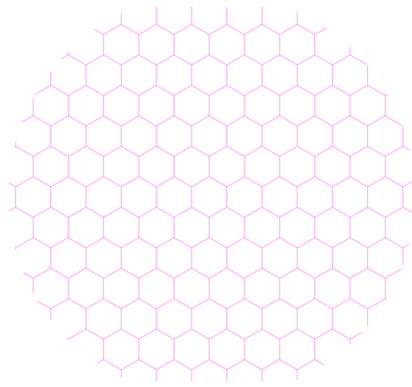


*Knowledge Networks. From centralized To decentralized*



Camille Akmut



2 essays : ‘An anarchist created a centralized system’ and ‘On the responsibility of computer scientists, and democracy’.

Camille Akmut

Short essays on large topics, indistinguishably technical, political.

## An anarchist created a centralized system.

One of the best portraits of Moxie Marlinspike has been given in the *Wired* article “Meet Moxie Marlinspike, the Anarchist Bringing Encryption to All ...”.

A touching portrait : a picture is drawn of someone having lived on the fringes of society for most of his young adult life.

Emma Goldman is cited as influence (a recurring reference for technologists of anarchist backgrounds, identifications).

Homelessness, squats, attempts to live a life worthwhile (the latter as Goldman envisioned free from imposed labor) – all things that win him a special place with us, of course.

But, Goldman – like anarchists – saw the State as the central place of violence and authority, properties she assigned to it as its very nature.

And, yet when the time came to design a system, this anarchist opted for a centralized system – a server somewhere, someone in control, someone with more control over it than others with control over it, ‘*etc. etc.*’ as Marx and Engels liked to say.

In such systems there are two big models roughly : client-server architectures and peer-to-peer.

Why would someone of such backgrounds and abilities have opted for the former? Out of ‘purely’ technical difficulties? Barely...

The creator of Signal should have been the creator of BitTorrent – an unpleasant truth he himself cannot avoid.

The full psychology and sociology of these events has yet to be written.

Perhaps – and it is our hope – this anarchist will one day be able to reconcile his technological creations with his views.

A feat – ‘god knows’ Goldman would have not said – that many of his peers have yet to achieve or realize. And, as such he is not alone.

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Anarchism, this other dominant ideology of technology circles.

‘*Petit bourgeois anarchism*’ wrote Marx of Proudhon – and he would have written today about self-fashioned ‘anarchists’ at Google or Twitter and any number of likewise companies.

[Jack Dorsey, CEO and co-founder of Twitter, lobbied against help for the homeless in San Francisco – a city ravaged by the gentrification brought on by these same technology companies and their staff...

Engineers, but only of devastation more often than not.]

At sea, freedom – but this freedom is only the luxury to forget about the world left behind.



## References

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“Dear Sir. Yesterday I received a letter in which you demand from me a detailed judgment of Proudhon...”

# *Notes* on the Freedom Tower. Current issues in Networking (mesh).

Camille Akmut

## **Abstract**

Original research notes on the Freedom Tower by Free Network Foundation. Technical characteristics, as well as social, political and philosophical aspects of a real incarnation of a mesh network. Highlights of shortcomings of the academic literature, textbooks in particular, on mesh networks, peer-to-peer, and related subjects.

*Keywords:* mesh; peer-to-peer; internet; networking; networks

## Introduction : mesh networks, social context

A surge of interest in mesh networks seemed to have happened in 2012, with multiple publications or projects happening in close succession to one another, building on previous efforts<sup>12</sup>.

This coincided with, and could be explained by the publishing, the previous year, of an official standard for Mesh networking by the IEEE in 2011<sup>3</sup>. And, the inclusion of the B.A.T.M.A.N. routing protocol inside the Linux Kernel<sup>4</sup>.

This however is not enough explanation – though it may be to some technologists or computer scientists.

In that year, and the previous, multiple socio-political events had made the use of mesh networks evident, vital, or otherwise necessary. The events of the Arab Spring of 2011 and 2012, during which the fragility of the Internet to censorship was again manifested, with access to social media and SMS communications blocked, and the Occupy Wall Street movement, where real uses of mesh networks were experimented, could be cited as examples.

The years before those had known a trend of either increased concentration of Internet infrastructure or/and increased perception of it.<sup>5</sup>

Failings of the traditional Internet, that can be directly attributed to its consolidated nature, and the centralized architectures it relies on, in particular spying by governments on their citizens, and misuse of user data on a massive scale by big corporations, have come to broad light since.

They were the subjects of vast media coverage from 2013 onward, bringing these modern computer technological subjects – perhaps for the first time and on that scale almost certainly – to very broad audiences. These subjects becoming simultaneously, and inseparably, political and social topics of first importance.

All of these factors and events combined give some explanation as to the surge of interests in technologies such as mesh networks, and as to why people may be looking for and already experimenting with alternatives for the Internet, or other forms of networks altogether.

But, little seemed to have hit back home in the academic literature, textbooks in particular where business as usual seemed to be the standard.

We aim to correct this with this publication, and to give a basis for further explorations, improvements and debate.

And maybe, by the year 2020, their inclusion in the seemingly atemporal

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<sup>1</sup>Motherboard 2012. Berkman Klein Center 2012. Cook 2012. airberry 2012.

<sup>2</sup>A notable such project, which runs in several major German cities, is Freifunk, also responsible for the development of the B.A.T.M.A.N. (routing) protocol among others.

<sup>3</sup>IEEE 802.11s.

<sup>4</sup>Implemented in or as B.A.T.M.A.N. advanced (batman-adv). Kernel 2.6.38.

<sup>5</sup>On Internet and Web consolidation, and their effects, among others, see our previous research. “A User-Defined Web. And, on Systems modification in general.”

books of knowledge of these gentlemen – how else do they expected research to move forward on these topics if students do not know about them.

Structured notes on a real incarnation of a mesh network, and its technological characteristics as well philosophical-political aspects follow.

Technical innovations bring or require a transformation of our language – unsure and uncertain yet, but here, and growing. “A *“user owned” Internet*”, “User Owned Communications Infrastructure”, “a *People’s “Internet”*”, “*Internet-like networks*”. Powerful ideas cannot be removed so easily.

These efforts have had and continue to have incarnations, in metal, software and paper, and the people that create them, one we discuss here.

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In presenting the topic, the Freedom Tower, we have taken the approach to give as much space as possible to

1. the descriptions of the makers or creators
2. secondary sources connected to the creators (one documentary, one report)
3. the wider available literature of computer science and networks/networking.

This includes forgoing a longer introduction (which we do not include in the numbering, neither do we the conclusion), this includes minimizing commentary to the only minimum necessary, and certain, and marking those that lead to digressions accordingly.

The aim of this report can be understood further to be a compact (portable), structured source of information.

# 1 The Freedom Tower

The “Freedom Tower” by the Free Network Foundation<sup>6</sup> is an example of such a network, or of how such networks can be created.

One of its directors, Isaac Wilder<sup>78</sup>, described their work as

We build decentralized and distributed communication systems.<sup>9</sup>

They are “independent wifi sources (...) beaming out free, secure Internet”<sup>10</sup> – the narrator comments while the following (animated) schema is shown.

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<sup>6</sup>Found abbreviated as FNF.

<sup>7</sup>Listed as “executive director” in the documentary *Free the Network* by *Motherboard* (Motherboard 2012). The graphics in the figures are extracted from this work.

<sup>8</sup>Another important figure of this project is or was Tyrone Greenfield (son of Jerry Greenfield (Ben & Jerry’s)).

<sup>9</sup>Ibid.

<sup>10</sup>Ibid.

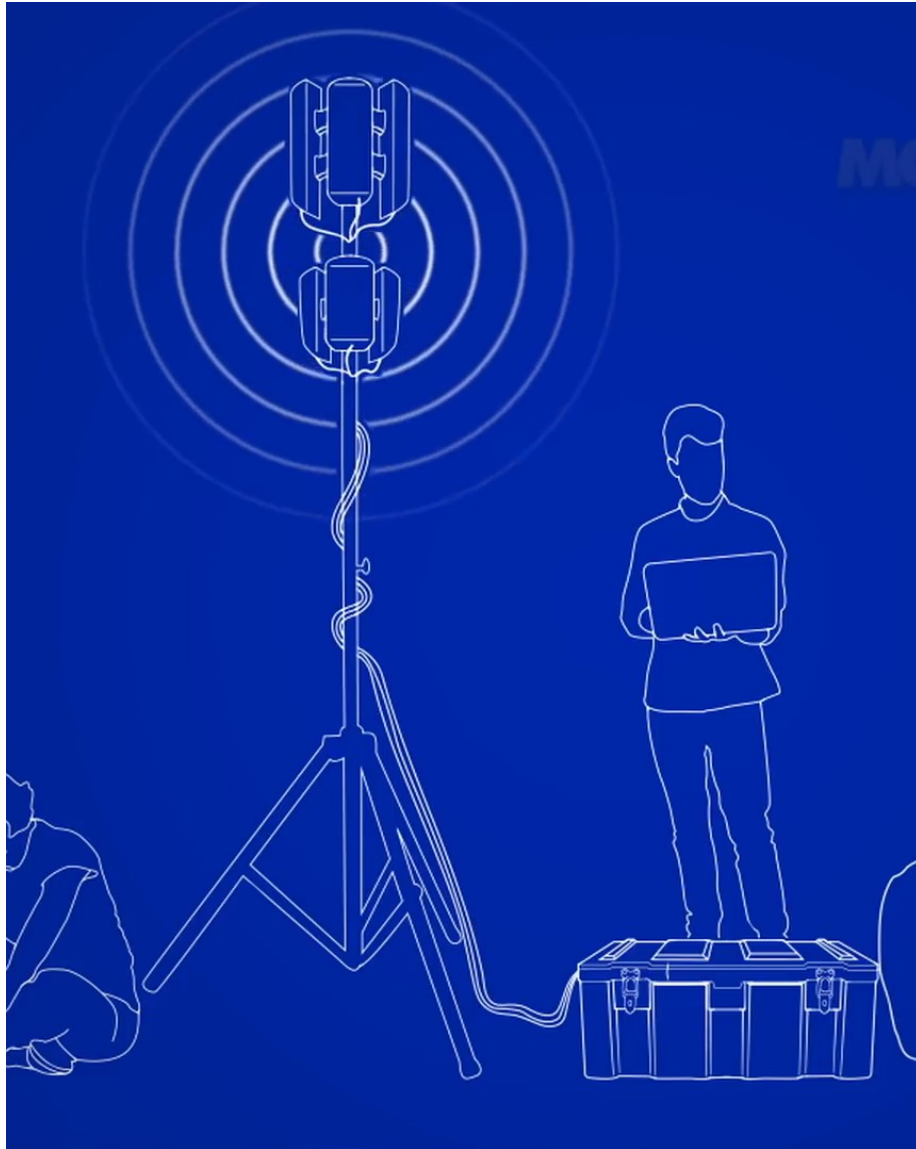


Figure 1: Freedom Tower (Motherboard 2012).

At a high level, of abstraction, it can be said that the Freedom Tower consists of two main components : the enclosure (shown at the bottom right in the graphic of figure 1), and the pole (extending from the bottom to the top, towards the left of the same graphic).

The equipment necessary for these Freedom Towers, hardware and software, is given by Wilder as follows :

There's the modems, the router, and the radios. The modems that we're using connect to Clear [a wireless Internet service provider

(ISP)]. In the future we'll be able to replace those with modems that connect to our radios, or to anybody's radios. The key I guess, the secret sauce right, is the software that's running on the router, that lets you anonymize, or tunnel, or do these kinds of fancy tricks with network traffic.<sup>11</sup>



Figure 2: Freedom Tower component.

The “enclosure”, or trunk<sup>12</sup>, shown in figure 2, he describes as :

The router is connected on one side to the wide area network, so that is like the backhaul<sup>13</sup>, or wherever we're getting our upstream

<sup>11</sup>Ibid.

<sup>12</sup>For lack of better or official terminology.

<sup>13</sup>“Backhaul” is Networking terminology (not to be confused with “back hall”). In Comer, backhaul appears in relationship to WiMAX : “WiMAX offers broadband communication that can be used in a variety of ways. Some service providers plan to use WiMAX as an Internet access technology that spans the last mile. Others see the potential of WiMAX to provide a general-purpose inter-connection among physical sites, especially in a city. Another type of interconnection is known as *backhaul* – the connection between a service provider's central network facility and remote locations, such as cell towers.” (Comer 2015 : 308).

bandwidth from.

You have this separation of components, so that this is modular, and you can replace a WiMAX<sup>14</sup> [high-speed wi-fi for large geographical areas] modem, with whatever kind of modem, or input that you want.

The wide area connection comes into the router. The router is connected to the switch, which then connects it to the server.

These two connections go to power injectors for the two gateway radios.

One on each ring is the gateway. And, then the other two, connect to that wirelessly, and redistribute the signal in the other directions.

(...) any kind of software that we want to run locally, Web software, whatever kind of software, we can run on this server. It's a Debian server. And, it will be accessible whether the wide area connection goes down, stays up, whatever. This has nothing to do with the global Internet. This is available locally.<sup>15</sup>

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<sup>14</sup>“WiMAX : Wireless access technology up to 155 Mbps using radio frequencies” (Comer 2015 : 243).

<sup>15</sup>Motherboard 2012.



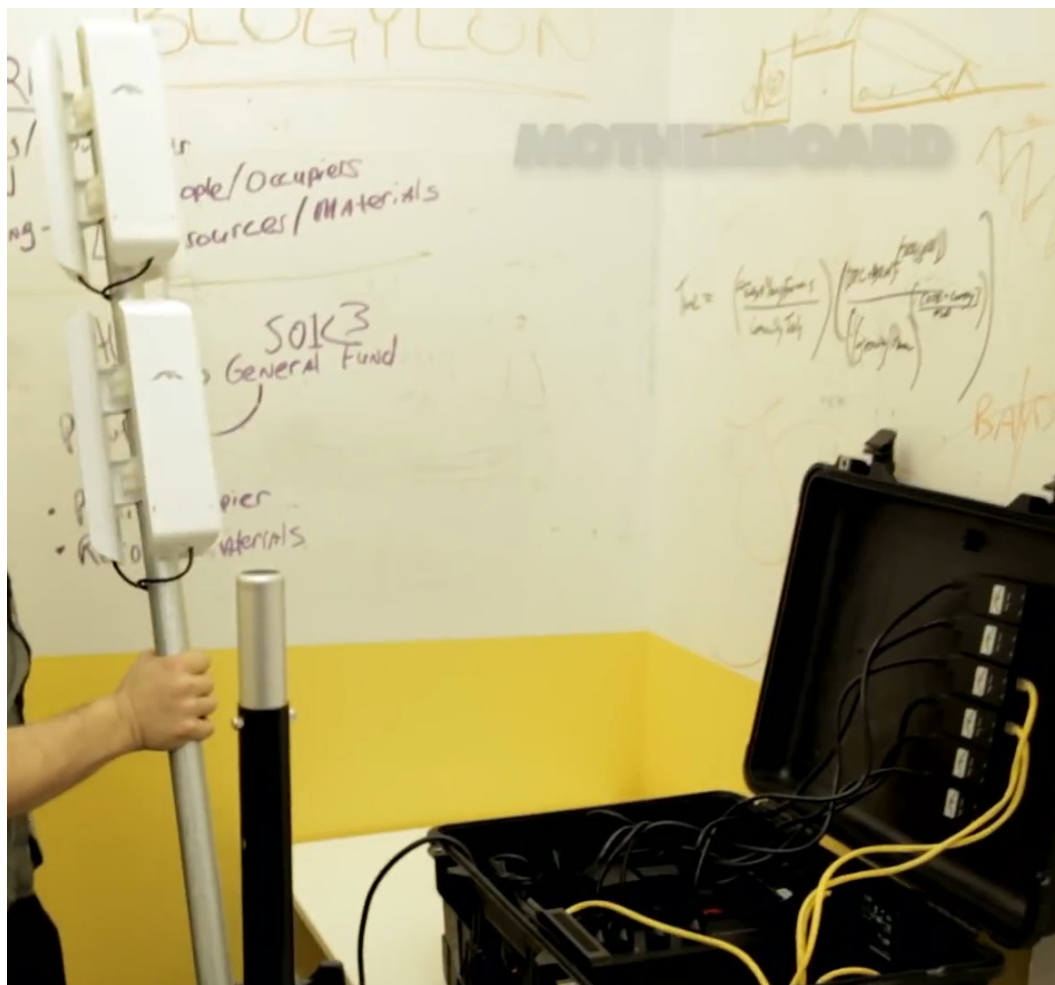


Figure 3: Freedom Tower.

In the report “Peer to Peer User Owned Communications Infrastructure”<sup>16</sup>, specific details are given<sup>171819</sup>.

It is worth to note, before we move on, that some of the indications in this report – if not all – seem to refer to a (seemingly) more primitive version of

<sup>16</sup>Cook 2012.

<sup>17</sup>In particular, where technical details are concerned, in the section “Freedom Tower Materials and Assembly” (Ibid., p. 29-32).

<sup>18</sup>Of which we cite here only a few, as for the hardware : “– A quiet power generator such as the Honda EU1000i (\$800), – A UPS such as the APC (...) (\$100 ), – A nettop [computer] (...) – An 8-port network switch (\$15) – Three USB [to] Ethernet adapters (\$30 x3) – Two 4G modems such as the Clear Series M (...) – Three Ubiquiti NSM2 (...) – Three Ubiquiti NSM5 Loco (...)” (Ibid., p. 29).

<sup>19</sup>From our research, we only conclude that the mentioned “radios” are the Ubiquity devices mentioned in their report. The modems being 4G modems (by Clear), as they appear in that report, also described as WiMAX in the documentary, and the router a computer with router software installed on it, still outgoing from information found in that same report.

((or) parts of) the Freedom Tower, and as such there may be slight variations in places, which we note whenever we can<sup>20</sup>. It is not clear if it is a more primitive version, as we assume, and describe here, or an alternative (co-existing) solution, different iteration.<sup>21</sup>

This seemingly more primitive version of the enclosure, and hence the (corresponding) Freedom Tower (component), than shown here, almost resembles a hard-shell suitcase, with components cluttered inside<sup>22, 23</sup>

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The contents of the “enclosure”<sup>24</sup> are listed there as follows :

Enclosure for UPS, computer, router, modems, and radio power injectors<sup>25</sup>

We do our best here to identify them in the depiction in figure 2<sup>26</sup> : (directions are given arbitrarily from the point of view of the modem) the modem is the white box, the UPS is above it, the switch (hard to distinguish) is below it, to its right (hard to distinguish) is the router, to its left the server<sup>27</sup>, while the radio power injectors are attached to the lid of the enclosure.

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As far as we can tell, in particular based on figure 7, which can be found in the appendix, and offers a better view of the insides, the UPS occupies all of the upper-half of the trunk (i.e. there are no more additional components there).

The outgoing power cable, that can be seen exiting the box, we can only assume goes to a power source : in the office where this was filmed, a regular power outlet we presume, but in the outside, the power generator mentioned in

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<sup>20</sup>This more “primitive” version is depicted on page 27 of Cook 2012. Because of this, we also include it in our appendix.

<sup>21</sup>The documentary was released on “Mar 29, 2012”, while the Cook report features the mention of “March April 2012 Part 2”, and its URL contains the date of “2012-04-13”, of which a longer part here : “.../2012/04/2012-04-13-Cook-...”. For lack of better proposals these two variants may have to be referred to as “Motherboard 2012” and “Cook 2012” (versions), to help facilitate discussion, or narration.

<sup>22</sup>In our opinion, it demonstrates that all such creations have to start somewhere, at a more basic level, from which they can always be improved. Something also found in Huang 2018. Seeing such imperfect states – in actual images, or better photographs – helps us break with fetishizations of technology. (We use this word in more or less the same sense as Marx does, in particular when he talks about the phenomenon of the “fetishization of the object”, by which products or goods are disconnected from their origins, the workers. (This is most likely either in *Capital*, if so most likely in the first book, or *Grundrisse*.) (Found elsewhere, with some possible inflections, as “commodity fetishism”..))

<sup>23</sup>As for the enclosure, though this is pure speculation on our part, and though various safety considerations would have to be considered, a primitive but widely available alternative could be constituted by a ((slightly) modified) hard-shell suitcase.

<sup>24</sup>Or trunk, we propose for lack of better/official terminology.

<sup>25</sup>Ibid.

<sup>26</sup>A much better view is given by the depiction in figure 7 placed in the appendix – minus the lid (where the radio power injectors are).

<sup>27</sup>Which we identify with “computer”.

the report, if no other, more practical sources of energy are present (e.g. power outlet).

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In further describing the Freedom Tower, we follow the order (given originally by Wilder) : modems, router (software), and radios. And, provide additional information on other components where we think useful.

the modems (we suggest two, but you could use as few as one or as many as are needed) (...) Because all Clear modems are set to the same address by default, it will be necessary to change the DHCP settings so that each modem has a different address. Leave one modem as 192.168.15.1, and number additional modems by iterating the third octet<sup>28</sup>: 192.168.16.1, 192.168.17.1, etc.<sup>29</sup>

As for the router, we deduce from the report that the router is a portable computer on which a Unix-like operating system is installed :

Router The heart of the Freedom Tower is a nettop computer running pfsense, a variant of openbsd, that makes it easy to do network administration.<sup>30</sup>

OpenWrt, a Linux distribution, which supports mesh networking, may represent an alternative<sup>3132</sup>. A laptop may also represent an alternative to the mentioned “nettop” (a small format PC)<sup>33</sup>.

As for the “radios” :

There are 6 radio’s overall. Three 2.4 GHz radios and three 5 GHz radios. The 2.4 GHz radios transmit with a strength of 18 dB a piece and the 5 GHz radios transmitted at the rate of 11 dB a piece. This gives us a coverage radius of about a half a mile.<sup>34</sup>

If we are correct in their identification with the Ubiquity devices, we can add the following information : The NSM2 model operates on frequency 2.4 GHz

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<sup>28</sup>Octet being the technical term used in Networking to describe the different parts (“numbers”) of an IP address : the third octet in the provided example changes from 16 to 17.

<sup>29</sup>Ibid.

<sup>30</sup>Ibid.

<sup>31</sup>“OpenWrt can of course run in normal PC or server hardware, and take advantage of the much more powerful hardware the x86 (Intel/AMD) architecture can offer.” [https://openwrt.org/docs/guide-user/installation/openwrt\\_x86](https://openwrt.org/docs/guide-user/installation/openwrt_x86).

<sup>32</sup>It has been used, and modified by Freifunk : “The Freifunk Firmware is a modified version of OpenWrt Linux Version that is developed for router devices.” <https://wiki.freifunk.net/Kategorie:English>

<sup>33</sup>On Linux, in the example we provide specifically Debian though this should be applicable to other distributions as well, the `/etc/.../logind.conf` file is edited such that `HandleLidSwitch=ignore` to prevent interruption of a laptop on lid closing (overheating may be a long-term issue of this hence stability). <https://wiki.debian.org/Suspend>

<sup>34</sup>Cook 2012 : 27.

and the NSM5 on 5 GHz (as reflected by their nomenclatures) while their range is over 10 kilometers, according to the specifications of the manufacturer<sup>35,36</sup>

These devices are described by the manufacturer as “ideal for Point-to-MultiPoint (PtMP) applications” (also found elsewhere as “P2MP” or “PMP”).

We provide more information about other components :

Inside the box is an uninterruptible power supply. The UPS power supply will allow the tower to operate for a couple of hours on battery power alone.<sup>37</sup>

We have followed the nomenclature of “enclosure” (present inside the report) to describe one component of the Freedom Tower. We propose pole<sup>38</sup> to describe the other (where the radios are) – to make discussion easier.

In the appendix, we include a photo of the Freedom Tower (pole?) in the outside.

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To break with the fetishization of electronic or technological equipment, that we may have encouraged so far, that makes it so that they are disconnected from their uses and origins, it is important to note that the Freedom Towers were used at Zuccotti Park, New York, among other places, to support Occupy Wall Street protests by providing protesters “free, secure” wireless Internet access.<sup>39</sup>

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Wilder described their goal as follows, under consideration of the system’s current – then – limitations :

Some day, our aspiration, is to help humanity build its own actual network. Not a virtual network. But, an actual network. But, in the mean time, a virtual network is the best we can do. And, it’s a necessary step in the process of bootstrapping an actual wide area network.<sup>40</sup>

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<sup>35</sup><https://www.ui.com/airmax/nanostationm/>

<sup>36</sup>This is consistent with the following mention in their report : “upstream connectivity is rebroadcast via powerful 2.4GHz and 5GHz radios on an open wifi network.” (Cook 2012 : 5).

<sup>37</sup>Cook 2012 : 27.

<sup>38</sup>A terminology also found in Cook 2012 : “a thin, maybe nine-foot-tall pole, loaded on all sides with nondescript routers that had been beaming out wireless access since early on in the occupation.” Either a. this may refer to an alternative or more primitive version of the Tower b. Cook 2012 is wrong when he talks of routers (instead of radios) c. we are wrong (and hence may be wrong in other places, as we identify them as radios) d. some other misconception.

