the WWW like zooming in toward a planet, round, then continents, then communities, and neighborhoods. From that metaphor, the incredible exponential growth of the internet is hardly a surprise. From that perspective, it is also not surprising that the whole drama of culture and individuals captures the same features as our global cultures. The god WWW is being shaped in our image. A self-organizational free fall. All the features of our social and

⁴ 19 August 2013 Tor downloads increased from about half million per day to 1.2 million (Dunn, JE, 2013).

⁵ Neil Edwards, also a member of the Google Group Chaopsych, who prefers to communicate with me by phone than by internet (a poet, scientist, engineer, super skier) and knows everything phoned me soon after my return from the Philippines, and when telling him of my Link12 commentary, immediately identified the Dread Pirate Roberts story as that of *The Princess Bride*. Who knew?

psychological chaotic dynamics are on display. Coalitions form as on Wall Street and Global Capitalism, trying to capture Bitcoins. Psychosocial dynamics *à la Electric Sheep* and *Neuromancer* (Dick, 1968; Gibson, 1984). There is conservative hanging on to old attractors, fundamentalism as the extreme example, and bold innovative bifurcations to new individual and cultural attractors. Hierarchical control versus individual freedom and expression. In the previous Link (11) he suggested the Web could self-organize into a singularity, a bifurcation to self-awareness. Take control, like Szilárd's dolphins (Szilard, 1961/1992). I don't know if that would be recognizable, but perhaps, the WWW with we humans in it, already have passed that singularity. Certainly we are all involved in Cyberspace, we are jacked-into the panopticon. Can we escape? With optimal mid-dimensional dynamics, the chaos formed by its convergent and divergent forces **could** empower progressive cultural change.

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⁶ Wikipedia sites were consulted from 10-13 November 2013.

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