<sup>39</sup>A service that Wilder described we believe as “comfort” to them (in the same way that other people have offered, historically, and presently, food, drinks, water or coffee, or else, and shelters, to protesters, this would be a digital equivalent of that, and one that is beyond that necessary to relay information both locally, to organize, and to the wider world, for information).

<sup>40</sup>Motherboard 2012.

Following this, the narrator of the documentary comments (we assume their work has received some approval from the Free Network Foundation or some of their members at least, which is why these comments are also important or of value to us) :

It's about peer-to-peer networks : people talking to one another, directly, and through no middleman.

The idea is to build up mesh networks, where all points of connection, or nodes, simultaneously receive and release information. But, on top of that, these nodes act as transmitters for other nodes too.

Isaac and the FNF are working to decentralize a global Internet that's become widely consolidated, and to redistribute the avenues we talk to one another.

Mesh networking is not a new idea. It's been spreading around the world in recent years, a sort of pirate radio Internet, that connects underserved communities to the Web (...) <sup>41</sup>

Meanwhile this animated schema is shown :

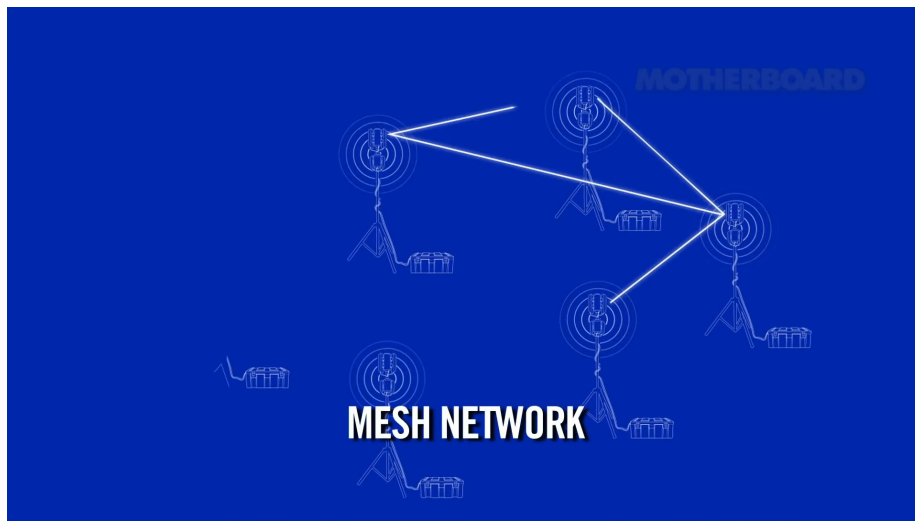


Figure 4: Freedom Towers in a mesh network (Motherboard 2012).

In this animated schema, which we are not able to render fully here, other than in words, links are successively established between the various Freedom Towers <sup>42</sup>, while new Towers emerge, or are created, who are then in turn linked to the (mesh) network.

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<sup>41</sup>Ibid.

<sup>42</sup>This we assume are the “nodes” mentioned in the narration of the voice-over speaker.

This goes on until the animation stops with the depicted mesh network in the following state : 6 Freedom Towers in total, where each Tower has *at least* links with two other Towers (their next closest Towers from what we are able to tell). But, some Towers, 4 in total, have links with more than two towers : they are (all) linked to three Towers in total.

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This represents a classic graph problem, and fits into the wider topic of graphs (and graph theory) : nodes are connected to each other through so-called edges (or vertices).

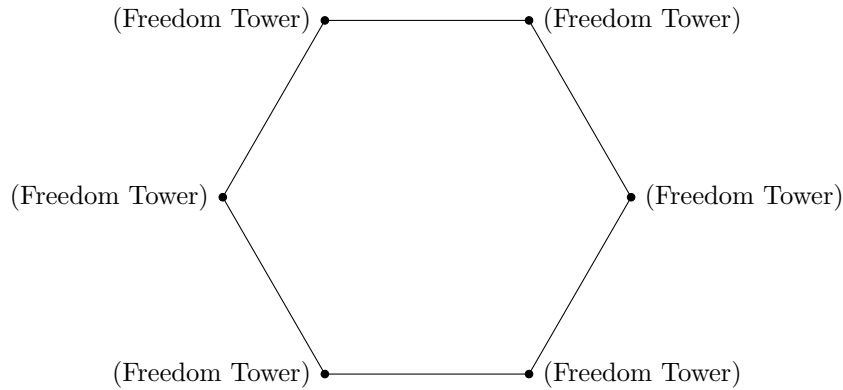


Figure 5: -.

Graph representations and problems have (long had) applications in networking, in particular shortest-path algorithms e.g. Dijkstra's algorithm or, maximum flow, Ford-Fulkerson algorithm.

Applied to the final state of the depicted mesh network, this means 6 nodes and 9 edges (6 edges on the outside, forming a hexagon of sorts, plus 3 traversal ones on the inside).

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The idea of peer to peer (networks or network) is also reflected in the title of the report cited previously, "Peer to Peer User Owned Communications Infrastructure" (containing various materials written in cooperation with, and to

the best of our knowledge partly, by them).

Specifically, talk is of so-called “Mesh networking” (also found elsewhere as “mesh network”, or “meshnet”).

The goal is given by the narrator of the documentary as decentralization (of the Internet).<sup>43</sup>

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In the academic literature, a definition is given as follows for peer-to-peer architecture :

“In a P2P architecture, there is minimal (or no) reliance on dedicated servers in data centers. Instead the application exploits direct communication between pairs of intermittently connected hosts, called *peers*. The peers are not owned by the service provider, but are instead desktops and laptops controlled by users (...). Because the peers communicate without passing through a dedicated server, the architecture is called peer-to-peer.”<sup>44</sup>

This model is in contrast with so-called “client-server architecture”, where “an always-on host, called the *server*, (...) services requests from many other hosts, called *clients*.”<sup>45</sup>

In other places, the terminology “hub and spoke” (architecture) is used (instead).

To understand mesh networks, we must understand how they’re different from typical network architectures, used to connect our devices, such as phones, computers and routers. These devices usually connect in what is referred to as a “hub and spoke network architecture”. Hub and spoke networks are centralized networks, in which points on the network – the “spokes” – are all connected to a single center – the “hub”, which serves as an access point through which all devices on the network connect to all other devices.

In a mesh network, the network architecture is not as defined – rather, the devices on the network connect to all other devices on the network that are nearby. The devices, also known as nodes, send data to other nodes that are within range, and the data moves through the network, node to node, until it reaches its final destination.

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<sup>43</sup>This represents an alternative to the phenomenon of concentration of Internet infrastructure and consolidation of the Internet as a product owned, by few, rather than a “good”, by, and for many. Rather than the Internet being owned by a dozen or so of private companies, with for-profit interests, this would constitute a *People’s “Internet”*.

<sup>44</sup>(Kurose and Ross 2017 : 114-115).

<sup>45</sup>(Ibid.).

But, what are these nodes? They can take many forms as long as they can send and receive data. Typically, they're made of wireless routers. Just like the ones you use at home. They can also be made of cell phones or radios.

For a mesh network to work, however, each node has to behave a bit differently than it would if it were connected to a typical network. It must not only send and receive data, but it must also determine an efficient way to send data across the mesh.

The nodes accomplish this, through what is known as routing protocol.

A routing protocol is a set of rules that are coded into the nodes, which uses either the local, or global make up of the mesh to determine the best path by which to send the data. There are various algorithms that are used for this<sup>46</sup>

To use the terminology of client-server architecture, the hub is the server, and the spokes are the clients.

The term “nodes”, used here in the context of mesh networks, most likely coincides with, if it is not replaceable by, the other term, employed by Kurose and Ross in their explanation of peer-to-peer architecture, “peers”.

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While the documentary does not go into these finer points (of routing protocols), the report does.

“At present, there are two leading algorithms in the arena of mesh routing - Optimized Link State Routing, and the Better Approach to Mobile Ad Hoc Networking. (...) Optimized Link State Routing, or OLSR, is widely utilized. (...) Though recent iterations have decreased CPU usage, and improved throughput, OLSR's primary drawback is heavy CPU usage, especially in discovering and repairing routes. The Better Approach to Mobile Ad Hoc Networking, or BATMAN, emerged from the German FreIFunk community. Its latest iteration, BATMAN Advanced, works at a lower level of the network stack than other mesh implementations, and has now been incorporated into the mainline linux kernel.”<sup>47</sup>

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<sup>46</sup>Berkman Klein Center 2012. This resource goes on to mention “OLSR, Batman, and HWMP.”

<sup>47</sup>Cook 2012 : 43.



## 2 Mesh networks (Shortcomings of academic literature)

In Kurose and Ross, mesh networks appear in two places<sup>48</sup>.

A “mesh networks, wireless” (“wireless mesh networks”) entry in the index, itself referring to page 552, which is part of chapter 6, “Wireless and Mobile Networks”, in a passage where a “taxonomy” of the “different types of wireless networks” are given

At the highest level we can classify wireless networks according to two criteria: (i) whether a packet in the wireless network crosses exactly *one wireless hop or multiple wireless hops*, and (ii) whether there is *infrastructure* such as a base station<sup>49</sup> in the network:

*Single-hop, infrastructure-based.* These networks have a base station that is connected to a larger wired network (e.g., the Internet). (...)

*Single-hop, infrastructure-less.* In these networks, there is no base station that is connected to a wireless network. However, as we will see, one of the nodes in this single-hop network may coordinate the transmissions of the other nodes. (...)

*Multi-hop, infrastructure-based.* In these networks, a base station is present that is wired to the larger network. However, some wireless nodes may have to relay their communication through other wireless nodes in order to communicate via the base station. Some wireless sensor networks and so-called **wireless mesh networks** fall in this category.

*Multi-hop, infrastructure-less.* There is no base station in these networks, and nodes may have to relay messages among several other nodes in order to reach a destination. Nodes may also be mobile,

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<sup>48</sup>The other being a passage out of “6.3.6 Personal Area Networks: Bluetooth and Zigbee” on Zigbee, an alternative wireless network protocol/standard to Bluetooth : “Nodes in a Zigbee network come in two flavors. So-called “reduced-function devices” operate as slave devices under the control of a single “full-function device,” much as Bluetooth slave devices. A full-function device can operate as a master device as in Bluetooth by controlling multiple slave devices, and multiple full-function devices can additionally be configured into a mesh network in which full-function devices route frames amongst themselves.” (Kurose and Ross 2017 : 578).

<sup>49</sup>“A base station is responsible for sending and receiving data (e.g., packets) to and from a wireless host that is associated with that base station. A base station will often be responsible for coordinating the transmission of multiple wireless hosts with which it is associated. When we say a wireless host is “associated” with a base station, we mean that (1) the host is within the wireless communication distance of the base station, and (2) the host uses that base station to relay data between it (the host) and the larger network. **Cell towers** in cellular networks and **access points** in 802.11 wireless LANs are examples of base stations. (...) the larger network (e.g., the Internet (...) or telephone network)” (Kurose and Ross 2017 : 550).

with connectivity changing among nodes—a class of networks known as **mobile ad hoc networks (MANETs)**. If the mobile nodes are vehicles, the network is a **vehicular ad hoc network (VANET)**. As you might imagine, the development of protocols for such networks is challenging and is the subject of much ongoing research.<sup>50</sup>

But, no more is said on these topics<sup>51</sup>, and the topic of (wireless) mesh networks specifically, as these authors prefer to “confine [them]selves to single-hop networks, and then mostly to infrastructure-based networks.” – leaving the reader to consult some hypothetical research during hours of their own.

In the latest version of *Networks*, by Tanenbaum and Wetherall, copyrighted 2011, mesh networks only appear once by name, and here also, briefly, only to refer to further research to which the reader may then turn to if their curiosity so desires.

A particularly challenging setting is a wireless mesh network in which multiple, interfering wireless links must be crossed, routes change due to mobility, and there is lots of loss. Research in this area is ongoing. See Li et al. (2009) for an example of wireless transport protocol design.<sup>52</sup>

This is all mesh networks deserve, as envisioned by Tanenbaum and Wetherall (as part of an aptly named “Wireless Issues”, that here is conferred the unintended double meaning of Issues in Networks teachings, or indeed, Current Issues in Networking).<sup>53</sup>

This is all the coverage undergraduate and graduate students – the public explicitly targeted – will ever receive on these topics, if their schools had picked them, when reading these books. They are the two most assigned textbooks in their domain<sup>54</sup>.

<sup>50</sup>Kurose and Ross 2017 : 552-553.

<sup>51</sup>Except “Hosts associated with a base station are often referred to as operating in **infrastructure mode**, since all traditional network services (e.g., address assignment and routing) are provided by the network to which a host is connected via the base station. In **ad hoc networks**, wireless hosts have no such infrastructure with which to connect. In the absence of such infrastructure, the hosts themselves must provide for services such as routing, address assignment, DNS-like name translation, and more.” (Kurose and Ross 2017 : 550-551).

<sup>52</sup>Tanenbaum and Wetherhall 2011 : 539. Li et al. 2009 is “Block-Switched Networks: A New Paradigm for Wireless Transport”.

<sup>53</sup>Their references stop with the year 2010. For the IEEE 802.11s standard, Mesh Networking, the date 2011 is provided by Beard and Stallings, *Wireless Communication Networks and Systems* (2016).

<sup>54</sup>By far, Kurose and Ross is the most assigned textbook in “Networking” (with a cumulative count of 197, this is as opposed to 3 for the next most-assigned book (in that category). Tanenbaum is the most assigned book in “Networks” (with a count of 138), followed by Peterson’s *Computer Networks: A Systems Approach* (count 132) and Comer’s *Computer Networks and Internets* (41). This is based on the “Open Syllabus Explorer” database, <http://explorer.opensyllabusproject.org/>

It is difficult to see how in such conditions they would be moved to move into research on them.

An example of the subtle ways in which, in computer science, and other disciplines, some topics, though presented “in general”, are given differentiated treatments.

*Computer Networks*, 5/e is appropriate for Computer Networking or Introduction to Networking courses at both the undergraduate and graduate level in Computer Science, Electrical Engineering, CIS, MIS, and Business Departments.

Tanenbaum takes a structured approach to explaining how networks work from the inside out. (...) <sup>55</sup>

Though, we are certain, and already assured, that Tanenbaum and Wetherall, and Kurose and Ross, and those who use their books, make up for it in their teachings, the consistently infallible explanation for such shortcomings – “it is handled in class”, “it is only the basis for “further explorations””. But, maybe these explorations, and secret closed door teachings, ought to be put in writing, just like the rest of the thousand pages of their books.

In Comer’s *Computer Networks and Internets*, mesh networks are strangely enough relegated to a chapter on “The Internet Of Things”, the second last chapter of their book – building up the impression that these are all the uses such networks could have and this is where they belong. Mostly, as part of developments on Bluetooth and Zigbee.

Even more confusing, the only general treatment we get in this book is a short explanation of mesh topology as part of “Chapter 13 Local Area Networks: Packets, Frames, And Topologies”, “13.8 LAN Topologies” :

A network that uses a mesh topology provides a direct connection between each pair of computers. The chief disadvantage of a mesh arises from the cost: a mesh network connecting  $n$  computers requires:

$$\text{connections in a mesh network} = \frac{n!}{(n-2)!2!} = \frac{n^2 - n}{2}$$

The important point is that the number of connections needed for a mesh network grows faster than the number of computers. Because physical connections are expensive, few wired LANs employ a mesh topology. <sup>56</sup>

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<sup>55</sup>Description.

<sup>56</sup>Comer 2015 : 228.

It would take any student, undergraduate or graduate, much capacity for imagination to – out of these two disparate treatments of either IoT or LAN – put together a notion of mesh networking as applied to the general, wireless, uses described here.

Of peer to peer networks, we also mostly only learn in Comer that “Instead of fetching a complete file from a central server (...) each client that obtains a piece of the file agrees to act as a server and supply the piece to other clients.”<sup>57</sup> As for our concerns, many of the developments in this book are stupefying. The other uses that these topologies have, none of which however any reader would find anywhere here, are either forgone or seemingly unknown to these authors.<sup>58</sup> an upside down pudding recipe for their subject, ins, and digression with digression from check digression transgression with sole transgression academic norm to have created an upside down pudding, instead of

These “experimental” network architectures will remain “experimental” as long as the authors of these textbooks – “widely used and acclaimed” if textbook publishing marketing is to be trusted – will not treat them; and neither should they be widely acclaimed, and even less so used.

A loss for all as these topics arguably represent some of the most exciting and fascinating parts of their domain.<sup>59</sup>

Not only that, but mesh networks have vital uses : in cases of natural disasters, that may severe important Internet links or phone lines, or made-made disasters (e.g. wars), that may have the same effects. But, furthermore, they have been used to provide access to the Internet to underserved places and communities, either rural and/or of often low socio-economic profiles. In addition, they provide means of communication in censorship contexts<sup>60</sup>.

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<sup>57</sup>Comer 2015 : 615.

<sup>58</sup>In Kurose and Ross, peer to peer is also mostly only treated from the point of view of file sharing, or distribution, but a broader context for other uses, such as the ones discussed here, to say nothing of their social or political implications, are completely absent (even more surprising as Ross is presented as someone whose “research interests are in privacy, social networks, peer-to-peer networking”, little of which is felt however when reading this mostly generic textbook whose only minor quirk, its only transgression of academic tradition, may have been to have created a recipe for an upside down pudding, instead of a straight pudding, and that is not much).

<sup>59</sup>Due to the nature of the topic, it seemed best – as alternative – to look for specialized books on “wireless networks” or “wireless networking”, or “wireless communication”, as opposed to textbooks on networks or networking in general, but most of these books (e.g. reference works such as *Fundamentals of Wireless Communication* by Tse and Viswanath or *Wireless Communications* by Goldsmith) are 15 years old. (Several books and resources handle these topics in more detail and we list them in the bibliography.

<sup>60</sup>Currently, still, at least 1.4 billion people only know a censored version of the Internet we hold for granted : this is the case for the inhabitants of China (whose access is filtered through the so-called “Great Firewall”). During the Arab Spring, several social websites were blocked in addition to communication by SMS, and censorship of traditional media. Mesh networking chat applications were used during the Hong Kong protests of 2014 (Hu 2014).

### 3 Routing protocols : B.A.T.M.A.N., OLSR

An overview of available algorithms is given by the report we cited before : it mentions OLSR and B.A.T.M.A.N. as the two leading algorithms, highlighting the former's wide use and weaknesses (CPU usage), and the inclusion of the latter in the form of Batman advanced in the Linux kernel<sup>61</sup>. Another resource mentioned both as well, and HWMP, Hybrid Wireless Mesh Protocol, additionally<sup>62</sup>.

These algorithms are not mentioned anywhere in the academic literature we have had access to (Kurose and Ross 2017, Comer 2015, Tanenbaum and Wetherhall 2011, Tanenbaum alone, etc.), and there can no hope of finding them there any time soon.<sup>63</sup>

The “main development website” for B.A.T.M.A.N. gives the following description :

B.A.T.M.A.N. (better approach to mobile ad-hoc networking) is a routing protocol for multi-hop ad-hoc mesh networks.<sup>64</sup>

If Kurose and Ross' taxonomy of wireless networks was to be used<sup>65</sup>, this would place B.A.T.M.A.N. applications in the “Multi-hop” category, either Multi-hop infrastructure-less (ad-hoc) or infrastructure-based ((wireless) mesh networks)?

In that same – official or as much as we are aware of so – source, B.A.T.M.A.N. advanced is presented :

B.A.T.M.A.N. advanced (often referenced as batman-adv) is an implementation of the B.A.T.M.A.N. routing protocol in form of a linux kernel module operating on layer 2.<sup>66</sup>

In the documentation for the Linux kernel, appearing as “Batman advanced”, in “batman-adv”, it is documented like so :

Batman advanced is a new approach to wireless networking which does no longer operate on the IP basis. Unlike the batman daemon, which exchanges information using UDP packets and sets routing tables, batman-advanced operates on ISO/OSI Layer 2 only and uses and routes (or better: bridges) Ethernet Frames. It emulates

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<sup>61</sup>Cook 2012 : 43.

<sup>62</sup>Berkman Klein Center 2012.

<sup>63</sup>These gentlemen may be waiting for an IEEE certification still, or some equivalent, after which point they will apply a puffer of 5 to 10 years before they can turn to them.

<sup>64</sup><https://www.open-mesh.org/projects/open-mesh/wiki>

<sup>65</sup>Kurose and Ross 2017.

<sup>66</sup><https://www.open-mesh.org/projects/batman-adv/wiki/Wiki>

a virtual network switch of all nodes participating. Therefore all nodes appear to be link local, thus all higher operating protocols won't be affected by any changes within the network. You can run almost any protocol above batman advanced, prominent examples are: IPv4, IPv6, DHCP, IPX.

Batman advanced was implemented as a Linux kernel driver to reduce the overhead to a minimum. It does not depend on any (other) network driver, and can be used on wifi as well as ethernet lan, vpn, etc ... (anything with ethernet-style layer 2).<sup>67</sup>

Instructions are given there, among others e.g. on how to load the batman-adv module into the kernel. This is done with `insmod`<sup>68</sup>. (A simple `batman-adv` won't do, nor will `man batman-adv` return anything.)

## 4 Obstacles

The obstacle presented by much of these technologies are habits and convenience (or lack thereof), a human factor, that is probably the biggest weakness of any system's modification. A user A may have recognized their benefits, but all of user A's network is made of people unwilling to switch to new technologies, or change their habits (in any major way).

Another obstacle, also human, is the lack of their teachings in academic computer settings : in textbooks and classes. "The systems, both human and computer".

Lastly,) the documentation for these various projects is not the best. This is an obstacle that ideally should not exist – but as most human factors, which turn out to be the most important in a lot of technological topics, contrary to intuition and common presentations, they do.

Another human factor is that such projects (often if not always?) necessitate the cooperation of many people, with all the advantages and disadvantages, and strengths and complications/weaknesses, of such systems.

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<sup>67</sup><https://www.kernel.org/doc/html/v4.17/networking/batman-adv.html>

<sup>68</sup> "insmod - Simple program to insert a module into the Linux Kernel" (Man pages).

••

The Freedom Tower by the Free Network Foundation is not the first of its kind<sup>69</sup>. But, their great strength, the way we see it, was the way they were able to package what is both an idea, and a powerful one, and a technical matter – including but not limited to building a practical, well laid-out, transportable encasing, showcasing their work to a vast public (e.g. documentary<sup>70</sup>), and providing some form of somewhat accessible written documentation (report).<sup>71</sup>

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<sup>69</sup>In the search for antecedents, an almost infinite activity, one could always go back to amateur radio. But, in this case, Freifunk is – if not the most – one of the most important references (expressed in their report in various ways, we believe).

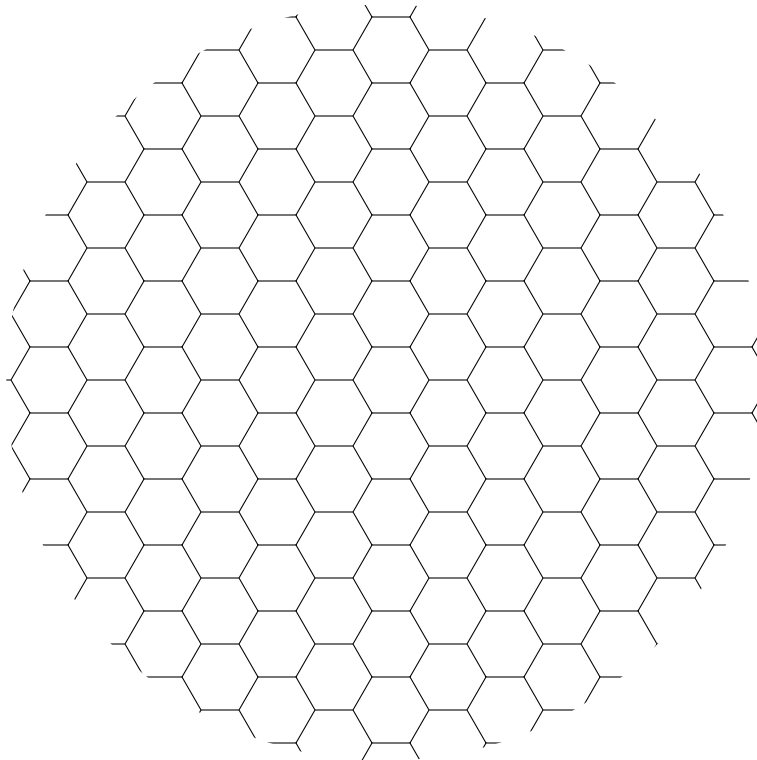
<sup>70</sup>In this case, the 30-minute short documentary film was produced by Motherboard, part of Vice (Vice Media), dedicated to technology. The video, made available for free on a popular user-contributed video platform, has over half a million views currently.

<sup>71</sup>In the opinion of this author, still, and always, the Freedom Tower has a distinct urban quality to it, that, as the documentary demonstrates, shot in various parts of New York, makes them easily deployable, they can be sprung in a few minutes, and is attached a philosophical-political meaning that resonates with many people (the documentary demonstrates how this has led them to receive support, financial and otherwise, or funding from a variety of sources and places). But, attaching the Freedom specifically to New York, or Zuccotti Park, or the Occupy Wall Street movement, is a mistake. It was just an experiment... “Through its offshoot KC Freedom Network, the FNF worked with area digital inclusion organization Connecting for Good to establish free networks serving more than 600 residences in the low-income housing developments of Juniper Gardens and Rosedale Ridge, both in Kansas City, Kansas.” <https://www.kcdigitaldrive.org/project/free-network-foundation/>. The pairings of the likes of the promoters of the Freedom Tower remind of historical characteristics of revolutionary figures, or movements (e.g. Marx and Engels’ roots in the upper-middle, upper classes.) With some these social origins mean they get to go through a rebellious stage, from the place of security afforded to them by their background, on which they may then look back either fondly or not-so-fondly in middle age, with others these causes can represent far more reaching and lasting engagements.

## Conclusion

The Freedom Tower was presented in a series of original research notes. Shortcomings of Networks and Networking textbooks were discussed in this context.

There can be no good conclusion for such a work : the Web and Internet need “champions” who will protect them according to Berners-Lee – may they find useful information here, and elsewhere, alternatives, or their successors.





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## Appendix

- Freedom Tower enclosure (better view).
- Freedom Tower enclosure (more primitive version).
- Freedom Tower (pole) (shown in the outside).



Figure 6: Freedom Tower enclosure (better view) (Motherboard 2012).



Figure 7: Freedom Tower enclosure (more primitive version) (Cook 2012).



Figure 8: Freedom Tower (pole) (shown in the outside) (Motherboard 2012).

# A User-Defined Web. And, on Systems modification in general.

Camille Akmut

## **Abstract**

In **no-television** and **permanent-vacation**, we explore two programs that would fit into a wider *User-Defined Web* : a term chosen and adopted here in opposition to the however well-meant, but ultimately false, established concepts of a “user-centered” or “user-centric” Web – in so far as they are dependent on the good will of those who have control over the Web and Internet, their natures, developments and directions, in particular those who have an above-average influence on them. We discuss *Systems modification* generally : programs that change the way we think of technology and society, by often modifying both.

*“the systems, both human and computer”* (Berners-Lee)

# 1 Background : the Web and the Internet

## 1.1 The searches for reasons

In other sciences and disciplines, a non-negligible part of the activity of scientists and scholars consists in and revolves around research seeking to establish the “etiology” of their various objects. Etiology, a term that, simply, means “root causes” or “reasons of being”; one that is strongly connected to the medical sciences. Why does a given thing exist? How did it come to be? Where and how did it first start? And, so forth. Such questions play an important role in the studies of infectious diseases for instance, as part of epidemiology.<sup>1</sup>

In some, the term etiology is replaced or is predated by others, with sometimes important inflections, and sometimes they are used or conceived of in direct opposition to it<sup>2</sup>.

A major part of philosophy for instance is a subfield called “metaphysics” (a term that is conventionally motivated by the fact that it historically originated in the parts of Aristoteles’ writings that dealt with this topic being placed after his book on Physics, hence literally meta-physics, or that which comes after, or beyond *Physics*), which can be described as the investigation of all questions that relate to the nature and purposes of our existence<sup>3</sup>.

For reasons that may be related to its relatively young age, and arguably its immaturity, in some ways, computer science and computer scientists have shown and display relative little interest in such endeavors and activities. Being still pioneers of their discipline, they may be more interested in doing, and being – without having to worry about the more meta-theoretical questions that come, whether they wish it or not, with these same doings and beings, and their

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<sup>1</sup>To give a specific example : the mortality rate among women giving birth, the etiology of which is now very different from how it was first conceived of during the 19th century : Semmelweis, the founder of modern antiseptic, or hygiene, rules, ultimately posited that much of it could be attributed to the practices of doctors at the time, some of whom went from dissecting corpses to assisting in birth, without disinfecting their hands and sometimes without changing their tools, practices that now appear as folly to us, but were not uncommon in the days of Semmelweis, who himself had struggled to come to this answer, both for scientific – the exclusion of competing hypotheses – and sociological reasons – this was not the standard of his time. Semmelweis, for his methods and hypotheses, though proven successful, was shunned and ostracized by the medical community, which in its wisdom held that, because things had been done a certain way, for a long time, there was no good reason to change (them). Most of the information presented here is derived from the medical doctoral thesis of Celine, of the same name, but the reader will most likely find it useful to consult additional sources.

<sup>2</sup>A controversy exists for instance as to whether etiologies of sexualities, of which many sexologists readily admit we know very little, should be taken into account when discussing and founding politics, human rights and legal acts that pertain or relate to them. Other controversies center around the notion of “essentialism” (when a mere property of a system is confused with or mistaken or passed for its nature).

<sup>3</sup>The question “Why is there something rather than nothing?”, posed by Leibniz at the beginning of the 18th century, is an often-quoted example of such questions; though Plato’s inquiries into the “real nature of things”, as perceived by our senses, and as posited as ideal, also represent a, perhaps more familiar, iteration of this particular sub-field’s interests.



meanings and functions including in our societies.

This may also be related to the context in which computer science was founded as a discipline, having had to deal with the skepticism of neighboring disciplines, and perhaps having adopted as an antidote a sort of hyper- but unrealistic scientism as a basic reaction.

Astronomy, a discipline not too distant, though much older, and within it in particular cosmology seems much more open to such questioning : it could have been limited to a simple cartography of the knowable universe, but instead questions surrounding the origins of the universe, its meanings, the philosophical implications of other life forms, are not foreign to them, and not treated as non-scientific, but in fact are treated as questions of first-rate scientific importance, and anyone able to answer them would forever have a place in history. This attitude seems to extend to some parts of physics as well.

In the same sciences and disciplines described above, whether misguided or not, inquiries into “the origins” or reasons of being are (can be) used as some indicator or guide of “this is what this truly is or means”; or with the political or philosophical or even aesthetical implications of “this is the purest form, or this is what we ought to want or get back”.

In the historical sciences, in particular as conceived and practiced by the *Annales* school<sup>4</sup>, research into previous eras can serve as a mirror to our own times; it is thus endowed with some subversive quality, if not political potential which can be summed up as : “if this was so, then, then what is now is only one possible, and hence transformable version of our daily experiences; and, equally, whatever we have gained is something we can lose again”.

But, when reaching the question “Why the Internet?”, one is dumbfounded and hard pressed to find many answers in computer science literature. The obvious approach consisting in looking at writings within networking or networks, the particular sub-field of computer science dedicated specifically to these topics, yields relatively little results.

These authors generally prefer to concentrate on the “purely technical” aspects (of their discipline), under the silent though widely accepted notion of there being such a thing<sup>5</sup>.

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<sup>4</sup>*Annales* is a journal around which gravitated a series of important figures within history that have (since) then been subsumed under that banner : Marc Bloch and Lucien Febvre in particular, and others. They all had a certain sensibility for, and art in approaching topics that, while at first sight remote, both in time and nature, from our own current concerns, nonetheless offered potent insights into our lives (e.g. Lucien Febvre’s research into the powers attributed to rulers, both given and acknowledged).

<sup>5</sup>To such approaches, one could oppose a diametrically opposite one, that in computer science everything is political, from the first chip, down to the most abstract algorithm. A notion no doubt highly irritable to these purists – though only time will tell if theirs can hold much longer.

## 1.2 The Internet, and its past

Andrew Tanenbaum starts his much used textbook<sup>6</sup> with an introduction that gives an overview of the subject and ends with an extensive bibliography.

Conforming with the tradition established by such books, he presents the topics of networks according to a layer approach : layer 1 (the physical layer), layer 2 (the data layer), etc, etc.. Except for the strange choice of explicitly opting for “he” to mean “he or she”, there is nothing exceptional about this book or its approach<sup>78</sup>.

Adopting the “top-down” approach for which they are known<sup>9</sup>, which simply reverses the layer approach but does not alter it, Kurose and Ross choose to go from the surface and the most familiar, i.e. by starting with what appears on the screen for instance, the web pages in other words, down to the less visible or approachable, the various data layers and packets; an approach that simply chooses to go backwards the already established model as we have already stated<sup>10</sup>.

All such presentations, whether “top-down”, or bottom-up as in the case of Tanenbaum<sup>11</sup>, more or less follow one or the other of the variants of the OSI (layer) model, also sometimes found as ISO, or a comparable one’s variants (TCP/IP).

Much is found about the what’s and how’s while much remains unclear about the why’s of it all. The authors may be of the opinion that such questions have no place in a scientific or college publication; or that they are the domain of other scientists.

Such books, primarily directed at college audiences, are however not completely devoid of interest when trying to find some historical, if not philosophical reasons for the existence of the Internet or Web. In Tanenbaum<sup>12</sup>, we learn crucially that<sup>13</sup>

Traditionally (meaning 1970 to about 1990), the Internet and its predecessors had four main applications:

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<sup>6</sup> *Computer Networks*. We use the last edition published by Tanenbaum alone, the fourth edition (Tanenbaum 2003).

<sup>7</sup>As we explain below. (Elsewhere, however, we highlight specific weaknesses and give a more detailed critic of this book’s more recent successor in particular.)

<sup>8</sup>It would appear more wise to use they, as in “*they have to log on that machine and run it there*”, if a gender-neutral or gender-all-encompassing approach was sought.

<sup>9</sup>Kurose and Ross 2017.

<sup>10</sup>Accordingly, they start with the so-called Application Layer, which contains the Web and its various protocols (HTTP), in chapter 2. Ibid.

<sup>11</sup>“He starts with an explanation of the physical layer of networking, computer hardware and transmission systems; then works his way up to (...)” (Description for Tanenbaum 2003).

<sup>12</sup>Tanenbaum 2003. Chapter 1. Specifically : “1.5 Example Networks”, which includes the Internet, ARPANET, NSFNET, etc., and historical developments on each.

<sup>13</sup>The more or less the same presentation, but in less detail, is found in Kurose and Ross 2017 on page 126.

1. E-mail. [since ... ARPANET] ...
2. News. [Newsgroups] ...
3. Remote login. [telnet, rlogin, or ssh] ...
4. File transfer. [FTP] ...

Up until the early 1990s, the Internet was largely populated by academic, government, and industrial researchers. One new application, the WWW (World Wide Web) changed all that and brought millions of new, nonacademic users to the net. This application, invented by CERN physicist Tim Berners-Lee, did not change any of the underlying facilities but made them easier to use. Together with the Mosaic browser, written by Marc Andreessen at the National Center for Supercomputer Applications in Urbana, Illinois, the WWW made it possible for a site to set up a number of pages of information containing text, pictures, sound, and even video, with embedded links to other pages.

Histories of the Internet, and the Web, have been written, and these offer more insights, or more detailed ones<sup>14</sup>.

But, before we turn to them, now is a good time to establish, and make explicit, some of the terminology that we use. A distinction has been made between the “Internet” and the “Web”, and it would be purposeful to remind of what these differences are.

To quote from Tanenbaum, “the Internet is not a single network but a network of networks”, while “the Web is a distributed system that runs on top of the Internet.”<sup>15</sup>

It also follows out of previous developments that : 1. The Internet predates the World Wide Web (or just “Web”), and 2. The Web is a portion or a branch<sup>16</sup>, in some presentations, of the Internet, or a structure that sits on top of it<sup>17</sup>, in others. Out of these presentations, it emerges that the Web uses the Internet as some sort of medium, or perhaps conduit – to use flawed visual imagery.

Among such histories, *Where Wizards Stay Up Late: The Origins of the Internet* plays a particular role as one of the first books published on the topic

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<sup>14</sup>But only so, in a system, where computer science was able to be successfully established as a discipline where most social concerns and political ramifications have been (successfully) removed or erased, a fact held by some as a definitive proof of its maturity, and by others as one of its great weaknesses and lacks.

<sup>15</sup>Tanenbaum 2003. Chapter 1.

<sup>16</sup>Hafner and Lyon 1998.

<sup>17</sup>Tanenbaum 2003.

with a wide readership<sup>18</sup>, preceding both Abbate's treatment of the subject and Tim Berners-Lee's own, and presumably surpassing both in sales by a large margin.<sup>19</sup>

Here, journalist Katie Hafner and Matthew Lyon tell a story of an Internet that had begun at the ARPA, Advanced Research Projects Agency, a part of the Defense Department, after which the eponymous ARPANET is named, that was able to strive in the context of an administration and specifically a President, Dwight Eisenhower, that had much faith in scientists and favored their company, and the Cold War (the launch of Sputnik had given a specific scientific twist to these wider oppositions)<sup>20,21</sup>

It is hard to read some of these beginning developments and not think of how much they appear in contrast with present times.

Eisenhower hadn't wanted a seasoned military expert heading the Pentagon; he was one himself. The president distrusted the military-industrial complex and the fiefdoms of the armed services. His attitude toward them sometimes bordered on contempt.

By contrast, he loved the scientific community. He found scientists inspiring—their ideas, their culture, their values, and their value to the country—and he surrounded himself with the nation's best scientific minds.<sup>22</sup>

Of the period mentioned by Tanenbaum that preceded the Web, where one of the main applications was e-mailing, not browsing, Hafner and Lyon write :

In the decade before the ARPANET, computer scientists had devised ways of exchanging electronic messages within a time-sharing system. Researchers on the same time-sharing system each had a designated file, like an in-box, in the central machine. Colleagues could address short electronic messages to someone else's box, where

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<sup>18</sup> *Where Wizards Stay Up Late* was – as the cover of the 1998 paperback edition indicates – a “National Bestseller”.

<sup>19</sup> *Where Wizards Stay Up Late* was published for the first time in 1996, in a hardcover edition by Simon & Schuster, then again in 1998 in paperback form, Abbate's *Inventing the Internet* in 1999, Berners-Lee's *Weaving the Web* in 1999 also (at which point world usage of the Internet was measured to be at about 5% of the world population compared with 50% currently, a large part of it driven by the Web).

<sup>20</sup> ARPA, now DARPA (Defense ...), was founded by Eisenhower in February 1958. In response to the launch of Sputnik (October 1957).

<sup>21</sup> The exposition in *Where Wizards Stay Up Late* is and reads much like a novel or a long work of investigative journalism : their story starts for instance with a flashforward to 1994. It lacks indication of sources within the text, e.g. in the form of notes, but features an extensive bibliography at the end (where the reader is left with the unpleasant task of putting the pieces together). Their non-descriptive choices of titles for the chapters of their book make it hard to follow them.

<sup>22</sup> Hafner and Lyon 1998. Chapter 1.

only the recipient could read them. Messages could be dropped and picked up at any time. It was convenient, given the odd hours people kept. People within a single lab sent parades of one-liners back and forth, as well as longer memoranda and drafts of papers.

The first of these programs, called MAILBOX, was installed in the early 1960s on the Compatible Time-Sharing System at MIT. Similar mailboxes became a standard feature of almost every timesharing system built thereafter.<sup>23</sup>

And, later, on the same topic, and the same chapter, we find that

In 1973, Lukasik<sup>24</sup> commissioned an ARPA study that found that three quarters of all traffic on the ARPANET was e-mail.

First mentions of the ARPANET appear in chapter 6, while first mentions of the ARPA network start appearing at the end of chapter 2.

But, other networks, whose purpose was primarily to link scientific communities together, are evoked, in particular the NSF's CSNET (a network to connect members of the computer science community) and the later NSFNET that catered to a wider public of scientists<sup>25</sup>.

Linking the computer science departments to the ARPANET was out of the question. To be assigned a site, universities had to be involved in specific kinds of government-funded research, typically defense-related. Even then, it was costly to allocate new sites. ARPANET connections came in one size only: extra large. The system used costly leased telephone lines, and each node had to maintain two or more links to other sites. As a result, maintaining an ARPANET site cost more than \$100,000 each year, regardless of the traffic it generated.

The computer scientists had to invent another way. In May 1979, Larry Landweber, head of the computer science department at the University of Wisconsin, invited representatives of six universities to Madison to discuss the possibility of building a new Computer Science Research Network, to be called CSNET.<sup>26</sup>

The book closes on an epilogue, where the Web appears, Tim Berners-Lee, his HTTP protocol, and the CERN code library are mentioned.

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<sup>23</sup>Hafner and Lyon 1998. Chapter 7 "E-Mail".

<sup>24</sup>Lukasik is Stephen Lukasik, the seventh director of (D)ARPA. See, [https://www.darpa.mil/attachments/DARPA\\_Directors\\_Sheet-web.pdf](https://www.darpa.mil/attachments/DARPA_Directors_Sheet-web.pdf)

<sup>25</sup>Hafner and Lyon 1998. Chapter 8.

<sup>26</sup>Ibid.

### 1.3 The Web, and its future

Still, histories of the Internet, and here specifically the Web, have been written or produced by some of their creators.

One important such book is Tim Berner's Lee *Weaving the Web: The Original Design and Ultimate Destiny of the World Wide Web*<sup>27</sup>.

The tone and approach of *Weaving the Web* is very different from both the textbooks and historical accounts cited previously, not least attributable to the unique position of its author as inventor of many of the technologies underlying and of the Web.

When I first began tinkering with a software program that eventually gave rise to the idea of the World Wide Web, I named it Enquire, short for *Enquire Within upon Everything*, a musty old book of Victorian advice I noticed as a child in my parents' house outside London. With its title suggestive of magic, the book served as a portal to a world of information, everything from how to remove clothing stains to tips on investing money. Not a perfect analogy for the Web, but a primitive starting point. What that first bit of Enquire code led me to was something much larger, a vision encompassing the decentralized, organic growth of ideas, technology, and society. The vision I have for the Web is about anything being potentially connected with anything. It is a vision that provides us with new freedom, and allows us to grow faster than we ever could<sup>28</sup>

And, for the first time, we also find expressed, in no unclear terms, with no ambiguity, an answer to our original inquiry : "Why a Web, why the Web?"

***a vision encompassing the decentralized, organic growth of ideas, technology, and society.***<sup>29</sup>

It is worth noting that the sources Berners-Lee draws from throughout the book, from literature to computer science, are also in stark contrast with preceding treatments, painting the picture of a scientist and technologist with broad interests.

These philosophical and literary underpinnings are usually then found erased, or purified, in other publications<sup>30</sup>.

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<sup>27</sup>The first, 1999 edition still featured the full title *Weaving the Web: The Original Design and Ultimate Destiny of the World Wide Web by Its Inventor*.

<sup>28</sup>Berners-Lee 1999 : 1.

<sup>29</sup>Ibid.

<sup>30</sup>As to why, we have already suggested so : the cult of the "purely technical" among many computer scientists. These computer scientists, put shackles on each other, and shackles on others, but many of them see no obvious complications or moral dilemmas on the other hand in accepting morally-ambiguous positions at various, but always similarly dubious and morally-ambiguous companies of morally-uncertain objectives, characters and/or acts.

The story of how the Web was created has been told in various books and magazines. Many accounts I've read have been distorted or just plain wrong. The Web resulted from many influences on my mind, half-formed thoughts, disparate conversations, and seemingly disconnected experiments. I pieced it together as I pursued my regular work and personal life. I articulated the vision, wrote the first Web programs, and came up with the now pervasive acronyms URL (then UDI), HTTP, HTML, and, of course, World Wide Web.<sup>31</sup>

Berners-Lee does not try to embellish the story. The Web, when it was first conceived, was far from an immediate success, including failings in securing funding or convincing colleagues. The modest origins of the Web are rendered in passages such as :

Robert<sup>32</sup> and I wrote a paper, too, "Hypertext at CERN," which tried to demonstrate the importance of what we were doing. What we hoped for was that someone would say, "Wow! ..." But it didn't happen.

In June we held talks and demonstrations within CERN, and wrote about the Web in the CERN newsletter.<sup>33</sup>

And, though, the Web appears now to us as a vast, anonymous, directionless space, this book helps remind that the Web, like most of the rest of technology (we use), is the creation of people, who watched and observed with some worry from afar, some more active or proactive than others, and that the Web did grow from something small (one server(?)) into what we know today :

As the Web slowly spread around the world, I started to be concerned that people who were putting up servers would not use HTTP, HTML, and URIs in a consistent way. If they didn't, they might unintentionally introduced roadblocks that would render links impotent.

(...)

By now the Web consisted of a small number of servers, with info.cern.ch the most interconnected with the rest.<sup>34</sup>

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<sup>31</sup>Ibid. : 2.

<sup>32</sup>Robert is Robert Cailleau, of whom Berners-Lee writes earlier in the book : "While it seemed to be uphill work convincing anyone at CERN that global hypertext was exciting, one person was an immediate convert: Robert Cailliau." (Ibid. : 25).

<sup>33</sup>Ibid. : 46.

<sup>34</sup>Ibid. : 53; 55.

If the criterion of “What should the Web be?” is made to be what its creators intended it to be, then we must hold that the Web was envisioned as a network of communication of information, with some emphasis placed, historical if not philosophical, on knowledge (with some scientific standard attached to it).

This seems at first sight preferable to a Web dominated by commercial interests and advertisements – though only in a society where knowledge was held to be of higher value than financial pursuits.

In his 30th open letter, from 2019, each marking one anniversary of the Web, Berners-Lee wrote :

We need open web champions (...) who will take action when private sector interests threaten the public good and who will stand up to protect the open web.

Companies must do more to ensure their pursuit of short-term profit is not at the expense of human rights, democracy, scientific fact or public safety.<sup>35</sup>

As for the Internet, many of the early networks, defense applications that have almost always accompanied the development of computer science excluded, were also thought of as ways to link creators and consumers of knowledge together (through e-mail).

Critics of such a position will argue that, due to their free and dynamic nature, the Web and the Internet are whatever they are at any given time, and that they should not be made to be anything specific – a position that can be described as what it is here, namely, a laissez-faire position of the category “this is just how things are, this is how they’ve always been”, and one that objectively supports the current status quo, which is highly in favor of large companies over users.

## 2 User-Defined Web

### 2.1 Dominant language : “user-centered”, “user-centric”

“The ideas of the ruling class are in every epoch the ruling ideas, (...) The class which has the means of material production at its disposal, has control at the same time over the means of mental production, so that thereby, generally speaking, the ideas of those who lack the means of mental production are subject to it.” posited Marx.

Much of our language defines our thoughts, and when using established terms such as “user-centered” or “user-centric” Web, we use terms, presumably having

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<sup>35</sup>Berners-Lee 2019.



originated in or emerged out of user interface theory or practice, academic or corporate, though this would be the subject of an entirely separate research of its own, that have become dominant, and they have so because they are regularly used by large companies, and so only as they serve their interests<sup>36</sup>.

### **Autodesk**

*June (...) 2018*

User-centered design starts with empathy. Design leader (...) talks innovation and making a difference worldwide.

<https://www.autodesk.com/...>

### **Measuring the User Experience on a Large Scale: User-Centered Metrics for Web Applications**

*Kerry Rodden, Hilary Hutchinson, and Xin Fu*

Google

There is a strong need for user-centered metrics for web applications

In this note, we describe the HEART framework for user-centered metrics, as well as a process for mapping product goals to metrics. We include practical examples of how HEART metrics have helped product teams make decisions that are both data-driven and user-centered.<sup>37</sup>

Falsely benevolent, to not so say patriarchal, in so far as they have the false property of not only being the product of top-down, few-in-the-know-many-in-the-dark models of creations, no matter how many samples they may collect, but also to depend on the good of will of these few, select companies – whose verifiable past practices<sup>38</sup> (be it their handling of private user data, their affinity with tax avoidance, among many other things noted in many other places) by almost all thinkable metrics leave much to be desired.

These terms themselves most likely go back to the established user-centered design (UCD) or user-driven development (UDD) out of design theory<sup>39</sup>.

No matter what endearing terms they are attached – here “HEART” – they rely on the old models of a Web by few for many. A version of the Web whose failings keep manifesting. Models that are those of traditional media, television first. Failings that the creator of the Web, Berners-Lee, himself highlights.

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<sup>36</sup>It cannot be reasonably assumed that they were chosen or picked because they did not, as otherwise terms such as “user-annihilating”, which may in other ways arguably better, objectively describe their practices, would be dominant instead. They are not for obvious reasons.

<sup>37</sup>Rodden et al. 2010.

<sup>38</sup>As opposed to promises, of wanting to “do better”.

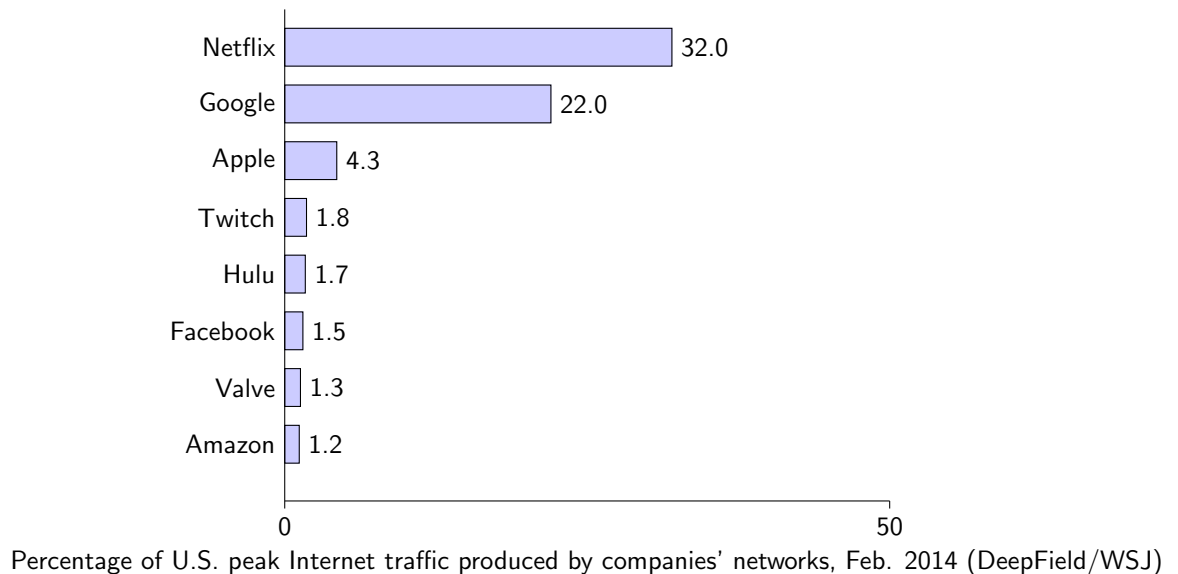
<sup>39</sup>And, *The Design of Everyday Things*.

## 2.2 Definition : User-Defined Web

Instead, we choose the term User-Defined Web that transparently translates into : a Web defined by its users (where each user, as in theory in a democracy, has the same weight). And, specifically not : a Web defined such that it would be thought to be agreeable to users (by few taste makers<sup>40</sup>).<sup>41</sup>

## 2.3 Internet consolidation, and the Web of Companies

This is not the case at the moment. Large corporations have an overwhelming influence on the Web, at present time. This, we can ascertain from various metrics on domain name popularity (e.g. <https://www.alexa.com/siteinfo>) and distribution of peak hour traffic<sup>42</sup>.



These eight companies alone were responsible for over 65% of total U.S. peak Internet traffic – as measured during the last week of January leading to February 2014<sup>43</sup>.

Two companies – Netflix and Google – subsumed among themselves 55% of all Internet peak traffic in a given week of 2014.

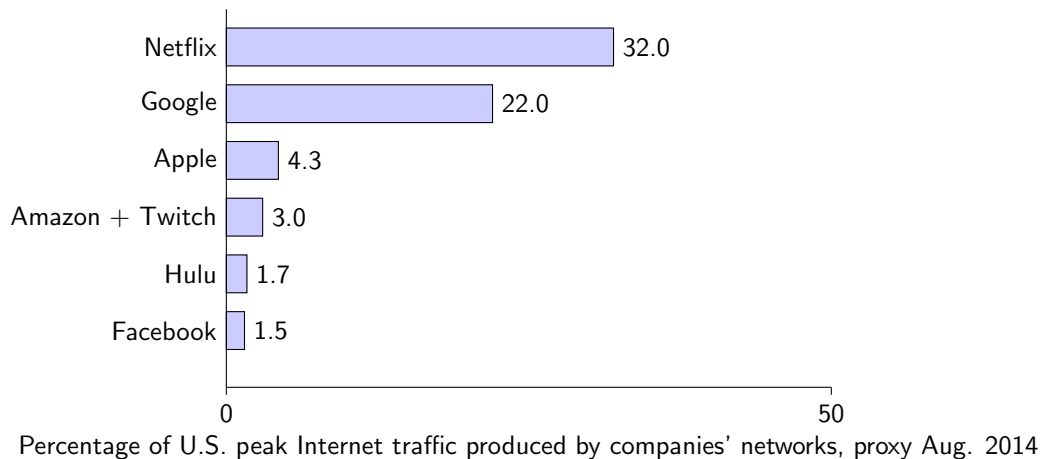
<sup>40</sup>E.g. Rodden et al., corporate designers (including company-hailed “design leaders”, called so not without good reason), etc..

<sup>41</sup>A possible alternative for terminology could have been “user-driven”, but this could be misconstrued to mean the exact opposite. Additionally, this terminology has already been charged with much history and practices, some of them implying very different things, including its inverse, as part of so-called “user-driven development” (a philosophy of design).

<sup>42</sup>The following chart is based on *The Wall Street Journal*, “Apple Quietly Builds New Networks”. See FitzGerald and Wakabayashi 2014.

<sup>43</sup>A note attached to their graphic mentions “For week ending Feb. 3. Source: DeepField” (where DeepField is “network researcher DeepField Inc.”).

If we account for the further concentration that has taken place since then, Amazon having acquired Twitch, six months after the above statistics were measured, we get the following chart – a proxy only – for August 2014 :



Here, six companies alone – Netflix, Google, Apple, Amazon (incl. Twitch), Hulu (Disney majority-owned), and Facebook – are responsible for what can be approximated to be 65% to 75% of total U.S. peak Internet traffic<sup>44</sup>.

In his 29th open letter to the Internet, published in 2018, Tim Berners-Lee wrote :

What was once a rich selection of blogs and websites has been compressed under the powerful weight of a few dominant platforms.<sup>45</sup>

One particular striking example of the ways in which the Web has been successfully re-shaped by large companies is given by the website YouTube<sup>46</sup>, (currently) owned by Google.

In 2005, the year of its founding, Internet users would have found this website in the approximate following state during the month of December<sup>47</sup> :

<sup>44</sup>In a follow-up article from May of that year, “Netflix’s Share of Internet Traffic Grows”, by the same publication and the same author, but drawing on different sources, Sandvine Corp., Netflix traffic was estimated to have grown to 34% (FitzGerald 2014). We base our estimations on these trends having kept up.

<sup>45</sup>Berners-Lee 2018.

<sup>46</sup><https://www.youtube.com/>

<sup>47</sup>The graphic we present is from a website called First Versions. The specific location of the image is <https://www.firstversions.com/2016/01/youtube.html> where it appears with the caption “YouTube, homepage at its official launch (December 15, 2005)”. This state is also captured, and archived, as part of the Internet Archive here : <https://web.archive.org/web/20051215194008/http://www.youtube.com/> (December 15, 2005 19:40:08). We include this version in the appendix; to its significance, it can be added that it is the last available capture for that day.

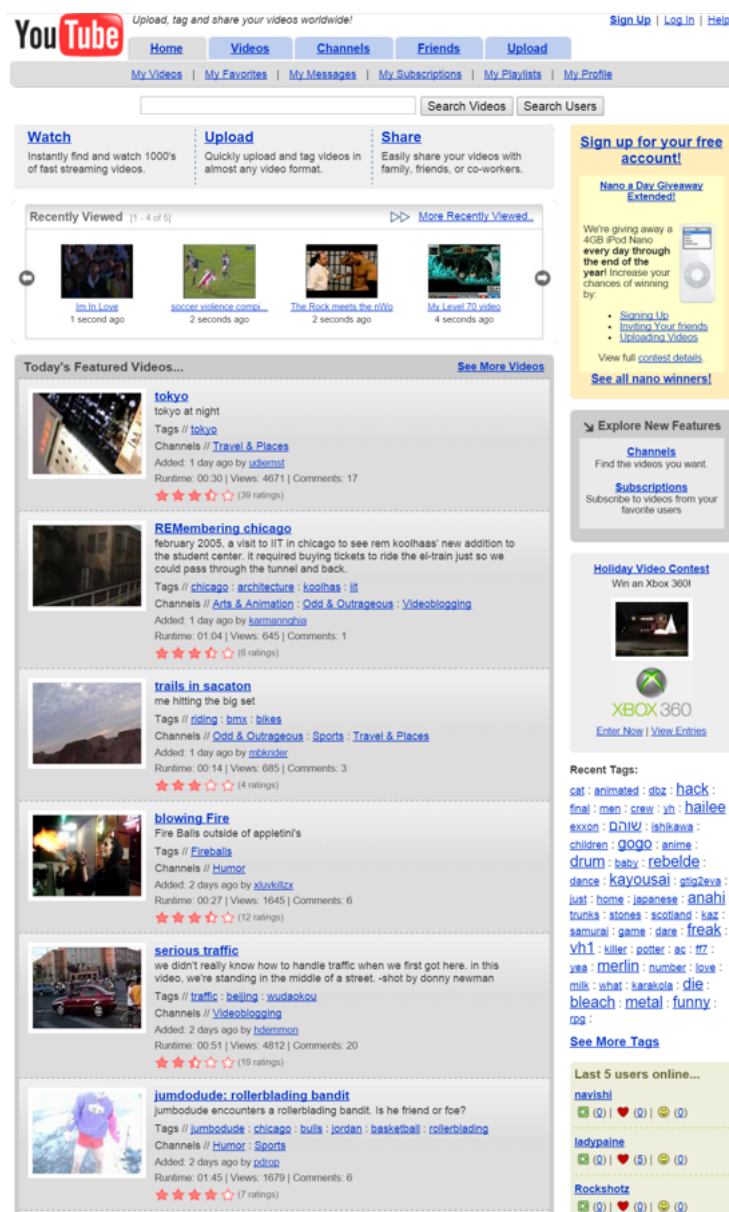


Figure 1: YouTube in 2005 ("official launch (December 15, 2005)").

Note, in particular, the large absence of videos by record labels, or film studios, or celebrities (including the particular strand of YouTube celebrities), that have now become common place on that same platform; having meanwhile undergone itself a change of ownership, from its original three founders, to one of the largest technology companies of our times.

It could be said, that these transformations have made websites like YouTube, and others like it, closer to the experience of comparable traditional media and

in particular television, where much if not all of content is non-modifiable and corresponds largely to mainstream interests and follows corporate, for-profit dictates.

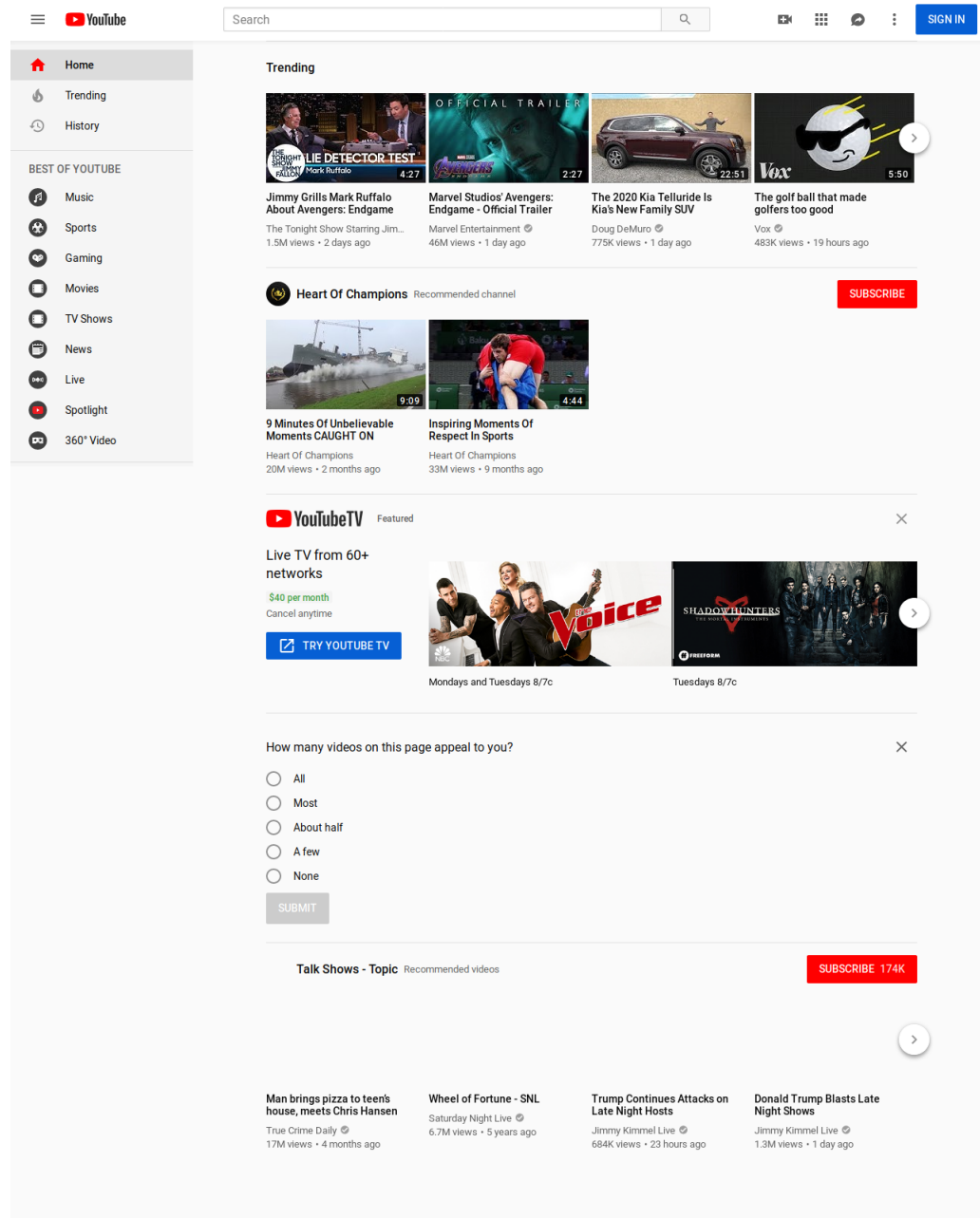


Figure 2: YouTube at present time.

Further, this occurs :

With much of the same effects. It puts the viewer into a passive position of consumer of mostly unsolicited content rather than a free, independent, active explorer or shaper of information.

It is however not the absence of technical means that prevent us from creating alternatives.

## 2.4 ‘no-television’ and ‘permanent-vacation’, user-defined web programs

In ‘no-television’ (appendix I) and ‘permanent-vacation’ (appendix II), we propose two programs that together offer a radically different view of what the Internet, Web could be : namely one where users each individually shape or rather re-shape the Web to their own liking, and preferences.

This goes beyond the mere selection of websites they visit, and the frequency at which they do so. But is extended to how it is rendered or presented to them; and, their ability to select – other than by looking or looking away – what content they which to receive on these websites – independently from the wishes, objectives or intentions of their makers.

In ‘permanent-vacation’, as well as ‘no-television’ we explored, starting from a simple personal wish or need, attempts to shape and re-shape the contents, all of it done with only the most basic of programming.

The title of the first was chosen in reference to the eponymous film by Jim Jarmusch, in which the lines between reality and fiction are blurred; such that it is unclear whether this represents a dream-like version of ours, or a political alternative to ours<sup>48</sup>.

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<sup>48</sup>In *Permanent Vacation*, his student film, most notably, work is largely or completely absent, among other common, widely-held for essential or indispensable parts of our lives (an interpretation that would have the merit of being a reasonable explanation for the title). Marked by empty streets, apartments empty of furnishings, absence of televisions, empty cells, etc. This program, as well as the other, no-television, also received much influence from the contents, mood and visuals of *Stranger than Paradise*, his follow-up film (motel, near airport, etc.). (This theme is also present in his later work.)

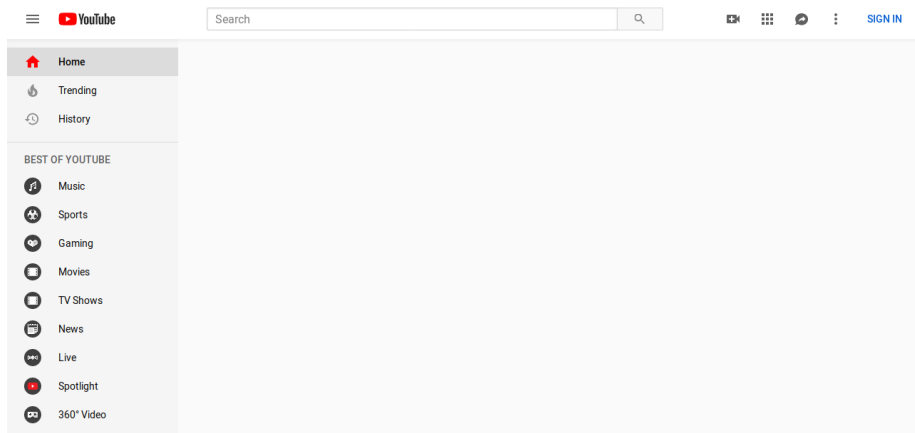


Figure 3: A user is greeted with the above interface while using **no-television**



Figure 4: A scene from *Permanent Vacation* by Jim Jarmusch.

Though, we have described them as experimental, such programs are not uncommon and fit into the category of Browser plug-ins.

Indeed, such programs already exist, and some of them are in fact in wide use. A category of tools called “ad blockers” serve as such an example : but, while their aim is to remove elements, namely advertisements, these are already commonly seen – hence also their usage – as something inherently foreign (of

the Web) or distractive.

A more pernicious form of advertisement comes in the form of content passed as content, but whose nature is in fact identical or similar to that of an advertisement. Other contents, while not so, can nonetheless be seen as intrusive or unwanted, and users will want to remove them (certain contents or parts of a website that is of no interest to them, or has negative value to them).

But, there can be no universal programs for such use cases as we explain.

For these kinds of needs, there can be no widely used programs, as each user would most like differ in what they consider to be wanted and unwanted, including advertisements-passed-as-content; hence each user's needs would be different from the next.

(Other similar such programs, of smaller user numbers, target Javascript and do the same for Javascript by blocking it or its delivery according to a series of rules : but, here too, this targets elements of the Web that are seen as inherently exterior to it, as some (technical) nuisance or danger; the television equivalent, of not ads, but technical limitations imposed on the user by cable companies' equipment or so.)

Ideally, a Web could exist where each user defines, writes their own plug-ins so that they create their own version of the Web, that is not that of other users, and is not that envisioned by corporations either.

In other ways, It would make it so that no 2 users, when browsing the same websites, would see or focus on the same things. Leading to a much more diverse range of experiences than our current experiences of the Internet, which are for the vast majority homogeneous and top-down defined.

In other ways, we felt that certain categories of websites, while neither advertisement, explicit or pernicious, represented parts that were unneeded or unwanted to us.

The modification program **permanent-vacation** constitutes an attempt to also shape the Web in this way.

The Stackoverflow website<sup>49</sup>, and the related Stack Exchange network of websites<sup>50</sup>, is an example of an information-driven, user-contributed platform where Internet and Web users can find information to specific topics of their choice. Stackoverflow is dedicated to computer science. Questions are tagged by specific interests (e.g. Haskell). Meanwhile Stack Exchange has various communities (e.g. Mathematics).

And, while the answers to questions themselves are relevant, and the related categories of questions often offers pertinent information, the "Hot Network Questions" features questions from the entire network (e.g. cooking) that are

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<sup>49</sup><https://stackoverflow.com/>

<sup>50</sup><https://stackexchange.com/>



off-topic.

### ### Description

This extension removes the "Hot Network Questions" bug / feature (depending on whether this is viewed from the dominant view of the platform's, or the personal needs of the user), which contains unwanted information ('digital/information pollution'/'noise') unrelated to the original question/search.

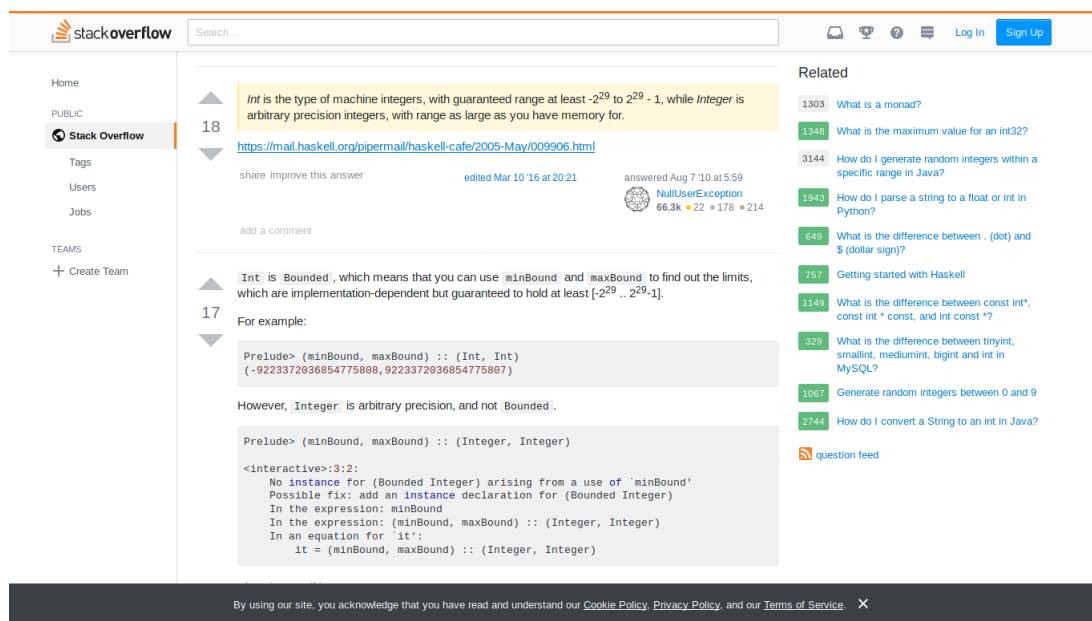


Figure 5: A user sees this while using the `permanent-vacation` program. Note the absence of further content below "Related"

## 2.5 Obstacles

Obstacles that stand in the way of either the creation or adoption of software can usually be subdivided into technical and sociological.

Currently, one of the obstacles that stands in front of the adoption of such a conception of the Web, is that such user-defined plug-ins need to be approved by a central authority, that will sign them, and perform additional operations on them for instance to make sure their contents are safe, and then return them to the user in a state such that will enable them to run them in any standard version of the browser (this is true of the Firefox browser).

Ways around this are currently the use of so-called "Nightly builds" of the Firefox browser, which are experimental versions of the browser.

Add-ons need to be signed before they can be installed into release and beta versions of Firefox. This signing process takes place through [addons.mozilla.org](https://addons.mozilla.org) (AMO), whether you choose to distribute your add-on through AMO or to do it yourself.

Unsigned extensions can be installed in Developer Edition, Nightly, and ESR versions of Firefox, after toggling the `xpinstall.signatures.required` preference in `about:config`.<sup>51</sup>

The technological requirements, however extremely minimal as in the case of ‘no-television’ and ‘permanent-vacation’, (certainly represent nonetheless an obstacle. But, perhaps, these basic technological requirements will represent a basic skill in future generations, though this is matter of pure speculation, and, more pragmatically, of how education will be conceived of and shaped then - we say however nothing of whether this is something that should be wished for or expected or realized.

Further considerations, not so much obstacles, are that the web is a changing medium and these alterations (browser plug-ins) may have to be rewritten (at times) from time to time.

## 2.6 A “User Owned” Internet

It would be hard to write an article on the Web (a user-defined Web), without mentioning the Internet at more length, which constitutes, as we know both of them (currently), its backbone; and specifically the implications and dependencies of both on both.

And, so, we do not conclude this article by looking at alternatives for the Internet as well, which we do elsewhere, but by pointing to general trends.

While this article has mostly concentrated on the Web, it is important to note that movements and ideas neither emerge out of or exist on thin air. While the web is its layer of ideas, its infrastructure is and remains currently the Internet – that is for the great majority of people.

A free Internet is no guarantee for a free Web, but it is one of its conditions – one.

Other and current efforts have concentrated on the removal of structural dependencies that stand in the way of a democratic Internet (, and hence Web)<sup>52</sup> – mainly the ownership of the Internet’s infrastructures<sup>53</sup> by few companies,

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<sup>51</sup><https://developer.mozilla.org/en-US/docs/Mozilla/Add-ons/Distribution>

<sup>52</sup>We use the term democratic here specifically in the sense of “of the many” / “of the people”. We chose to discard the euphemism “a more democratic”.

<sup>53</sup>What is also generally referred to as “critical Internet infrastructure”, various links or lines including (currently) fiber optic cables, and services like DNS. Not least the submarine communications cables (sub-sea fiber optic cables) on which it (still) relies.

characterized by high degree of concentration, these are among others the so-called “Tier 1” networks or providers : CenturyLink, Verizon, AT&T, Tata Communications India, Liberty Global, etc..

Attempts of creating a “*user owned*” *Internet*, or *Internet-like networks*, have recently known several incarnations.<sup>54</sup>

### 3 Programs that make us dream : Software and Systems modifications

In this section, we more generally discuss programs that change the way we think of technology and society<sup>55</sup>.

In doing so, we develop a theory of them that emphasizes a value of programs not derived from or based on their – judged – technical merits, but their ability to extend the domain of what we think possible or permissible or desirable, our domain of possibilities in other words.

Indeed : With certain programs, it is not so much their technical intricacies – sometimes surprisingly small or limited – that impress us, or put us in awe, or makes them of importance to us, but the ways in which they shape or re-shape our understanding of the possible uses or meanings of technology, and their interactions with our societies.

They often do because they put upside down our conceptions of them, much of which we have inherited from dominant views, those of the manufacturers of hardware, makers of commercial software, large, enterprise corporations, but not least also from academic computer scientists, an ever-increasing portion of whom come from or have significant ties with these same groups, whose rules, disciplines, sets of thinkable and un-thinkable, permissible and non-permissible, acceptable and non-acceptable, they then bring home, in thought or unthought form, in the abstract form of grades, the classes they teach, the topics they select (or “prefer to confine themselves” to), the textbooks they pick, and in the way of the graduate students they select and do not select, colleagues (“co-workers”) they promote and do not promote, and the others they publish and do not publish, and up to the things they themselves publish and encourage their students to publish, or discourage.<sup>56</sup>

Some books can have the power of a many Men, it has been observed, but the same can be said of programs; and, perhaps much more so. And, as for our times, as we can, for better or worse, only live in them, though some do their

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<sup>54</sup>We discuss this topic in detail elsewhere, separately.

<sup>55</sup>By modifying either or both systems.

<sup>56</sup>“Microsoft Research Cambridge, said the company had a long history of a two-way flow of researchers between itself and universities that was beneficial to all.” (Sample 2017)

best to ignore them, a keyboard can be much more powerful than a pen.

In the following developments, we look at two works in particular, `keepgrabbing.py`, and `Kopimashin`, that are representative of such programs.<sup>57</sup>

### 3.1 Aaron Swartz' `keepgrabbing.py`

An example of such a program is the 17-line `keepgrabbing.py` program by Aaron Swartz, reproduced here down below :

```
import subprocess, urllib, random
class NoBlocks(Exception): pass
def getblocks():
    r = urllib.urlopen("http://{?REDACTED?}/grab").read()
    if '<html' in r.lower(): raise NoBlocks
    return r.split()

import sys
if len(sys.argv) > 1:
    prefix = ['--socks5', sys.argv[1]]
else:
    prefix = ['#'-interface', 'eth0:1']
line = lambda x: ['curl'] + prefix + ['-H', "Cookie: TENACIOUS="
↪ + str(random.random())[3:], '-o', 'pdfs/' + str(x) + '.pdf',
↪ "http://www.jstor.org/stable/pdfplus/" + str(x) +
↪ ".pdf?acceptTC=true"]

while 1:
    blocks = getblocks()
    for block in blocks:
        print block
        subprocess.Popen(line(block)).wait()
```

What puts us in awe, and fills us with wonder, whenever we encounter such programs are questions such as “What kind of upbringing made them possible? What kind of education? What collected life experiences made them ultimately thinkable?” Issues of technical prowess, here a lambda function<sup>58</sup>, `lambda`, or a

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<sup>57</sup>We remind of the wider history of systems modifiers elsewhere. A separate forthcoming article.

<sup>58</sup>Lambda functions have the general form `lambda x: do something with or to x` e.g. `lambda x: x + 1` such that e.g. `lambda 1 = 2`. They go back to the lambda calculus of Alonzo Church, and various discussions of and improvements on it by others. In `keepgrabbing.py` `x` is

reference to a redacted website of which we are left to wonder exactly what it did and how the `/grab` request was implemented, of which some technologists seemingly cannot get enough, to the exclusion of everything else, appear almost of secondary nature and importance when compared to these other questions.

But, such programs, do more than that : They extend the domain of our imagination, and ultimately possibilities : what was previously unthought, or thought impossible, suddenly becomes thinkable and possible.

A program such as this one would have represented no visible or particular challenge to someone like Aaron Swartz who had been programming since his teen years at least and who by his mid-twenties would have accumulated anywhere from 15 to 20 years of programming and computer science experience.<sup>59</sup> But, what is true is that it took a special kind of courage to do it, and a special kind of heart and person to think it and want it<sup>60</sup>.

Again, it is not the complexity of the program, which, at under 20 lines of mostly self-contained code<sup>61</sup>, can only be relatively small, that strikes, but what it means, and what can be made of it.

It effectively was able to download, by various tricks such as the insertion of headers with random values<sup>62</sup> or MAC address changes<sup>63</sup>, massive amounts of

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passed to other functions, namely the Python built-in function `str` which turns a value, here a number, into a string (text). This is explained in further detail in the appendix. There is no standard form for such functions as far as is known to us, and they can freely (re)written as e.g. `\x = x + 1` (where the backslash is an approximation or simplification of the, lowercase, lambda symbol) or `\x = x +1`, etc.

<sup>59</sup>The more surprising thing would have been for anyone to not have reached some kind of mastery, whatever the field, by then. In a post entitled “A Non-Programmer’s Apology” particularly, he explains his commitment to learning his skills.

<sup>60</sup>We believe it was Evelyn Waugh who wrote, in *Brideshead Revisited*, that “intelligence without heart is sterile”.

<sup>61</sup>It does not reference other functions that may be much more voluminous, other than standard library (`subprocess`, `urllib`, `random` and `sys`), here the “Python Standard Library”, or other, third-party modules, libraries or programs (here, in addition, the utility `curl` is used). The only uncertainty is represented by the redacted website, which may have contained additional and possibly complex code, we do not know.

<sup>62</sup>`‘-H’, “Cookie: TENACIOUS=” + str(random.random())[3:]`

<sup>63</sup>In official court documents, the following was noted : “To evade the MAC address block, Swartz “spoofed” the Acer laptop’s computer’s MAC address. A MAC address is usually assigned to a network interface card by the cards manufacturer, and therefore generally remains constant. But a user with the right knowledge can change the MAC address, an action referred to as “MAC address spoofing.” Swartz spoofed the Acer laptop’s MAC address by changing it from 00:23:5a:73:5f:fb to 00:23:5a:73:5f:fc (that is, the final ‘b’ became a ‘c’). c. By re-registering the laptop, the laptop received a new IP address, which disassociated Swartz’s Acer laptop from the IP addresses that JSTOR had blocked” (USA v. Swartz, p. 7). In the code, a reference to the network interface card can be found in the following line of code : `#'-interface', 'eth0:1'` (note this is a comment, as per the `#` symbol, which instructs the compiler to ignore whatever comes afterwards on that line, it is a form of documentation). The documents later mention : “Rather than let MIT assign his computer an IP address automatically, Swartz instead simply hard-wired into the network and assigned himself two IP addresses. He did so by entering a restricted network interface closet in the basement of MIT’s Building 16, plugging the computer directly into the network (...) Swartz also hid the Acer laptop and a succession of external storage drives under a box in the closet, so that they would not arouse the suspicions of anyone who might enter the closet.” (p. 8).

articles from the JSTOR catalog of scholarly articles. But beyond this, it did more as we have already suggested.

And, though, this program had many antecedents in the “hacker” culture that had originated at MIT, first in the Tech Model Railroad Club, then around various Artificial Intelligence figures and projects, it also seemed to represent something else.<sup>64</sup>

It was not a “clever hack”, and did not correspond to the old model of a, again, “clever hack”, which is to say to prove or demonstrate to others technical prowess or bravado, it was not made for amusement or entertainment (*Space-war*), or personal gain, whether financial or of mere service<sup>65</sup>, but seemed to aim at what could be described as the liberation of information for the public benefit; information that was for instance either in fact public, but hard to reach, out of whatever administrative or technical or legal constraints, or such information that was created as part of a publicly funded institution, but nonetheless remained out of reach to those, namely the people, who had funded it through taxes and various other means, etc..

Aaron Swartz’ program represents a vision of a Web or an Internet that is about pure information and knowledge (transfer), devoid of graphical interfaces, uninterested in paywalls and the legally protected, but collectively harmful notion of a system of copyrighted, for-profit<sup>66</sup>, closed research publication model<sup>67</sup>.

The violations of the program were much more than the superficial downloading of scholarly articles, but the modifications it operated on our values (detailed in as many offenses listed in *USA v. Swartz*). Values that we hold on to despite better judgement, so the strange and peculiar notion of our times that scientific knowledge should or could be owned, instead of being accessible to the greatest number possible. But, how else is science expected to make progress? The more people work on a problem, and the more resources they have access to, one influencing the other, the higher the chance of finding a solution.<sup>68</sup>

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<sup>64</sup>Where the specific culture of “hackers” is concerned, and specifically its historical origins, both drastically different from common mainstream media usage and portrayal and perception, see Levy’s *Hackers: Heroes of the Computer Revolution*. We talk about this further, and give a critical analysis, elsewhere, in a separate article.

<sup>65</sup>E.g. a printer is now endowed with functionalities it did not have before.

<sup>66</sup>In 2017, the publisher Elsevier has made revenues of 2.5 billion dollars (RELX Group 2017). It is hard to think of another market where participants and actors not only readily give away their labor, but pay to give it away in some cases, and attach great pride to these various acts.

<sup>67</sup>Currently, despite all the collective progress made, this is still the dominant model in research, particularly in the humanities and the social sciences (economics excluded perhaps), where researchers continue to fall over themselves to publish in their favorite journals, or any closed journal that will accept them, not out of lack of information or available alternatives, now plenty, but because – it must be said – they are either naive or slaves to and blinded by reputation, unable to draw the self-esteem they lack from the merits of their research alone, having to attach additional institutions to their name to make up for either or.

<sup>68</sup>This corresponds to a portion of how modern mathematics research is done, where not only the digital open-access platform arXiv exists which regularly is the place of publication

Where Aaron Swartz goes, his biggest offense may have been to “*ignore their laws and profane their holy culture*”<sup>69</sup>. Such had always been the biggest crime of all.<sup>70</sup>

## 3.2 Peter Sunde’s Kopimashin

Another creation that has fulfilled a similar role is Kopimashin<sup>71</sup> by Peter Sunde.

A description for the Kopimashin has been provided as follows :

The Kopimashin creates an endless amount of copies of a specific audio track (gnarls barkley’s crazy). The audio track is copied to `/dev/null`, a unix data pipe for avoiding permanent storage. The Kopimashins lcd display consists of three rows of information, the serial number of the mashin, amount of copies created and the dollar value it represents in losses for the record labels (Downtown Records / Warner Music), currently represented by USD1,25 per copied piece.

The goal of the kopimashin is to make the audio track the most copied in the world and while doing so bankrupting the record industry.<sup>72</sup>

In **keepgrabbing**, the traditional graphical interfaces of the Web were forgone to access information on the Web or Internet, but here even the data collected itself is forgone as soon as copied.

**Kopimashin**, the name we use here to describe the program contained within the Kopimashin, indeed transfers copyrighted material at a considerable rate, but as soon as a file is copied, it is instantaneously discarded (by being sent to the `/dev/null` location (data pipe), which in Unix systems, fulfills the function of erasing whatever is sent to it e.g. by using the redirect operator, `>`, like so `someoperation > /dev/null`, or by using a utility tool for copying, `cp` for example, like so `cp filename /dev/null`).

---

of major papers by leading mathematicians, but platforms such as wiki communities and communication tools such as chat programs are used to bring together researchers from all over the world to work on common, open problems. (This was for instance the case after the publication of Yitang Zhang’s paper on prime number gaps, which led to a burst of activity in number theory, with groups forming around individuals who had already thought of or contributed to these problems e.g. Terrence Tao et al. used Skype to communicate.)

<sup>69</sup>One of Aaron Swartz’ favorite TV series was *Buffy*, and we cite here with slight modifications from one of the so-called “Buffyverse” – a contraction of Buffy and universe – shows, called *Angel* (Season 2). He wrote about such things in various blog posts (that have now been published).

<sup>70</sup>The heroes of Ancient Greek tragedies saw a conflict between Earthly laws and the laws of the heart, and of Gods, burial rights in Antigone for instance, but still could not help but intervene, paying the high price. We remember them, protect their memory and learn from their experiences, cherish their existence that give us courage, and set an example.

<sup>71</sup>Whose use is demonstrated in the following video : <https://vimeo.com/148955816>. The graphic we present is extracted from this work.

<sup>72</sup>“KH000 // Kopimashin”. <https://konsthack.se/portfolio/kh000-kopimashin/>

From a “purely technical” standpoint, which is the preferred standpoint of mainstream computer scientists, such a program would make little sense.

However, in these sorts of programs, as we have already explained, it is not only the technical aspects that matter, but what they are able to accomplish.

In this case, such a program raises a host of questions on current copyright laws, and is able to do so most notably in a practical way : Does such an act constitute an infringement? The files, while technically copied, are instantly discarded and never used.

Kopimashin mocks copyright laws, and/but is able to do so from the internal perspective of technology, where the programmer of such programs is at an advantage, because they know and control and make the system, not least due to having created it.

This is as opposed to trying to modify copyright laws from the internal perspective of law, which is to say to fight laws with laws – a system in which programmers or any outsiders are and can only be at a disadvantage for the great majority of cases, and for the vast majority of them<sup>73,74</sup>

It is also worthy to note that this machine (consisting of a popular embedded board, an LCD display, and the program itself) was showcased as part of an art exhibition<sup>75</sup>.



Figure 6: The Kopimashin shows potential damages of over 2M\$!

<sup>73</sup>Which, at the same time, does not mean they should completely forgo, or ignore this. Their expertise is valuable and needed there too.

<sup>74</sup>In a speech, Andrew Huang, better known as bunnie, recounting his experiences of hacking the Xbox, and expanding on them, mentioned that it was hard to fight a system from within the system’s rules, as this could only put one at a disadvantage. One could or had to find ways to approach the system from within a set of rules it had itself not designed or implemented or made use of.

<sup>75</sup>Konsthack. <https://konsthack.se/>



A pseudo-code for this program, which ignores the display, hence a simplified command-line version of it, could be written as follows :

```
loop until 100 copies are made
  copy song to /dev/null
  add 1 to copycounter
  add 1.25 dollars to damagecounter
```

```
print copycounter // 100
print damagecounter // $125
```

And, in a slightly more intricate variant that would begin to take account of a display, for visual, pedagogic or art purposes :

```
loop infinitely
  add 100 dollars to the counter every second
  // (100 copies * 1 dollars = 100 dollars per second)
  update LCD based on the current state of counter
  // 100 dollars per second = 4.1666 dollars for every 24th
  ↪ fraction of a second
```

---

Lastly, such programs do not need to be laid out completely, or even be in working or final form. Steven Levy, in the documentary *Hackers: Wizards of the Electronic Age*, says “A hacker never finishes a program”.

## 4 Conclusion

A “user-defined” Web was presented in opposition to dominant conceptions of a “user-centered” or “centric” Web; which we call falsely benevolent in so far as they are dependent on the good will of those who have control or an above-average influence on the Internet and the Web, their nature, development and direction - and, worse, their collective agreement.

Opposite models, that are passed as progressive and in the interest of the user, such as “user-centric” or “user-centered” terminology, retain the quality of highly centralized systems where top-down decisions, here imposed from few companies, (leading) designers and the like on many users, and cannot reasonably thought to provide an alternative for a democratic Web.

We discussed systems modifications : “programs that make us dream” of a different society, and of different uses of technology – they do so often by modifying both.

These programs make us dream of different, and better tomorrows. They give (offer us) glimpses into alternative futures, that could simultaneously be alternative presents. Programs. **Programs**. *Programs*. “Programs”. Pro-grams. Grams. Pros, and cons. As many different visions of the ways we may organize our societies – open or closed, by few or by many – and design our many systems, of which not only electronic or software. Knowledge, politics, etc.

Good books should not have the effect of making us think of lunch. They should make us weary, and out of breath, and out of sight. Nauseous and out of balance, no maps can seemingly be found. For what had been held for granted, is not only false, but can be modified.

Not, just in words – the words and ways of Goldsmith-style academics, bowl cuts and affected *false-queer* styles and all, whose lives are often nothing to write about, either because they are mundane, or of no standard to follow, or both. So much different from their models’. Foucault had lived a thousands of them, and each one with much courage : he wrote perfect-shaped books, dazzling like black diamonds, impressive even by the standards of Medieval copists, but it was the same person who went out on the streets for those in prisons, the same who had been in a relationship with a crossdressing prostitute, the same who had been in a psychiatric hospital when he was younger, the same who planned on becoming a journalist because he had had enough of being what he was, and what they could only dream to be, and would never be even if they had a thousands lives, the same who, when he died early, left many confused, for, just for a short while, it seemed like they had had a glimpse of tomorrow;

But, in real acts. Programs are political acts.

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## Appendix

- no-television
- permanent-vacation
- Website YouTube on 15/12/2005 (19:40:08) (official launch day).
- Analysis, documentation of `keepgrabbing.py`, hand calculations

## no-television.js

```
document.body.style.visibility = "hidden"; // optional

window.location.href =
  ↪ "https://www.youtube.com/results?search_query=%2A"; // "*"
// could be set to search for a random word from a dictionary
  ↪ (list)

/* working solution

var elem = document.getElementById("page-manager");
elem.remove();

*/
```

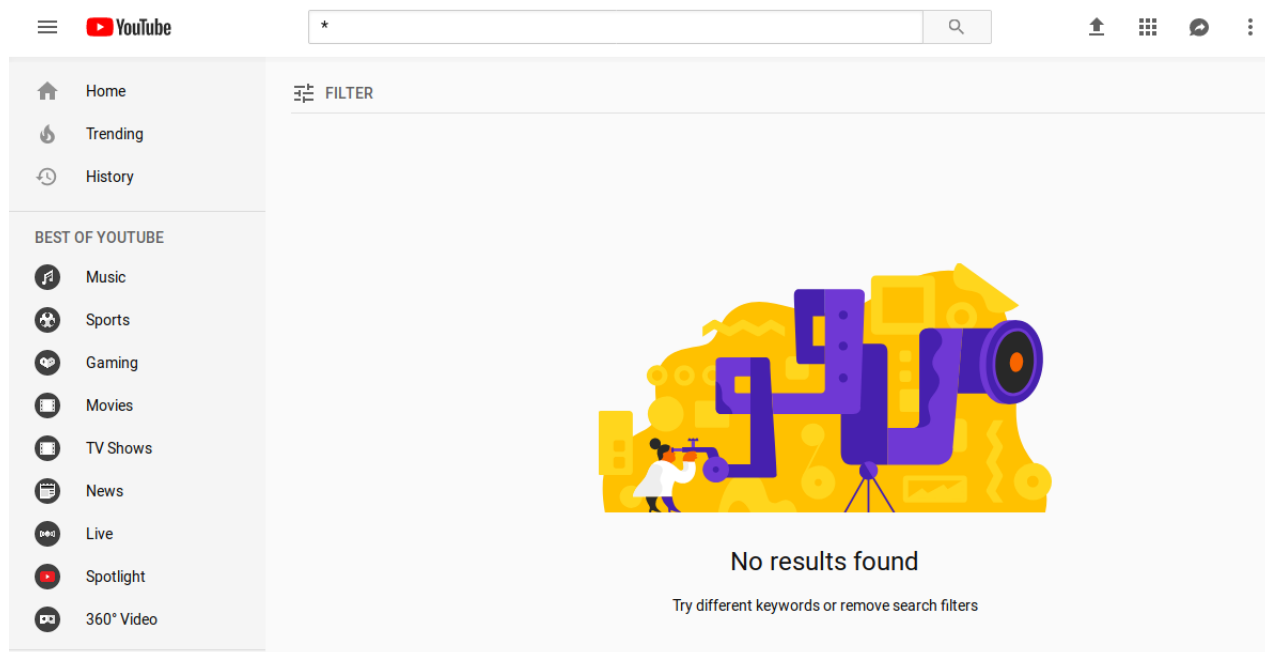


Figure 7: no-television, home page view (current version).

**permanent-vacation.js**

```
var elem = document.getElementById("hot-network-questions");  
elem.remove();
```



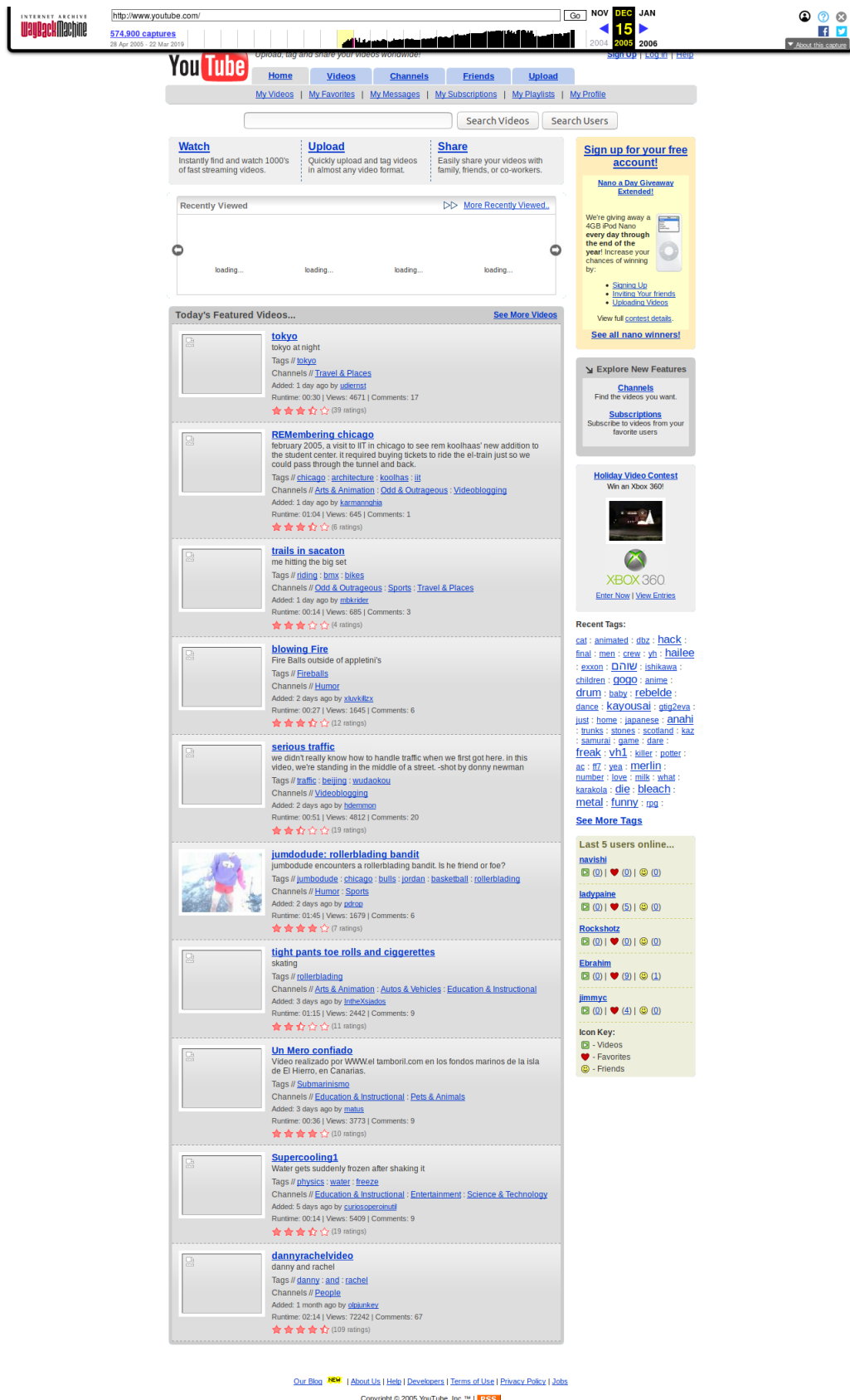


Figure 8: Website YouTube on 15/12/2005 (19:40:08) (official launch day).

## Analysis, documentation of keepgrabbing.py, hand calculations

```
import sys
if len(sys.argv) > 1:
    prefix = ['--socks5', sys.argv[1]]
else:
    prefix = ['#'-interface','eth0:1']
line = lambda x: ['curl'] + prefix + ['-H', "Cookie: TENACIOUS="
↪ + str(random.random())[3:], '-o', 'pdfs/' + str(x) + '.pdf',
↪ "http://www.jstor.org/stable/pdfplus/" + str(x) +
↪ ".pdf?acceptTC=true"]
```

\$ python

```
>>> import random
>>> str(random.random())[3:]
'296408626944884'
>>> str(random.random())
'0.49420092253673065'
>>> random.random()
0.809925979892945
```

```
line =
e.g. ~
curl --socks5 127.0.0.1:8080 -H "Cookie:
↪ TENACIOUS="296408626944884 -o pdfs/exampletitle.pdf
↪ http://www.jstor.org/stable/pdfplus/exampletitle.pdf?acceptTC=true"
```

\$ man curl

## NAME

curl - transfer a URL

## SYNOPSIS

curl [options] [URL...]

## DESCRIPTION

curl is a tool to transfer data from or to a server, using one of the supported protocols (DICT, FILE, FTP, FTPS, GOPHER, HTTP, HTTPS, IMAP, IMAPS, LDAP, LDAPS, POP3, POP3S, RTMP, RTSP, ...).

...

## OPTIONS

Options start with one or two dashes. Many of the options require an additional value next to them.

...

-H, --header <header/@file>

(HTTP) Extra header to include in the request when sending HTTP to a server. You may specify any number of extra headers. Note that if you should add a custom header that has the same name as one of the internal ones curl would use, your externally set header will be used instead of the internal one. This allows you to make even trickier stuff than curl would normally do. You should not replace internally set headers without knowing perfectly well what you're doing. Remove an internal header by giving a replacement without content on the right side of the colon, as in: -H "Host:". If you send the custom header with no-value then its header must be terminated with a semicolon, such as -H "X-Custom-Header;" to send "X-Custom-Header:".

curl will make sure that each header you add/replace is sent with the proper end-of-line marker, you should thus not add that as a part of the header content: do not add newlines or carriage returns, they will only mess things up for you.

...

`-o, --output <file>`

Write output to <file> instead of stdout. If you are using {} or [] to fetch multiple documents, you can use '#' followed by a number in the <file> specifier. That variable will be replaced with the current string for the URL being fetched. Like in:

```
curl http://{one,two}.example.com -o "file_#1.txt"
```

...

`--socks5 <host[:port]>`

Use the specified SOCKS5 proxy - but resolve the host name locally. If the port number is not specified, it is assumed at port 1080.



A cheese sandwich never tasted better : 13 years  
in the life of Aaron Swartz (1999-2013)

Camille Akmut

October 10, 2021

*(Un article a la Rene Taton.)*

## Introduction

Going through existence without lasting guiding principles condemns individuals to a life spent as "half birds and fishes", as Pascal – this moralist of the 17th century – put.

Nietzsche, writing in the wake of the industrial revolution, observed that moralists had disappeared in societies where increased speeds and rhythms of life left no space in the minds of people for contrarians. (He included academics in this category, comparing them to anxious peasants.)

We live in the best of all worlds, we are constantly reminded.

Aaron Swartz's life and death should give us an indication, or an intuition that this is unlikely to be the case.

The sociologist Pierre Bourdieu called attempts to normalize and explain away everyday life, no matter how cruel painful or unjust, "*social theodicies*" referencing the long-standing problem of the justification of God in the presence of evil in the world, in the philosophical tradition.<sup>1</sup> Justifications for inequalities are among them.

Marx had described the phenomenon as attempts to pass economics for natural causes, disasters.

Property rights have reached such a saintly status in our political systems that competing notions of human rights, even the most basic ones — housing, health, education... — everywhere take a backseat.

"*Respect property, because it is the first law of societies.*", invoked already a representative in the French revolution, who at least defended class interests openly.<sup>2</sup>

The fate of the Gracchus brothers precedes him : dare touch property and never touch anything again.

Elites do not mind playing the game of "democracy", so long as it goes their way :

In the case of Allende, the local Chilean and international Bourgeois counter-revolution created improbable progressive movements (Feminine Power, combining feminism with [far-]right women), staged false strikes (affecting the key area of transportation), withheld basic foods (community initiatives were started to replace petty shop owners), harassed factory workers (solidarity networks connecting the various factories emerged), until their patience ran out and they called the army in, finally showing their true colors, firing at youths and students and random passerbys, killing journalists, presidents, anyone and everyone standing in their way... They were so unhinged at that point that they did it in front of rolling cameras – while striking poses.<sup>3</sup>

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<sup>1</sup>See Leibniz' *Theodicee* as a famous example of these tortured arguments (leading to the almost comical "best of all worlds" theory).

<sup>2</sup>A quote attributed to the deputy Jean Desvars (cf. Popkin 2021).

<sup>3</sup>See Guzman's extraordinary documentary, *The Battle of Chile*.

Gibson's *Neuromancer* describes a highly advanced stage of the capitalist system. In its opening pages he tells of people reduced to round-the-clock hustlers, who "one day" simply disappear as soon as unable, too weak to keep up with the latest demands of modern society.

Existing power structures are maintained by impersonal, interchangeable executives that are implanted with the entire histories of the giant corporations they serve, securing continuity beyond individuality and previously fixed biological barriers. Assassination attempts are vain. A manager is killed, another appears with no loss of information after an update.

Bio-technologies have extended the notion of property rights to now include the human body.

\*\*\*

A home movie titled 'Cooking with Aaron' (2002) gives a rare insight into his early life : books everywhere, multiple computers including what appears to be an Apple, and a large comfortable house...

Aaron Swartz himself later wrote of his background, with no illusions :

*"Undoubtedly, the first step is to choose the right genes: I was born white, male, American. My family was fairly well-off and my father worked in the computer industry."*<sup>4</sup>

(as part of a talk meant to be given at a conference in India?)

At a memorial, his father started speaking by relating the following, representative, anecdote :

*"Growing up, Aaron's grandfather used to talk about the giant [?] library in Chicago. It was a public, technical library, which he spent a lot of time doing research [in] (...) He taught me how to use a library (...) [he] showed how libraries were magic portals into the knowledge of the world. Years later, when Aaron was young, the [?] library had moved to the University of Chicago (...) the U of C had tried to limit access (...) I took Aaron (...) to show him what a wonderful place the library was. I remember clearly pulling out a book off the shelf, which turned out to be from the 1800s, expressing how marvelous this was. (...)"*<sup>5</sup>

Finally, one of his friends observed :

*"He moved in and out of institutions, he didn't fit into boxes (...)  
He was monk-like."*<sup>6</sup>

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<sup>4</sup>Swartz 2007.

<sup>5</sup>Robert Swartz 2013. (our transcript, in particular we were unable to identify which library was meant.)

<sup>6</sup>Ben Wikler (Day 2013).



The years from 2000 onward cover Aaron's first experiences with activism (education reform), his first major achievements (the RSS 1.0 specification), through PACER hacking all the way to "a *really good* grilled cheese sandwich"...

His early experiments with trying to transform the systems he found unpleasant or unjust in his immediate life surroundings (his own school) would be a framework or jump-start for the rest.

*"Once I questioned the school I was in, I questioned the society that built the school"*<sup>7</sup>

In retrospect, there is a terrible consistency to Aaron's life, his general attitude and his overall interests and priorities staying mostly the same.

He did what all smart people end up doing, eventually : he drew all the consequences that could be drawn from his knowledge and started living life accordingly.

His example, and memory, should be a constant irritation to strategically apolitical individuals, to powerful ones because there are only very rich people where there are poor masses (no 'clean' fortunes), and to all the rest.

At age 13, in uncomfortably mature and disarmingly open writings, he wondered already "Who am I and what am I doing here"<sup>8</sup>.

\*\*\*

A review of Aaron's life would not be complete without mention of what is perhaps his most striking blog post, "A Moment Before Dying", which appears to be a pseudonymous autobiography about

"a family of bellowing, rotund Americans, who had a room in their house with wall-to-wall, floor-to-ceiling cabinets, all entirely filled with bags and boxes"...

and a boy growing up with "body image issues" who later finds out that his problem is not immutable.

(We find here the same lifelong ethos of an issue being identified followed by a quest for a solution, which characterized much of Aaron's doing.)

This piece of writing underwent multiple modifications online, first appearing in its original form<sup>9</sup>, then erased (ie. replaced with the below notice), then restored but made to appear as if coming from a hypothetical third point of view :

*"I'm OK, just have a bit of a cold. Sorry if the previous post here misled you. Thanks for the support."*

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<sup>7</sup>Swartz 2010.

<sup>8</sup>From one of the *schoolyard subversions* pages.

<sup>9</sup>Per the *Rolling Stone* article "The brilliant life", though we could not find any archived versions of it

(as captured by archive.org on January 29, 2007)<sup>10</sup>

In Aaron's last known or extant blog post, from 2012. the topic of suicide is renewed. Its last sentence (a discussion of the latest Batman movie) :

*"Thus Master Wayne is left without solutions. Out of options, it's no wonder the series ends with his staged suicide."*

Two other blog posts strike as outstanding : the twin series from September 2009 about the ethics of (friends) breaking in at MIT for food and shelter. Aaron goes :

*"Even if they were costing MIT money, it seems this could be justified. MIT receives enormous sums from the wealthy and powerful, more than they know how to spend. Much of it gets spent on unneeded luxuries for their already-elite students. Redistributing it to the town's poorer residents seems potentially justified."*

Extrapolate to academic articles, their privileged university subscribers and the needs of the rest of humanity, the world... and one gets closer to answering the open question of 'why he did it'.

But, that question is in fact of relative little value, being mostly now only of interests to historians and, coming before them, prosecutors. Of greater interest is the one that Aaron himself asked in the opening lines of those writings :

*"How are we to live? Most people seem to agree that there are "right" things and "wrong" things and we should try to do the right ones, but they're less clear on how to figure out what the right ones are."*

\*\*\*

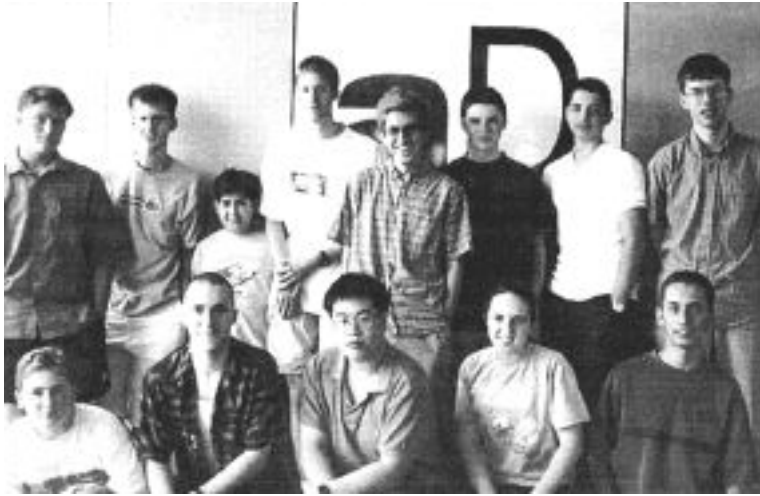
In *The Long Tomorrow*, Moebius imagined a civilization of the future characterized by vast vertical constructions where the social order was such rich residents occupied, counter-intuitively, the lower levels without providing much explanation. [We suspect it must be something to do with the environment...]

In today's urban centres, life is only possible at the cost of a great, constant mental strain : looking away.

But, capitalism's effects eventually catch up with everyone as the strident laughs of today are replaced by the bitter tears of tomorrow...

---

<sup>10</sup>See also "Life in suburbia" ("the fake coat of paint that lets you pretend your unhappy life is just as nice as everyone else's") and "Eat and code" ("I've always had a problematic relationship with food.") for more.



Student at North Shore Country Day School.		Swartz 2000b
<b>1999</b>		
until 2000	"Member" RDF Core Working Group	LinkedIn via FBI File
until 2000	"Member" W3C	LinkedIn via FBI File
<b>2000</b>		
May – June	13, Aaron launches 'The Info Network', becomes a finalist ("runner-up") for the ArsDigita prize which includes a trip to MIT. The <i>Boston Herald</i> describes the creation as "a Web site designed to contain all human knowledge."...	Swartz 2000; Schorow 2000; Swartz 2006g
Summer (August?)	Ninth-grader, starts a blog collecting his experiences with school and shares alternative resources (unschooling, Holt, Paulo Freire, Sudbury etc.) " <i>I finally realized that school wasn't working [and] decided to do something about it.</i> " eg. " <i>fight to change my school.</i> "	Swartz 2000b
Dec. 6	Release of the RSS (RDF Site Summary) 1.0 specification.	Swartz via resource.org; TIOB
<b>2001</b>		
April	Dubbed "Teenager in a million" in the press for his work on Internet standards (RFCs) and meeting Tim Berners-Lee	O'Brien 2001

Sept. (?)	"After a year of high school he found it intolerable and refused to go back. His family told the state of Illinois that they were "home-schooling" him and he enrolled in a handful classes at nearby Lake Forest College (Physics, Chemistry, Logic, and Number Theory) but spent most of his time on his own."	Swartz 2006g
<b>2002</b>		
Until 2004	"Metadata Advisor" at Creative Commons	LinkedIn via FBI File
Aug.	Aaron reviews the Eldred v. Ashcroft case in a blog post	Swartz 2002b
Oct.	Travels to Washington, D.C.. "I met Aaron at the U.S. Supreme Court (...) when we both went to hear the oral argument in Eldred v. Ashcroft. Most of us non-lawyers had to spend the night sleeping in the street in front of the Court in order to get a ticket — since the line to get into an oral argument generally starts forming the night before — but Aaron (though a teenager) was Larry Lessig's personal guest"	Schoen 2013b; see also Clark 2014
<b>2004</b>		
Sep. onward	Aaron goes to Stanford and hates it – giving way to an epic, 16-some part takedown [the Disneyland of higher ed.]. "There is a large career fair today, with booths for all sorts of companies. Already, we are being pointed towards careers." Sociology.	Swartz 2004; LinkedIn via FBI File
<b>2005</b>		
	Y Combinator, Paul Graham	TIOB
circa June onward	Moves to Simmons Hall (Cambridge)	Swartz 2006h
Nov. (until Jan. 2007)	"co-founder" reddit. "in short, last November I joined the amazing team behind reddit, merging our two companies." (in Swartz 2006g October is mentioned)	LinkedIn via FBI File; Swartz 2006f
<b>2006</b>		
	Lives in San Francisco with Peter Eckersley (EFF employee) in a sharehouse, in the tiniest, closet-sized room	Eckersley 2013; also TIOB
May 27	Comes to the conclusion that being a writer is more important for him than being a programmer. "writing code, although it can be enjoyable, is hardly something I want to spend my life doing."	Swartz 2006d

circa July	Visiting a friend at MIT makes Aaron further reconsider life choices. " <i>Perhaps it's natural, when doing something so greedy and practical as a startup, to pine for the idealized world of academia. (...) It's not that I don't enjoy my work; it's just that I feel like I'm getting dumber doing it.</i> "	Swartz 2006b
Oct. 2006	Reddit is purchased by Conde Nast	Swartz 2006g
circa November	Crisis. " <i>Since I moved to San Francisco I literally haven't gotten anything done. I haven't finished a book (..), I haven't answered many emails (...), I've written only a couple blog posts (I used to do one a day), and I haven't written a line of code (I used to write whole programs in the evenings). It's a pretty incredible state of affairs.</i> ", " <i>By lunch time I had literally locked myself in a bathroom stall and started crying.</i> "	Swartz 2006c
circa Dec.	Trip overseas; prompts a devastating blog post, 'Cultural Imperialism Sucks' : " <i>Berlin does not feel like a particularly vibrant city.</i> ", " <i>One wonders how much of their fitting in is an attempt to forget their different past.</i> " ... The 23c3 is the object of a separate entry wherein Aaron declares " <i>I don't particularly like computers</i> "; accompanied by Seth Schoen.	Swartz 2006 and 2007c; Schoen 2013
<b>2007</b>		
	Launch of "pilot project (...) to provide free PACER access to users at 17 libraries around the country"	Lee 2013
until at least Feb. 2009	"Tech Lead" at Open Library. " <i>The idea is to be a huge wiki, an editable website, with one page per book. So for every book ever published, we want to have a webpage about it (...)</i> "	LinkedIn via FBI File; Swartz via TIOB
Jan. 2007	End of "co-founder" reddit period after 1 year and 3 months	LinkedIn via FBI File
Jan. 18	Stomach issues(?). " <i>one week of pain (...) searing, tormenting agony</i> " ('A Moment Before Dying' blog post)	Swartz 2007b (for compar. S.-K. 2013)
<b>2008</b>		
until at least Feb. 2009	"Founder" watchdog.net	LinkedIn via FBI File
Jul.	"EIFL meeting at a monastery in Italy" Quinn Norton is also in attendance	Norton 2013

July	<i>Guerilla Open Access Manifesto</i> “(...) The world’s entire scientific and cultural heritage, published over centuries in books and journals, is increasingly being digitized and locked up by a handful of private corporations. (...)” (signed in “Eremo, Italy”)	
Summer - Sep.	Meets Steve Schulze in the Boston area. ”[Aaron] said, ‘Oh, I don’t really like Perl. I’m not a Perl programmer.’ Then he took my Perl code and made a whole bunch of great improvements.” A friend living near one of the participating libraries, in Sacramento, helps out (cookie?). ”Swartz started his downloading in early September. On September 29, court administrators noticed the Sacramento library racked up a \$1.5 million bill. The feds shut down the library’s account.”	Lee 2013; also TIOB
Dec.	<i>Punitive Damages, Remunerated Research, and the Legal Profession</i> Stanford Law Review 61(3) ”in conjunction with Shireen Barday, he downloaded and analyzed 441,170 law review articles to determine the source of their funding” (Demand Progress bio) [Aaron is not credited?]; based on the Westlaw legal database	Swartz via Lee 2011; TIOB
<b>2009</b>		
	“intern in the congressional offices of Democrat Alan Grayson because he wanted to learn about how government operated” (via friend Matt Stoller); ”He was sort of learning a new community, a new set of skills, and kind of learning to hack politics”	Day 2013; Stoller via TIOB
Feb. - April	Under surveillance, FBI file following the PACER events. [Case closed 20/04] ”Synopsis: To set lead to locate Aaron Swartz. (...) Lead 1 (...) AARON SWARTZ has a profile on the website LINKEDIN (...)”	Swartz 2009c / FBI File
Sep. 14 and 15	In two consecutive blog posts, Aaron discusses ”friends who, to save money, break into buildings on the MIT campus to steal food and drink and naps and showers.” and its ethics (one of them titled ’honest theft’).	Swartz 2009 and b
<b>2010</b>		
until 2011	”Lab Fellow” at Edmond J. Safra Center for Ethics, Harvard	Harvard
	“volunteered for the Democratic national convention in the runup to the midterm elections.”	Day 2013

Sep.	Learns about COICA, the <i>Combating Online Infringement and Counterfeits Act</i> , which morphed into SOPA ("from [his] friend Peter" ... Eckersley?). "this bill would let the government devise a list of websites that Americans weren't allowed to visit"	Swartz 2012b
Sep. 24	"registered his computer on MIT's campus and obtained a guest account on MIT's computer network. The individual did not provide his true identity at this or any subsequent time"	USA v. Swartz
Sep. 25	"hundreds of thousands of downloads from the ghost laptop"	USA v. Swartz
Sep. 26	"The next day (...) the ghost laptop's user obtained a new IP address from MIT's network (...) This defeated JSTOR's IP address block"	USA v. Swartz
Oct. 2	"Having recognized that MIT or JSTOR had blocked his ghost laptop by recognizing its MAC address, the individual now manipulated the ghost laptop's MAC address to mislead MIT into believing that he was a new and different guest registrant."	USA v. Swartz
Oct. 8 (?)	"connected a second computer to MIT's network and created another guest account"	USA v. Swartz
Oct. 9	"activated the ghost laptop and the ghost macbook to download JSTOR's articles once again."	USA v. Swartz
Oct. 16	Gives a talk about the (unequal) accessibility of scholarly journals, at the Univ. of Illinois. Mentions JSTOR, among other providers. "It's a legacy that should belong to us, as a commons, as a people. But, instead it's been locked up (...) by a handful of for-profit corporations"	Swartz via TIOB
End of Oct. - Jan. 6 2011	"the hacker obtained at least three new IP addresses and assigned his computer two new MAC addresses. He also moderated the speed of the downloads, which made them less noticeable to JSTOR."	USA v. Swartz

## 2011

Jan. 4	<i>"an MIT network security analyst traced the hacker's IP address to a network switch located in a basement wiring closet in MIT's Building 16. (...) When MIT personnel entered the closet, they found (...) the ghost laptop, an Acer-brand laptop, connected to a separate hard drive for excess storage. (Ex. 11). The network cable connected the laptop to the network switch, thus giving the laptop Internet access. (...) MIT called campus police to the scene, who, in turn, brought in the Cambridge Police and the Secret Service. (...) The Secret Service opened the laptop and sought to make a copy of its volatile memory (RAM) (...) "</i> etc. etc.	USA v. Swartz
mid-day Jan. 4	<i>"Experience told them that (...) rather than take the hacker's equipment away (...) The ruse worked. Within an hour of their departure, the hacker returned."</i>	USA v. Swartz
Jan. 6	<i>"the hacker returned to the wiring closet yet again. This time, worried about being identified, the hacker covered his face with his bicycle helmet as he entered the closet. (...) A little after 2:00 that afternoon, MIT Police Captain (...), who had been involved in the investigation, was heading down Massachusetts Avenue within a mile of MIT when he spotted a bicyclist who looked like the hacker caught on the wiring closet video. Captain (...) identified himself as a police officer. After a brief exchange, the individual dropped his bike to the ground and ran away. The individual was chased, apprehended, arrested, and identified"</i>	USA v. Swartz
Jan. 6	<i>"I had to get a hold of [his] lawyer and find someone to bail him out. I found a local friend, who went and got out \$1,000"</i>	Norton 2013
Feb.	<i>"(...) the inevitable raid. The Secret Service came to his house and his office at the Harvard Ethics Center and took hard drives and computers. Aaron's phone was taken."</i>	Norton 2013
End of April	<i>"Aaron, Ada, and I went to DC, and took Ada to the museums. We walked along the sidewalk in front of the White House together. Aaron looked past the lawns at the grand doors and said quietly "They don't let felons work there." I replied it was ironic, given how many felonies were committed there. But Aaron didn't laugh."</i>	Norton 2013
"Summer"	<i>"we didn't trust each other anymore (...) He wanted something untouched by all of this, and had met someone – someone more like who he wanted to be. (...) he told me our relationship had to stop."</i>	Norton 2013
June	<i>Beginning of relationship with Taren Stinebrickner-Kauffman.</i>	Collins 2013

## 2012



May 21; Aug. 16	Delivers "How we stopped SOPA" keynote speech at the <i>F2C</i> conf. in Washington, D.C. (and at ThoughtWorks in August)	Swartz 2012b
Nov. 1	Last known/extent blog post. " <i>The Dark Knight Rises 1980s-style tough-on-crime policies and neoliberal economics lead to a revolt</i> "	Swartz 2012
	"The last day I saw Aaron was two weeks before he died. (...) We'd become friends again, though slowly and imperfectly (...) I was dropping my daughter off to spend her Christmas break with Aaron and his girlfriend"	Norton 2013
<b>2013</b>		
New Year	Vacation. " <i>We went to Burlington with a bunch of friends and stayed in a house and played in the snow. It was wonderful.</i> "	(T. S.-K.) Collins 2013
Jan. 9	Request for plea deal turned down.	Collins 2013
Jan. 10	Aaron eats a <i>really good</i> grilled cheese sandwich. " <i>The night before he died, Aaron really wanted to go to a bar called Spitzers Corner in the Lower East Side. I was tired and didn't want to but he insisted. He wanted to go to the Happy Hour (...)</i> "	(T. S.-K.) Collins 2013. See also S.-K. 2013
Funeral	Robert Swartz reads a eulogy containing the following condemnation : " <i>He was killed by the government and MIT betrayed all of its basic principles.</i> "	Collins 2013
Jan. 24	At a memorial, Taren Stinebrickner-Kauffman reiterates " <i>Aaron's death should radicalize us</i> ", Carl Malamud speaks of " <i>a posse intent on protecting property, not people.</i> " among others.	S.-K. 2013, Malamud 2013



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## Methodology and technical notes

– Our leading principle was to seek out and reference primary sources whenever possible, ie. writings or other media by Aaron himself, his partners, friends, family... Legal and police documents were also considered.

– Among the goals of this project is to help others gain a succinct, dependable overview of Aaron’s life (whatever their own goals). Its inspiration was the similar project undertaken by the historian of science Taton on Pascal in the 1960s.

– Aspects of Aaron’s life, in particular technical details, were covered in several previous publications, ”A brief history of Aaron Swartz on Github”, the *keepgrabbing.py* articles, and the companions to the MIT/JSTOR case, among others.

The Perl script used for massively retrieving the PACER documents seems rudimentary but, (not only is it an early version of it), it relies on ”*the vulnerability of the PACER pilot project was that the cookie used for log-in did not track the user’s IP address*” per the FBI File<sup>11</sup> e.g.,

\* it did not need to be renewed with every download, \* the downloading itself did not even need to take place at an authorized location, library but could happen from anywhere.

The program would be executed about like so :

```
$ ls
pacер.perl
cookie.txt

$ perl pacер.perl <COURT CODE> <CASE ID>
```

---

<sup>11</sup>The File goes on to specify that ”*The only limit in place was that the cookie lasted for one week.*” (ergo every week someone would need to grab the cookie from one of the PACER program participating libraries.)

## Annex



Figure 1: One of the bookshelves at the Swartz' (2002)

```
Terminal — vim — 80x24
#!/usr/bin/perl -W

# Open Government Data Principles
# http://public.resource.org/8_principles.html

# "No one can obtain the exclusive right to publish the laws of a state
# in a book prepared by him. This general proposition cannot be
# doubted. And it may also be said that any person desiring to publish
# the statutes of a state may use any copy of such statutes to be found
# in any printed book, whether such book be the property of the state
# or the property of an individual" Howell v. Miller, 91 F. 129 (1898).
# This program is designed to expand public access to court records.
# Use only in conjunction with authorized PACER access.

use strict;
use File::Path;

my $court = $ARGV[0] or die "specify court code\n";
my $pacer_case_id = $ARGV[1] or die "specify starting PACER case ID number\n";

open (COOKIEFILE,"cookie.txt") or die "couldn't find cookie.txt file\n";
my $PacerUser = <COOKIEFILE>;
```

Figure 2: Schulze's perl script

A photograph of a piece of lined paper with a spiral binding on the left. A handwritten note in black ink is written on the paper. The text of the note is "All downloads went to the 2 IPs (Amazon)". The handwriting is in a cursive, slightly slanted style. The paper has horizontal lines and a few small black marks on the left side.

Figure 3: Extract from FBI File

- 1 -

## FEDERAL BUREAU OF INVESTIGATION

Date of transcription 04/16/2009

[redacted] social security number [redacted] date of birth [redacted] California drivers license number [redacted] cellular telephone number [redacted] email address [redacted] work telephone number [redacted] work address 1005 Gravenstein Hwy N., Sebastopol, California 95472, was interviewed at the FBI Washington Field Office. After being advised of the identities of the interviewing agents and the purpose of the interview, [redacted] provided the following information:

b6  
b7C

[redacted] a 501c3 non-profit company called public.resource.org. [redacted] has been making government data available online for the past twenty years. In 1994 and 1995, [redacted] the SECURITIES AND EXCHANGE COMMISSION's EDGAR database. [redacted] has worked with the SMITHSONIAN to get more of their data available online. [redacted] stated that he is responsible for changing policies at CSPAN. [redacted] has scanned three million pages of Congressional hearings and made those available online.

In 2007, [redacted] began focusing on primary legal materials that needed attention. In 2008, [redacted] put fifty years worth of COURT OF APPEALS information online. People began writing [redacted] with concern that their social security numbers were posted online in this data. [redacted] was able to get LEXUSNEXUS and WEST to redact social security numbers. [redacted] sent an audit to Judge ROSENTHAL listing the social security numbers posted online and presented a series of recommendations for correcting this issue.

b6  
b7C

In mid-2008, [redacted] pacer.resource.org. [redacted] intended for this website to get policy aims across and get PACER documents uploaded for anyone to view. [redacted] does not like the PACER pilot project and made this clear on his website in the seventeen frequently asked questions (FAQ). FAQ number sixteen refers to a thumb drive corps where [redacted] encourages people to go to the seventeen libraries participating in the PACER pilot project and download PACER documents. Then the PACER documents can be uploaded as pdf documents on [redacted] website using an upload button.

Investigation on 04/15/2009 at Washington, DCFile # 288A-WF-238943 -39 Date dictated N/A  
by SA [redacted]  
SA [redacted]b6  
b7C  
b7F

Aaron Swartz's JSTOR code :  
**keepgrabbing.py**. Further research notes.

Camille Akmut

December 30, 2019

**Abstract**

Technical as well as sociological, legal and historical characteristics of a critical program.



```

1  import subprocess, urllib, random
2  class NoBlocks(Exception): pass
3  def getblocks():
4      r = urllib.urlopen("http://-----/grab").read()
5      if '<html' in r.lower(): raise NoBlocks
6      return r.split()
7
8
9  import sys
10 if len(sys.argv) > 1:
11     prefix = ['--socks5', sys.argv[1]]
12 else:
13     prefix = []#'-interface','eth0:1']
14 line = lambda x: ['curl'] + prefix + ['-H', "Cookie:
    TENACIOUS=" + str(random.random())[3:], '-o', 'pdfs
    /' + str(x) + '.pdf', "http://www.jstor.org/stable/
    pdfplus/" + str(x) + ".pdf?acceptTC=true"]
15
16
17 while 1:
18     blocks = getblocks()
19     for block in blocks:
20         print block
21         subprocess.Popen(line(block)).wait()

```

Figure 1: keepgrabbing.py

# Aaron Swartz JSTOR code

keepgrabbing.py further research notes

29-12-19



## context

*"Swartz's ... laptop contained a software program named "keepgrabbing.py," which was designed to download .pdf files ... from JSTOR"*

(USA v. Swartz)

## overall architecture

(The program can be read by anyone with 3-4 years of programming. I'll do my very best to explain how it works, but I can't guarantee I won't make any mistakes.)

The whole program is based around `curl`, a utility to download files from the Internet/Web, from the command-line.

*"a tool to transfer data from or to a server"*, its man(ual) page tells us.

This is of particular significance since the whole point of the program was to download .PDF files (i.e. academic papers, a lot of them publicly funded) massively from JSTOR servers.

*"The command is designed to work without user interaction."* the man page accordingly goes on.

Alternatively, Swartz could have used `wget`.

(The reason he used curl is perhaps that the Developer Tools section found in browsers give translations for GET requests in curl format but not in wget's e.g. Firefox.)

So, the general architecture :

1. *getblocks()* generates a list of research paper titles or more precisely their nomenclature (whatever they use at JSTOR)

e.g. :

```
On_the_Landau-Siegel_Zeros_Conjecture  
regions_and_social_groups  
etc.
```

or perhaps, given a url from <https://server.org/pdf/0000.4000.pdf> :

```
0000.4000  
0505.1000  
etc.
```

whatever.

This is the first block of code.

The output of which is associated with the variable "blocks" at the end. Each individual entry is accessed via "block".

1. the lambda function takes this as input
2. curl is executed on all papers, with some extra parameters presumably to make sure the server will cooperate and not throw up errors (header, cookies, ...)

## the lambda function

As a functional programmer, I'm particularly drawn to the lambda function and it's arguably the heart of the program.

```
line = lambda x: ['curl'] + prefix + ['-H', "Cookie: TENACIOUS=" + str(random.  
random())[3:], '-o', 'pdfs/' + str(x) + '.pdf', "http://www.jstor.org/stable/p  
dfplus/" + str(x) + ".pdf?acceptTC=true"]
```

This looks like a lot, but the tools that we have at our disposal are always the same, and very effective too : simplify, experiment.

```
>>> double = lambda x: x*2
>>> block = 3
>>> double(block)
6
```

and further :

```
>>> blocks = [3,2,1]
>>> for block in blocks:
...     double(block)
...
6
4
2
```

So what is going on here?

We must jump around the program to make sense of it, it is not a novel.

```
subprocess.Popen(line(block)).wait()
```

Here, line is passed "block". This is our "x" in "lambda x"! At least this is my best understanding.

Let's go back to the lambda line and erase all of the extra stuff that's fundamentally not needed :

```
line = lambda x: ['curl'] ... '-o', 'pdfs/' + str(x) + '.pdf'
```

This is just Aaron telling curl : please download all of the articles inside the local folder "pdfs" and label them nicely.

e.g.

```
-- ./pdfs
- On_the_Landau-Siegel_Zeros_Conjecture.pdf
- regions_and_social_groups.pdf
```

etc.

This is the core of it

```
line = lambda x: ['curl'] ... "http://www.jstor.org/stable/pdfplus/" + str(x)  
+ ".pdf..."]
```

translated later as the familiar command line command :

```
$ curl (-O) http://www.jstor.org/stable/pdfplus/On_the_Landau-Siegel_Zeros_Con  
jecture.pdf
```

(minus the extra parameters)

The “prefix” bit is just Aaron passing an additional parameter to curl, “--socks5”.

As with everything else, it can be looked up in this utility’s, curl’s manual :

```
man curl | grep "socks5"
```

returns :

```
--socks5 <host[:port]>
```

He was using a proxy. (?)

## getblocks()

It’s hard to say much about this, because one part has been redacted.

But “[http://-----/grab](#)” was definitely able to generate a list of all of JSTOR’s articles.

```
>>> "article1 article2".split()  
['article1', 'article2']
```

the Python built-in function *split()* does stuff like that.

## References

- . 2019. "A User-Defined Web. And, on Systems modification in general."  
*Buffy*. S07E22. (Final episode : "Cookie dough speech")

`keepgrabbing.py` : additions, and documents.

Camille Akmut

January 13, 2020

**Abstract**

Important program continues to be reviewed from all perspectives.

---

## Additions

- Python's `str()` function takes an object and converts it to a string...

```
>>> str(1)
'1'
```

In this example, the integer 1 becomes the string '1' (or "1").

```
>>> type(1)
<class 'int'>
>>> type('1')
<class 'str'>
```

(Side note :

In Python, the single quotes ' ' do not signify a character as opposed to a string; for which double quotes " " would be used - in Haskell.

In that former language, they are the same (type of objects, they have the same type) :

```
>>> '1' == "1"
True
>>> '10' # '10' is not a character (but '1' is for example)
'10'
>>> type('10')
<class 'str'>
>>> type("10")
<class 'str'>
```

)

- Haskell's version of Python's `split()` is `words` (from the `Data.List` module) :

```
Prelude Data.List> words "article1 article2"
["article1","article2"]
```



- Here I've re-written the proxy of the lambda function that I showed, in Haskell :

```
Prelude> line = (\x -> x*2)
Prelude> line 3
6
Prelude> blocks = [3,2,1]
Prelude> map line blocks
[6,4,2]
```

(mapping is the functional programming equivalent of looping, as found in languages with imperative elements / Python)

or, closer to Aaron's application :

```
Prelude> line = (\x -> ["curl"] ++ [x])
Prelude> line "--proxy"
["curl", "--proxy"]
```

Now you may be asking yourself : how do we go from this list of strings, to something that could be passed to Curl/Wget or the Shell?

We do this :

```
Prelude> unwords ["curl", "--proxy"]
"curl --proxy"
```

(Haskell has a function just for this, unwords.

If it did not we would have needed to write our own, most likely a fold.

Here :

```
Prelude> foldr (\x y -> x ++ y) [] ["curl ", "--proxy"]
"curl --proxy"
```

Can also be simplified to foldr (++), which turns out is the definition of `concat` . This is because of point-free style I believe.

We would have used `head` to extract the string if a list had been given back to us as intermediary result, but such is not the case.

e.g. head ["curl —proxy"] == "curl —proxy")

- More context :

#### Timeline of events

Dates	Actions	
Sep. 25-26th 2010	>450k .pdfs downloaded	IP address changed once, Class C network blocked
Oct. 9th 2010	8k .pdfs (only)	entire MIT network blocked
Late Nov. 2011 - Early Jan. 2011	? (lots, presumably)	new IP address, slowed below-monitoring downloading.

*“Overall, more than 450,000 articles spanning 560 journals were downloaded between 5:00 p.m. Saturday and 4:00 a.m. Sunday. (...)*

*JSTOR engineers temporarily blocked further downloads directed to the MIT ... IP address issuing the requests. But the downloading continued from a different IP address. (...)*

*The next day, Sunday, September 26, 2010, JSTOR shut off access for the entire range of addresses (Class C network) containing the two addresses. (...) The first IP address was 18.55.6.215, and the second address was 18.55.6.216. The blocked range consisted of all IP addresses beginning with 18.55.6 (...)*

*The network DHCP server maintains a log, called a DHCP log, which records the IP address assigned to a MAC address, as part of the DHCP process. At MIT, an IP address will often identify the building where network device is located.”*

*“Two weeks later, on Saturday, October 9, 2010, during the Columbus Day weekend, a second, similar incident occurred: a visitor downloaded more JSTOR articles, using a slightly modified MAC address. (...) JSTOR’s response was to shut down service, at approximately 11:15 p.m. on October 9, 2010, to all MIT’s IP addresses, that is, the entire Class A network, doing so quickly enough that only about 8,000 articles were downloaded during this incident.”*

*“December 26, 2010, JSTOR again noticed excessive downloading from MIT, originating from a new IP address. Significantly, this most recent downloading had been going on for some time, beginning in late November, but JSTOR did not realize this fact until much later. The manner of accessing downloads had been*

slowed and altered in such a way that JSTOR's monitoring systems did not identify that the robotic harvesting had resumed."

(Abelson et al. 2013, 'Report to the President')

- "Cookie: TENACIOUS=" + str(random.random())[3:]

```
>>> "Cookie: TENACIOUS=" + str(random.random())[3:]  
'Cookie: TENACIOUS=2113961635582544'  
>>> "Cookie: TENACIOUS=" + str(random.random())[3:]  
'Cookie: TENACIOUS=6451074056572803'
```

*"It deleted its JSTOR cookie after each download, disconnected, and then re-accessed JSTOR, resulting in a new cookie being placed on the machine each time this occurred and making it appear that this was a new machine for each access."* (Ibid.)

(I'm not entirely sure that Abelson's understanding of the program here is entirely correct.

It's not so much that the cookie was deleted, but a new one generated with every new curl execution. See above.)

...

## Annex

- Document 1 : Abelson et al., *Report to the President* of MIT.
- Document 2 : *USA v. Swartz*.

---

## **PART I: EVENTS LEADING TO THE ARREST**

- I.A Downloading of JSTOR Articles**
  - I.B Discovery of the Laptop**
  - I.C Events of January 6, 2011: The Arrest**
  - I.D Events of January 6, 2011: Seizure of the Laptop**
  - I.E Access to the MIT Network**
    - I.E.1 Connecting to the MIT network
    - I.E.2 JSTOR and eControl
- 

## **Part I: EVENTS LEADING TO THE ARREST**

### **I.A Downloading of JSTOR Articles**

The history of the events leading to the arrest of Aaron Swartz in January 2011 begins the previous fall with the JSTOR (Journal Storage) digital library, a service that licenses scholarly journals to numerous academic and research organizations, including MIT.<sup>1</sup>

On the evening of Saturday, September 25, 2010, JSTOR engineers noticed an extremely large number of requests for downloads originating from MIT. Overall, more than 450,000 articles spanning 560 journals were downloaded between 5:00 p.m. Saturday and 4:00 a.m. Sunday.<sup>2</sup> The volume of data transferred was enough to overload the affected JSTOR server. In response, JSTOR engineers temporarily blocked further downloads directed to the MIT Internet Protocol (IP) address issuing the requests.<sup>3</sup> But the downloading continued from a different IP address.

---

<sup>1</sup> See Appendix 6 for more information on JSTOR and the MIT Libraries.

<sup>2</sup> Ordinarily, when someone requests a download from JSTOR, the system pops up a window that refers to JSTOR's terms of use, and requires the user to click to confirm before the download can proceed. This not only notifies the user of JSTOR's terms, but also limits the rate at which automated downloads can be requested. In this case, however, the download script included a flag (acceptTC=true) that bypassed the acceptance step.

<sup>3</sup> In an effort to warn the person causing these downloads to stop, JSTOR's engineers caused a web page to be presented to the computer engaged in the downloading, reading:

Access Suspended—We noticed content downloading activity from your IP address (18.55.6.215) that appears to be in excess of what is allowed under our Terms & Conditions of Use. Please review our terms for more information about allowable uses. If you have additional questions or need other information, please contact JSTOR Support.

**UNITED STATES DISTRICT COURT  
DISTRICT OF MASSACHUSETTS**

**UNITED STATES OF AMERICA**

**v.**

**AARON SWARTZ,**

**Defendant**

**Crim. No. 11-CR-10260-NMG**

**VIOLATIONS:**

**18 U.S.C. § 1343 (Wire Fraud)**

**18 U.S.C. § 1030(a)(4),(b) (Computer Fraud)**

**18 U.S.C. § 1030(a)(2), (b), (c)(2)(B)(iii)  
(Unlawfully Obtaining Information from a  
Protected Computer)**

**18 U.S.C. § 1030(a)(5)(B), (c)(4)(A)(i)(I),(VI)  
(Recklessly Damaging a Protected Computer)**

**18 U.S.C. § 2 (Aiding and Abetting)**

**18 U.S.C. § 981(a)(1)(C), 28 U.S.C. § 2461(c),  
18 U.S.C. § 982(a)(2)(B), and 18 U.S.C. §  
1030(i) (Criminal Forfeiture)**

**SUPERSEDING INDICTMENT**

The Grand Jury charges that at all relevant times:

***PARTIES***

***JSTOR***

1. JSTOR, founded in 1995, was and continued to be a United States-based, not-for-profit organization that provides an online system for archiving and providing access to academic journals and journal articles. It provides searchable digitized copies of articles from over 1,000 academic journals, dating back for lengthy periods of time.

2. JSTOR's service is important to research institutions and universities because it can be extraordinarily expensive, in terms of both cost and space, for a research or university library to maintain a comprehensive collection of academic journals. By digitizing extensive, historical collections of journals, JSTOR enables libraries to outsource the journals' storage, ensures their preservation, and enables authorized users to conduct full-text, cross-disciplinary

# *keepgrabbing.py* : final additions, more documents

Camille Akmut

January 14, 2020

## **Abstract**

Further notes and documents around this program. Including "Aaron Swartz and the social sciences" – a bibliography.

---

## Additions (2)

- Further antecedents : Swartz as a freshman at Stanford in 2004

*“They register your computer’s MAC address so they can track you if you take your laptop anywhere. (...) [The ID card] has a RFID transmitter in it, so they can track us while we walk.”*

(Swartz, 2004, “Stanford” series of blog post, the old blog (called ‘The Weblog’?))

(I’m pretty sure this is something that was overlooked by Abelson et al., as well.)

RFID : [Radio-frequency identification](#). *“An RFID tag consists of a tiny radio transponder; a radio receiver and transmitter.”* (Wikipedia)

- Hand calculation

I’ll go through the whole calculation (and end program output) once more, by going through a fictive example :

Say, “regions\_and\_social\_groups” *was one of the outputs from* getblocks()\**, then this is what the* lambda function would do with it :

(\*an actual title of a paper by Bloch)

```
>>> import random
>>> line = lambda x: ['curl'] + prefix + ['-H', "Cookie: TENACIOUS=" + str(random.random())[:3], '-o', 'pdfs/' + str(x) + '.pdf', "http://www.jstor.org/stable/pdfplus/" + str(x) + ".pdf?acceptTC=true"]
>>> prefix = ['--socks5 <sys.argv[1]>']
```

Result, application :

```
>>> line("bloch_regions_and_social_groups")
['curl', '--socks5 0.0.0.1', '-H', 'Cookie: TENACIOUS=6849865095777357', '-o', 'pdfs/bloch_regions_and_social_groups.pdf', 'http://www.jstor.org/stable/pdfplus/bloch_regions_and_social_groups.pdf?acceptTC=true']
```



(I've cheated with prefix : sys.argv[1], as its naming convention implies, is an argument taken from the command line e.g. 0.0.0.1,

but for demonstration purposes will do.)

If this was an Arxiv-style database, with numbered nomenclature, e.g. 5051.pdf, we'd have :

```
>>> line(5051)
['curl', '--socks5 <sys.argv[1]>', '-H', 'Cookie: TENACIOUS=80600805627042',
'-o', 'pdfs/5051.pdf', 'http://www.jstor.org/stable/pdfplus/5051.pdf?acceptTC=true']
```

instead.

(Notice how the cookie value changes with every execution.)

#### Annex

- Document 1 : Swartz, Aaron. 2004. "Stanford: Day 4".
- Document 2 : "Aaron Swartz and the social sciences" (a bibliography)

# Stanford: Day 4

This week we were repeatedly informed about the “unprecedented personal freedom” that we would have at Stanford. Apologies, but I don’t see it. First, I stay in a three-room system with four other people (two two-person bedrooms on either side and a shared office in the middle). Our only bathroom is down the hall, where there are five stalls shared with the whole hall. This means practically everything I do — sleeping, waking up, alarm clocks, working, showering, etc. — must be coordinated so as not to interfere with those other people. Stupid other people...

Of course, this is not an accident. The whole thing is a giant privately-owned community, like some sort of Disney World. They run the government, the police, the restaurants, the bookstores, the shopping center, the transportation, the entertainment, etc. Worse yet, they track you while you use it all. Everyone gets an ID card which must be swiped to eat, visit the library, use a computer terminal, check your mail. It even has a RFID transmitter in it, so they can track us while we walk. (They didn’t bother to tell us this and we wouldn’t notice because it looks just like a regular card. I just found out because I happened to walk by a reader.) They register your computer’s MAC address so they can track you if you take your laptop anywhere.

It’s like I’ve woken up in some sort of libertarian nightmare world, where one company has bought up everything and now tells everyone what to do. Obviously there’s no freedom, but the ardent libertarians still say “Look at how free you are! There’s no government telling you what to do!” If this is freedom, I think I might prefer tyranny.

All this by way of saying, I get to take a shower for the first time today. Honestly, with all the money they seem to have around here, it wouldn’t kill them to just build a few hotels. But I guess removing self-dignity and privacy is part of building conformity and obedience. I don’t know the history, but I might venture to guess they borrowed the whole thing from the military.

After my shower, I head over for breakfast, but apparently the cafeteria decided to close half an hour early. I run all over campus looking for a bagel. Eventually, I am about to go to the library to try Googling for a bagel, but I am spared from this indignity by a bagel shop just outside the library.

\* \* \*

When I’m back at the cafeteria for lunch, I notice a bizarre note placed at each table. It’s a letter from the head of Stanford Dining, praising their great work:

“extremely excited...cuisine experiences...enthusiastically prepare...passionately serving...36 years...chefs trained at world-renowned schools...recruited from top industry performers...nationally recognized, award winning”. I try and think about the process that put this bizarre note here. Who are they trying to impress? Certainly not the students, who are *required* to buy the food and, in any event, are going to end up eating it, propaganda or not. (I can tell you, it doesn’t taste award-winningly good.) The whole thing is bizarre.

\* \* \*

Today’s afternoon event is “Faces”, a collection of student speeches and arts performers meant to highlight diversity at Stanford. The upperclassman who leads our hall insists we all dress weirdly for the event. I get to wear a wig. As the leader note, the end effect is to make all the boys look gay (or, in one case where breasts were worn, lesbian). When we get to the auditorium and mix with the other kids, it’s hard to tell who’s dressing weird and who just dresses like that.

Inside, it’s a beautiful, touching show, that would likely make even the most staunch opponent of equality reconsider, but it contains puzzles nonetheless. One boy tells us he had bipolar disorder — he pushed himself too hard, failed miserably, and was put on academic probation and is suspended for a year. Sent home to sit and be depressed alone, things just get worse for him. He eventually comes back and manages to make a recovery when the stakes are high (if he screws up again, he gets suspended for three years!) and begins to take on more work and succeed. It’s a touching story, but there’s some sort of a breakdown somewhere.

Why did Stanford torture this poor, sick boy, doing his best to succeed? What sense does it make to suspend him because he tried too hard? Where was the care for this poster boy of the diversity they claim to champion? How can they expect anyone to push themselves if they threaten to suspend them for years if they fail? It makes no sense.

Afterwards, we break into small groups for discussion. Ours ends up becoming a debate about affirmative action. (Perhaps partially my fault, because I remember what I read in *The Language War* and suggest that the event had the implicit message that “We, the straight upper middle class white people, are the normal ones”.) Stanford has “theme houses” for blacks, hispanics, etc. Anyone can apply and apparently they try to make it half racial group, half others, but apparently it’s still controvertial here. *Isn’t just another form of segregation?* one Asian girl asks.

I respond that Stanford is comically segregated. Our dorms are segregated by what classes we’re taking, our peer advisor groups are segregated by engineering/humanities, why, we even have separate *libraries* for engineering

students. Why, I ask, are we arguing about the one form of segregation that might actually be beneficial? The answer, of course, is because we're still so self-conscious about race.

See, the thing about race is that while it's usually a liberal/conservative issue, it's not a corporate one. Corporations don't care if their employees or managers are white or black, as long as they act the same as the other managers. Indeed, corporations probably benefit from increasing the size of the workforce. So if you get the liberals distracted by arguing about race, maybe they'll ignore the more important dehumanizing and corporatizing part of all this.

\* \* \*

Later that night, The Sexual Health Peer Resource Center (SHPRC) puts on a seminar about sex at Stanford. For unclear reasons, sex is still a taboo topic in America, even among these jaded, elite, attractive teenagers. (Even at our supposedly-hardbitten "The Real World" play, they euphemized about "other things on the menu".) The SHPRC tries valiantly to overcome this. As I walk in, they're rattling off statistics about how frequently each set of body parts is combined. They give us cards so we can ask questions anonymously and use laughter as a way of loosening things up (how in the original version, The Prince rapes Sleeping Beauty and leaves before she wakes up, how lesbians sometimes exclude bi people because they're sleeping with The Man, etc.). They also have an impressive set of portmanteau words — you sexile (sex + exile) your roommate, avoid dormcest (dorm + incest), etc. They also tell us about all the free stuff for students: free condoms and lube, free STD testing, free advice, free classes, etc. It was a valiant effort.

\* \* \*

When I'm back in my dorm, no sooner does the Internet come back up (a router had apparently blown up) than a bunch of kids, dressed in naked clothes and bikinis, start running through the halls singsonging "let's go Roble [clap, clap, clap clap clap] fountain-hopping [clap, clap, clap clap clap]". I quickly realize that fountain-hopping does not mean travelling to visit the campus's beautiful fountains, but instead running around campus and jumping into them. I decide to follow and take notes.

We run through the streets (there are no supervising police this time, apparently the thing was one girl's spontaneous idea that just sort of snowballed) to the nearest fountain, where everyone jumps in and starts splashing each other. There appears to be something of a code of conduct — there is no actual nudity and the group eschews puny sprinklers. Apparently I've picked a good one. One kid comments this is "the most fun fountain hopping I've ever had" and suggests we do it every thursday night.

The singsonging seems to be some sort of consensus process, when people are all spread out in the fountain it suddenly switches to “everyone together [clap, clap, clap clap clap]” as people move together in the center. One guy carrying a boombox puts on “Baby Got Back”, which seems to be a popular cross-gender choice. The group sings along, even spontaneously splitting up the group in half to take the different parts. The cooperation is incredible.

Later I learn things always weren’t so good, when one girl notes that they’re “trying to say away from tearing curtains down, banging doors down” this year.

\* \* \*

Closing out this busy night is a show from the Stanford Improv Society or Slmps. Even though they’re performing in a different theater at a different time from our usual meetings, and the crowds are thoroughly mixed, unlike our usual seating by dorm, interdorm cheering still erupts. (Kids across the audience stand up to cheer for their dorm.) I briefly imagine what things would be dorms were numbered, like MIT’s buildings:

*What’s the dorm with the perfect num?  
E forty-nine minus twenty-one!*

That wouldn’t be so bad, I guess.

Improv is one of the most cooperative of games — it’s all give and take between partners, working together to make something funny. It’s really a lot of fun. (Studies with small children have shown competitive games are less enjoyable, less effective, and more demotivating than cooperative games.) But here, even improv is made competitive — people are split into two teams and forced to compete for our applause. They do an applause poll after every two acts; not surprisingly, the team who went second wins every time.

posted September 24, 2004 02:49 PM ([Education](#)) ([19 comments](#)) <#>

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[Aaron Swartz](#) ([me@aaronsw.com](mailto:me@aaronsw.com))

## BIBLIOGRAPHY : AARON SWARTZ AND THE SOCIAL SCIENCES

Swartz, Aaron (Lucchese ed.). 2014. *Raw Thought, Raw Nerve. Inside the Mind of Aaron Swartz*.

- What is going on here? (2006)

”In his 1959 classic, *The Sociological Imagination*, the great sociologist Charles Wright Mills told students of the discipline...”

- Stanford: Psychology is a Fraud (2005)

”Instead of dropping the theory, they decided to just ignore the experiments...”

- Freakonomics (2005)

”I happen to be taking a class on sociological methods. The other day we had a section where the TA showed us how to use SPSS (...)

Sociologists write many amazingly well-written and fascinating books, (...) yet none of them have seen anything like the publicity this book has.

I don’t think it’s a coincidence that it took an economist to write a sociology book before it could be given publicity. Sociology raises too many problematic questions about society but an economist can do somewhat interesting things while continuing to endorse the status quo.”

- The Hard Sciences (2006)

”The reason is, because the “soft” sciences are, in fact, harder.”

Compare with Paul Graham’s prose on this subject (opposite, largely ignorant outlook).

Compare also with Bourdieu et al.’s 1968 *Le metier de sociologue* [*The Sociologist’s Craft*], where similar arguments were developed : e.g. atoms don’t talk back, but people do – making the ”job” of the sociologist significantly harder. (I don’t think this has been translated yet, either. A collection of epistemological writings by various philosophers-historians of science with their commentary.)

- The Book That Changed My Life (2006)

one night, I watched the film *Manufacturing Consent: Noam Chomsky and the Media* (...) [then] read *Understanding Power*, a thick paperback I picked up at the library. Edited by Peter Mitchell and John Schoeffel, two public defenders in New York (...) One terrifying side effect of learning the world isn’t the way you think is that it leaves you all alone.



Aaron's final program. A formal approach to the  
analysis of software archives for the social and  
historical sciences.

Camille Akmut

January 14, 2020

**Abstract**

A working version of `keepgrabbing.py` was reconstructed from archives.

## Software as archives

In writing *Aaron Swartz's JSTOR code* we did not merely attempt a “technical” presentation, but sought to give a full “sociological, legal and historical” account – as part of our efforts to extend both the domain of one and the other science. These sciences meet now halfway, or they are the same.

These debates are far from settled.

Written over a period of a few weeks, though a long time in the coming<sup>1</sup>, in multiple iterations, we drew primarily from 3 documents :

- The source code of the program (entitled *keepgrabbing.py*).
- *USA v. Swartz* (hundreds if not thousands of pages of collected legal and technical prose<sup>2</sup>)
- The *Report to the President* of MIT, ordered by the latter institution and written by computer scientist Hal Abelson inside of a larger team<sup>3</sup>.

Our efforts took us so far that we ended up reconstructing a working version; From a careful analysis – as good as we could, anyway – followed chaotic consequences.

But, crucially, this reconstruction, while of strong scientific interest, was not able to accomplish anything with the inputs we gave to it, *exempli gratia*, the titles of two texts by Marc Bloch and Yitang Zhang.

Let alone that the infrastructure at JSTOR must have considerably changed since the last decade.

In any case, the moneyed interests of this institution cannot trump those of research, and the quest for knowledge and truth.

The main difficulty consisted in identifying the inputs passed to the lambda function (encapsulated in `line`) in the absence of the redacted passage of code.

But, this could be reversed engineered thanks to even summary knowledge of the Python standard library – as long as paired with a knowledge of functional programming.

The `.split()` function was key.

```
>>> ['regions', 'landau'].split()
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
AttributeError: 'list' object has no attribute 'split'
```

It only accepts certain types of objects. From there the rest could be derived.

---

<sup>1</sup>This research had for antecedent the relevant sections in “A User-Defined Web” (2019).

<sup>2</sup>We have made use of one document in particular : the so-called “Superseding indictment” from Sep. 2012. Others are encouraged to go through the rest – these inhumanely numerous pages are the new archives, of this new history and sociology.

<sup>3</sup>We presume it was Abelson who wrote, or made the biggest contributions to the more technical “Part 1” and connected apparatus (e.g. inventory of terms found at the end).

The redacted passages point to a website with the ending `/grab`, of which we have presumed so far it was created by Aaron.

But, as we argue, even with no knowledge of this portion of the code, a black box, a correct or even partial understanding of the anonymous function `lambda x` was sufficient.

To be clear, `keepgrabbing.py` was not Aaron Swartz's last program<sup>4</sup>. But, it was the one that had the most effect in defining the next three years of his life, from 2010 to January 2013.

Aaron Swartz had lived in Cambridge, MA<sup>5</sup>, but moved away presumably as a result of the events, and hanged himself in Brooklyn, NY<sup>6</sup>.

We simplified the program, but did not lessen its functionalities :

Instead of receiving its inputs from the Internet/Web (via the Python module `urllib`), here it does so from a list, the same list it would have received, or close enough.

```
def getblocks():  
    r = "regions_and_social_groups On_the_Landau-Siegel_Zeros_Conjecture"
```

Simplifying and experimenting, we cannot stress this enough, remain some of the most powerful tools in our equivalent of the archaeologist's toolkit.

A diagram to complete this discussion :

```
http://-----/grab  
|  
r = "article1 article2 article3 ..."  
|  
r.split()  
|  
['article1', 'article2', 'article3']  
|  
getblocks()  
|  
blocks = getblocks()  
|  
line(block)  
|  
line('article1')
```

---

<sup>4</sup>See our history of his time spent on Github.

<sup>5</sup>See Abelson et al., beginning of part 2 of their report.

<sup>6</sup>His partner has given an account of their last days.

```
|  
lambda 'article1'  
|  
$ curl www.jstor.org/.../article1.pdf  
|  
repeat with 'article2' etc.
```

What follow are the last fragments of these experiments.

#### Annex

- 1 : raw code (as found about in archives i.e. the legal documents)
- 2 : working version (the redacted part is bypassed as well as the use of proxy, we assume the simplest scenario) do not execute!
- 3 : this version is run successfully for the first time (after multiple tries and modifications resulting in 2)
- 4 : this version is run a second time by accident (inside the Python shell)
- 5 : a second version for local testing is created
- 6 : output of the second version : the `x` to the lambda function is as intended and the rest too

```

#!/usr/bin/python
import subprocess, urllib, random
class NoBlocks(Exception): pass
def getblocks():
    r = urllib.urlopen("http://-----/grab").read()
    if '<html' in r.lower(): raise NoBlocks
    return r.split()

import sys
if len(sys.argv) > 1:
    prefix = ['--socks5', sys.argv[1]]
else:
    prefix = ['#'-interface', 'eth0:1']
line = lambda x: ['curl'] + prefix + ['-H', "Cookie: TENACIOUS=" +
str(random.random())[3:], '-o', 'pdfs/' + str(x) + '.pdf', "http://www.jstor.org/
stable/pdfplus/" + str(x) + ".pdf?acceptTC=true"]

while 1:
    blocks = getblocks()
    for block in blocks:
        print block
        subprocess.Popen(line(block)).wait()

```

```

import subprocess, random #urllib,
#class NoBlocks(Exception): pass
def getblocks():
    r = "regions_and_social_groups_On_the_Landau-
Siegel_Zeros_Conjecture"#urllib.urlopen("http://-----/grab").read()
    #if '<html' in r.lower(): raise NoBlocks
    return r.split()

#import sys
#if len(sys.argv) > 1:
#    prefix = ['--socks5', sys.argv[1]]
#else:
prefix = []##'-interface','eth0:1']
line = lambda x: ['curl'] + prefix + ['-H', "Cookie: TENACIOUS=" +
str(random.random())[3:], '-o', 'pdfs/' + str(x) + '.pdf', "http://www.jstor.org/
stable/pdfplus/" + str(x) + ".pdf?acceptTC=true"]

while 1:
    blocks = getblocks()
    for block in blocks:
        print block
        subprocess.Popen(line(block)).wait()

```

```

$ torsocks python python.py
regions_and_social_groups
% Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
           %             %         Dload  Upload  Total  Spent  Left  Speed
0      0      0      0      0      0      0  0.000 0.000 0:00:00 0:00:00 0:00:00 0.000
0      0      0      0      0      0      0  0.000 0.000 0:00:00 0:00:00 0:00:00 0.000
0      0      0      0  --:--:-- 0:00:01  --:--:-- 0.000 0.000 0:00:01 0:00:01 0:00:01 0.000
last):
File "python.py", line 21, in <module>
    subprocess.Popen(line(block)).wait()
File "/usr/lib/python2.7/subprocess.py", line 1099, in wait
    pid, sts = _eintr_retry_call(os.waitpid, self.pid, 0)
File "/usr/lib/python2.7/subprocess.py", line 125, in _eintr_retry_call
    return func(*args)
KeyboardInterrupt

```



```

>>> import python.py
regions_and_social_groups
% Total    % Received % Xferd  Average Speed   Time    Time       Time  Current
           Dload  Upload   Total     Spent    Left     Speed

0      0    0     0    0     0      0      0  --:--:-- --:--:-- --:--:--
0Warning: Failed to create the file pdfs/regions_and_social_groups.pdf: No such
Warning: file or directory
100  117 100  117    0     0    319     0  --:--:-- --:--:-- --:--:--    318
curl: (23) Failed writing body (0 != 117)
On_the_Landau-Siegel_Zeros_Conjecture
% Total    % Received % Xferd  Average Speed   Time    Time       Time  Current
           Dload  Upload   Total     Spent    Left     Speed

0      0    0     0    0     0      0      0  --:--:-- --:--:-- --:--:--
0Warning: Failed to create the file
Warning: pdfs/On_the_Landau-Siegel_Zeros_Conjecture.pdf: No such file or
Warning: directory
100  129 100  129    0     0   1535     0  --:--:-- --:--:-- --:--:--   1535
curl: (23) Failed writing body (0 != 129)
regions_and_social_groups
% Total    % Received % Xferd  Average Speed   Time    Time       Time  Current
           Dload  Upload   Total     Spent    Left     Speed

0      0    0     0    0     0      0      0  --:--:~ --:~:~ --:~:~
0Warning: Failed to create the file pdfs/regions_and_social_groups.pdf: No such
Warning: file or directory
100  117 100  117    0     0   1300     0  --:~:~ --:~:~ --:~:~   1300
curl: (23) Failed writing body (0 != 117)
On_the_Landau-Siegel_Zeros_Conjecture
% Total    % Received % Xferd  Average Speed   Time    Time       Time  Current
           Dload  Upload   Total     Spent    Left     Speed

0      0    0     0    0     0      0      0  --:~:~ --:~:~ --:~:~
0Warning: Failed to create the file
Warning: pdfs/On_the_Landau-Siegel_Zeros_Conjecture.pdf: No such file or
Warning: directory
100  129 100  129    0     0   1402     0  --:~:~ --:~:~ --:~:~   1402
curl: (23) Failed writing body (0 != 129)
regions_and_social_groups
% Total    % Received % Xferd  Average Speed   Time    Time       Time  Current
           Dload  Upload   Total     Spent    Left     Speed

0      0    0     0    0     0      0      0  --:~:~ --:~:~ --:~:~
0Warning: Failed to create the file pdfs/regions_and_social_groups.pdf: No such
Warning: file or directory
100  117 100  117    0     0   1026     0  --:~:~ --:~:~ --:~:~   1026
curl: (23) Failed writing body (0 != 117)
On_the_Landau-Siegel_Zeros_Conjecture
% Total    % Received % Xferd  Average Speed   Time    Time       Time  Current
           Dload  Upload   Total     Spent    Left     Speed

0      0    0     0    0     0      0      0  --:~:~ --:~:~ --:~:~
0Warning: Failed to create the file
Warning: pdfs/On_the_Landau-Siegel_Zeros_Conjecture.pdf: No such file or
Warning: directory
100  129 100  129    0     0   1343     0  --:~:~ --:~:~ --:~:~   1343
curl: (23) Failed writing body (0 != 129)
regions_and_social_groups
% Total    % Received % Xferd  Average Speed   Time    Time       Time  Current
           Dload  Upload   Total     Spent    Left     Speed

0      0    0     0    0     0      0      0  --:~:~ --:~:~ --:~:~
0Warning: Failed to create the file pdfs/regions_and_social_groups.pdf: No such
Warning: file or directory
100  117 100  117    0     0   1218     0  --:~:~ --:~:~ --:~:~   1218
curl: (23) Failed writing body (0 != 117)
On_the_Landau-Siegel_Zeros_Conjecture
% Total    % Received % Xferd  Average Speed   Time    Time       Time  Current
           Dload  Upload   Total     Spent    Left     Speed

0      0    0     0    0     0      0      0  --:~:~ --:~:~ --:~:~

```

```

Warning: Failed to create the file
Warning: pdfs/On_the_Landau-Siegel_Zeros_Conjecture.pdf: No such file or
Warning: directory
100 129 100 129 0 0 1290 0 --:--:-- --:--:-- --:--:-- 1290
curl: (23) Failed writing body (0 != 129)
regions_and_social_groups
% Total % Received % Xferd Average Speed Time Time Time Current
0 0 0 0 0 0 0 0 --:--:-- --:--:-- --:--:--
0^CTraceback (most recent call last):
  File "<stdin>", line 1, in <module>
  File "python.py", line 21, in <module>
    subprocess.Popen(line(block)).wait()
  File "/usr/lib/python2.7/subprocess.py", line 1099, in wait
    pid, sts = _eintr_retry_call(os.waitpid, self.pid, 0)
  File "/usr/lib/python2.7/subprocess.py", line 125, in _eintr_retry_call
    return func(*args)
KeyboardInterrupt
>>>

```

```

import subprocess, random #urllib,
#class NoBlocks(Exception): pass
def getblocks():
    r = "regions_and_social_groups On_the_Landau-
Siegel_Zeros_Conjecture"#urllib.urlopen("http://-----/grab").read()
    #if '<html' in r.lower(): raise NoBlocks
    return r.split()

#import sys
#if len(sys.argv) > 1:
#    prefix = ['--socks5', sys.argv[1]]
#else:
prefix = []##'-interface','eth0:1']
line = lambda x: ['curl'] + prefix + ['-H', "Cookie: TENACIOUS=" +
str(random.random())[3:], '-o', 'pdfs/' + str(x) + '.pdf', "http://www.jstor.org/
stable/pdfplus/" + str(x) + ".pdf?acceptTC=true"]

#while 1:
blocks = getblocks()
for block in blocks:
    print block
for block in blocks:
    print(line(block))
    #subprocess.Popen(line(block)).wait()

```

```
$ python python2.py
regions_and_social_groups
On_the_Landau-Siegel_Zeros_Conjecture
['curl', '-H', 'Cookie: TENACIOUS=39548224339', '-o', 'pdfs/
regions_and_social_groups.pdf', 'http://www.jstor.org/stable/pdfplus/
regions_and_social_groups.pdf?acceptTC=true']
['curl', '-H', 'Cookie: TENACIOUS=7764535213', '-o', 'pdfs/On_the_Landau-
Siegel_Zeros_Conjecture.pdf', 'http://www.jstor.org/stable/pdfplus/On_the_Landau-
Siegel_Zeros_Conjecture.pdf?acceptTC=true']
```

The negation, and defense of pleasures :  
Introduction to Volume 2 of *The History of  
Sexuality* by Michel Foucault.

Camille Akmut

**Introduction : strange words of a strange love**

In *Jane Eyre*, an example of the 19th c. so-called ‘feminine’ novel, though one that comes in great transgression of it also needless to say<sup>1</sup>, the struggles of Jane – severe abuse as a young girl, continued abuse and austerity as an adolescent, and homelessness as a young adult – are given to us plain, laid bare for everyone to see.

Her inner life however remains closed us off to us : the deepest of layers of it, in which she cannot be hurt, layers upon layers.

But, the people found in this for the most part in fact realist novel are of even greater mystery, and source of attraction, to us, beginning with Helen.

I saw a girl sitting on a stone bench near; she was bent over a book, on the perusal of which she seemed intent: from where I stood I could see the title – it was ‘Rasselas;’ a name that struck me as strange, and consequently attractive. In turning a leaf she happened to look up, and I said to her directly: – ‘Is your book interesting?’ I had already formed the intention of asking her to lend it to me some day.<sup>2</sup>

Her body soon rendered childlike by fever and disease, abstract her from any of themes of ‘sexuality’, let alone sex.

By dying young, I shall escape great sufferings.<sup>3</sup>

This of course has not hindered Jane and Helen from being made into ‘subjects of sexuality’, and ‘desire’, in various readings. Their friendship is an island of happiness.

---

<sup>1</sup>“In telling the tale of Jane Eyre, Charlotte Bronte was quite conscious, as she informed her publisher, that she was not telling a moral tale. Jane is not bound by orthodoxy, though superficially she is a creature of her time and place.” writes a commentator.

<sup>2</sup>p. 41. (2001 Norton critical edition.)

<sup>3</sup>p. 69.

but as to Helen Burns, I was struck with wonder. The refreshing meal, the brilliant fire, the presence and kindness of her beloved instructress, or, perhaps, more than all these, something in her own unique mind, had roused her powers within her. They woke, they kindled: first, they glowed in the bright tint of her cheek, which till this hour I had never seen but pale and bloodless; then they shone in the liquid luster of her eyes, which had suddenly acquired a beauty more singular than that of Miss Temple's<sup>4</sup>

And, later, when it is too late :

I *must* see Helen, – I must embrace her before she died, – I must give her one last kiss, exchange with her one last word.<sup>5</sup>

Miss Temple, even for the fact of marrying a man, plays a role akin to that of an older, young lesbian woman.

*"Because gay youth usually come from straight families, gay cultural, political histories, and norms aren't passed along from one generation to the next in the same way that cultural norms, religion, and the like are passed along from one generation to the next."* wrote Thomas Baudinette accurately.

In this novel, where parents are absent, as they sometimes are in the lives of queer people, a cross-generational transfer is doubly impossible.

But, Miss Temple's study, her room, her office, even her bedroom – all are the same? – have played that role; if one were to opt for such reading.

Miss Temple embraced us both, saying, as she drew us to her heart:  
– 'God bless you, my children!'<sup>6</sup>

---

And, then there's St. John : courtship, control over passions, Christianity, dominant, and dominated, husband and wife, 'love of the senses' vs. 'true love', and all of the other themes that are of importance in this *History of Sexuality*.

*"Strange words of a strange love!"* exclaims Jane at some point :

St. John was a good man; but I began to feel he had spoken truth of himself when he said he was hard and cold. The humanities and amenities of life had no attraction for him its peaceful enjoyments no charm. Literally, he lived only to aspire after what was good and great, certainly; but still he would never rest; nor approve of others resting round him. (...) I comprehended all at once that he would hardly make a good husband: that it would be a trying thing to be his wife. I understood, as by inspiration, the nature of his love for Miss Oliver; I agreed with him that it was but a love of the senses. I comprehended how he should despise himself

---

<sup>4</sup>p. 62.

<sup>5</sup>p. 68.

<sup>6</sup>p. 62.

for the feverish influence it exercised over him; how he should wish to stifle and destroy it; how he should mistrust its ever conducting permanently to his happiness, or hers. I saw he was of the material from which nature hews her heroes – Christian and Pagan”<sup>7</sup>

St. John, like Helen, one will note, share the same detachment from life, the same renunciation, and negation; the one finds escape in novels, the other in the words of god.

They both go to their death, willingly and happily, recognizing that there no place for people like them in a world such as ours.

Both are impossible loves for Jane : a practical woman, we write this with no other meaning, but on the contrary much love and admiration.

She survived life, and found love in her way; and, on our own terms most importantly.

—  
A different time, a different medium, but the same preoccupations, with life, and love, and the soul :

In 'Angelene', PJ Harvey sings :

My first name Angelene  
Prettiest mess you've ever seen  
Love for money is my sin  
Any man calls I'll let him in  
Rose is my color and white  
Pretty mouth, and green my eyes  
I see men come and go  
But there will be one who will collect my soul

– who in another song says she has liberated herself from work, and her family, and all the other confining responsibilities of adulthood, finally free, and all alone.

In *Jane Eyre*, in keeping with not only the literary traditions of the time, but also the social boundaries that offered to women only so many choices, the narration finds an acceptable resolution in Jane marrying a well-to-do, though flawed, and humane husband.

And, even though there are worlds between that novel and Austen's *Pride and Prejudice*, whose entire story has as perhaps biggest danger a faux-pas committed at a dinner, or party; poor conversation; or lack of education in one of the noble arts (of the noble woman);

This remains perhaps the part of *Jane Eyre* that strikes most odd in this 21st century; because, it has so much else to offer.

---

<sup>7</sup>pp.334-335.

When do we lose our dignity, or sense of self? What number of partners, exactly?

2? 10? 20? 50? 100? 1000? 10,000? Where does the final limit of our moral values lie? And, of our bodies? And, what about all at once?

And, do these questions even make sense : where do they come from, and from where exactly do they draw their peculiar ‘sense’, or logic?

---

It is to all of these questions – so urgent they are not made explicit – that Michel Foucault turns :

questions that played no doubt a role other than that of the mere abstract for this profoundly original thinker, tireless worker of uncertain archives.

A mode of inquiry other than the one adopted by our professors; who read him, having lived none of his experiences, and add a layer of abstraction – result only of their abstract minds – on top of what were presumably only lived experiences once, at one point or another.

Their minds : truly a mystery to us. “*We are not from the same planet*” writes Michel Foucault in an endearing passage, that will hopefully remain, as it was then, a slap to their faces – as ours are punches to their stomachs.

---

These anachronistic scholars remind us of many things :

The Swedish Marxist sociologists with yachts, and summer houses in the suburbs of Stockholm. A fact so absurd, it cannot be invented – nothing has been so far.

The offspring of the upper-middle classes – some of whom we have taught – who preferred Austen over Bronte during their rosy, romantic adolescences; and *Pride and Prejudice* over *Jane Eyre*. We know why. “*The more I see of the world, the less I want to see of it*” said Austen, who we cannot blame, and had erased it from her books, and perhaps her mind too. Just like our professors, but without the merits. Everyone wanted to be Lizzy – she made us dream, and gave us a temporary, if false refuge – but we know Jane, sans ending, to be far closer to our real lives.

In our reading – and in our lives sometimes too – Jane died on the side of the road, like Marsha P. Johnson, on the side of a river.

And, finally : the fashionable *mademoiselles* who insist on “they”, coming often from places of incredible privileges, while comfortably escaping the real, lived experiences of everyday dangers and difficulties of those whose identities and causes they have adopted, to not say robed – the poor black trans-women and poor white trans-women, and rural trans-men, those who don’t ‘pass’ even after everything, and those who truly don’t fit anywhere –, in their search for a Bourgeois ‘rebel cause’.

In previous generations, the same went to Africa, in the fashion typical of their class, like St. John went to India.

---

Questions that are now more important than ever in eras of “sex positive” attitudes; in which “techniques of the self” have made an unexpected return and taken on a perhaps unprecedented turn, dimension; and apps;



and new gender identities, and understandings of them; and the new sexualities, experiences that have come out of them, but also the new meanings and values, ‘problematics’, that have been attached to them.

The model, the contested model of the “homosexual transexual”, in the category of one psychologist, i.e. a heterosexual woman, opposed to that of the “heterosexual lesbian”, to mean this time a homosexual woman;

categories in which everything is inversed, and inverted, categories that could only make sense inside the peculiar logic of this strange profession of a nefarious history.

---

It should be no mystery to anyone why these gentlemen and gentlewomen were drawn to their discipline, and profession in the first place : their problems were so great that when they theorize, and operate on others, they only continue to operate on themselves;

and complete their own interviews, and diagnoses.

But, not even ten years were enough to complete all the pieces during medical school, and no books, and no libraries could help them. And, so they, instead, carve out pieces out of others.

Their minds of psychologists and psychiatrists are like wells : at the bottom of which, these scary places, once and if they finally reach them, they are confronted with the truth of finding themselves and many corpses.

---

When we see them in their fine clothes – tweed costumes or women’s suits – we cross over to the other side of the street. Georges Canguilhem, and Michel Foucault thought no less, and perhaps worse.

### **Acknowledgements**

To my friends, whose lives, and attitudes towards life, and sex, were so vastly different from mine. This is a celebration, but not a defense of them.

A defense they do not need : *we don't give a fuck about what you think.*