

Article

The Science of Virtual Culture Wars

William Sims Bainbridge¹¹ wsbainbridge@gmail.com

Abstract: Much of today's geopolitical conflict is taking place online, carried out in significant measure by volunteers, even as governments seek to emphasize information technology cooperation. Computational social scientists have discovered multiple online environments in which to collect relevant statistical data, including Wikipedia pageviews, archives of government research grant abstracts, and behavior in massively multiplayer online war games. Three very different examples of the dynamics of collaboration and conflict provide alternative perspectives: (1) the Pirate Parties that seem to have been an overly ambitious attempt to transform democracy in the Information Age, (2) citizen science that had some success attracting volunteers to donate labor to academic research projects, but generally avoided controversial research projects in areas such as human conflict, and (3) a genre of online role-playing games that emphasized spontaneous organization of volunteer armies to develop skills and resources for victory. Without claiming to offer strict rules for success, this article considers the organizational structures and practical methodologies that might be adapted for achievement of goals by ethical social movements.

1. Introduction

At a time in history when the New World Order and many governments of nations seem to be descending into disorder, it is worth examining the virtual organizations that use information technology for more creative forms of chaos. Here we shall consider relevant data and research literature in the context of three contrasting examples, each of which has qualities of a social movement: (1) the Pirate Parties International that proposes peaceful but revolutionary transformations of intellectual property rights and representative democracy, (2) Citizen Science in which traditional organizations recruit volunteers from the general public to contribute to objective research studies, and (3) *EVE Online*, a war-oriented massively multiplayer online game that supports direct conflict in a virtual cosmos where research is fundamental for survival. Other examples will also be considered, but the distinctive qualities of these three facilitate discussion of major issues at an anarchistic time in history when traditional norms seem either obsolete or sadly lacking sufficient respect. Deep issues must be at least noticed, before we can be confident in developing practical new innovations to improve human society.

The focus of this analysis is on how human beings organize their use of information technologies to achieve goals such as promoting new government legislations or public freedoms, and attacking or defending within global conflict. We often think of algorithms as simple mathematical functions operating on computers, yet on a higher level of meaning they can also be social action plans that shape the dynamic human interaction between conflict and cooperation, and that degrade or develop online ethics. The three main examples were chosen because they stimulate thought and connect to much useful information, but that does not require the reader or even the author to agree with the norms and values of any particular online social movement, including of course the Pirates.

Citation: Bainbridge, William Sims. 2022. The Science of Virtual Culture Wars. *Journal of Ethics and Emerging Technologies* 32: 1. <https://doi.org/10.55613/jeet.v32i1.112>

Received: 25/07/2022
Accepted: 29/11/2022
Published: 29/11/2022

Publisher's Note: IEET stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2022 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).

2. Inspirational Online Piracy

In order to have a clear but intense basis for subsequent consideration of the social and cognitive science research, this section will survey a striking example of a complex online subculture and some of its connections: Pirate Parties International. The popular electronic platform for information sharing, Wikipedia, explains: "Pirate parties support civil rights, direct democracy (including e-democracy) or alternatively participation in government, reform of copyright and patent law, free sharing of knowledge (open content), information privacy, transparency, freedom of information, free speech, anti-corruption and net neutrality."ⁱ Although its roots are older, the public birth of the first Pirate Party was on January 1, 2006, when the *Piratpartiet* was founded in Sweden. There, also in Germany, and to some extent elsewhere, the national version of a Pirate Party has garnered votes in elections, but across the 40 or more nations where this social movement exists, its organization and policy emphasis has varied. For our purposes, two of its revolutionary goals are especially interesting: (1) Limiting or even eliminating copyright and some other forms of legal protection for intellectual property, and (2) Experimenting with alternative forms of online government, notably fluid democracy that reduces the significance of stable political parties (Hall, 2012).

The word *pirate* has multiple meanings, but many of the historical and contemporary cases were in the context of some form of tyrannical government that honorable pirates opposed, and the name did generate a good deal of publicity (Dawdy & Bonni, 2012; Fredriksson, 2020). Pirate Party enthusiasts quickly disseminated positive propaganda, such as a note in *British Medical Journal* that proclaimed: "Although the party was initially concerned with file sharing, it has expanded its focus to include three areas that are especially relevant to doctors: reform of copyright law, respect for patients' right to privacy, and the abolition of drug patents. The Pirate Party is critical of the copyrighting of scientific articles and anything else that reduces their accessibility because it believes that knowledge has intrinsic value" (Ingdahl, 2011, p. 1280). In 2011, the website of Pirate Parties International, that was in the form of a wiki, posted a formal resolution complaining that Bradley Manning was imprisoned by the United States government for transmitting secret documents to WikiLeaks: "It is a sad day when someone just accused of trying to expose war crimes is treated worse than those who actually commit them."ⁱⁱ In 2015, another resolution posted on the same page included:

Improved public availability of information, knowledge and culture is a prerequisite for the social, technological and economic development of our society. Pirates therefore demand that copying, storing, using and providing access to literary and artistic works for non-commercial purposes must not only be legalised but protected by law and actively promoted. Everyone shall be able to enjoy and share our cultural heritage free from the threat of legal action or censorship.

Early in the process of its development, the German branch of the Pirate Party promoted what it called *liquid democracy*, an English term that translates into German as *flüssige Demokratie*, that might better be translated back as *fluid democracy*.ⁱⁱⁱ One version would give each voter in a nation a private website where the government would list current issues that were before parliament, and the voter could mark which party should have his or her vote for each separate issue (Bainbridge, 2012). Thus, the decision in parliament would be based on the

momentary numbers of voters rather than of term-serving politicians. Another algorithm would allow any registered voter to identify another specific voter as their virtual representative, sometimes creating a mountain of links that effectively served as an online parliament that might or might not have organized parties, and might be highly fluid as the issues under consideration changed. Even though it seems unlikely that such radical changes in democratic systems of national government are likely in the near future, fluid democracy can function for a diversity of online communities that are not limited by geographic boundaries, what Tonn and Feldman (1995) called *non-spatial government*.

Having already cited a Wikipedia article, plus linking two public but internally controlled wikis belonging to Pirate parties, we can get an overview of the global reach of this conflict-oriented subculture by tabulating the number of pageviews garnered by multiple pages in six linguistically different versions of Wikipedia during the year 2021. Wikipedia is not merely a tool for learning about social movements, but is itself a social movement with values similar to those of the Pirates, especially volunteer sharing of authentic information, which logically harmonizes with freedom of expression. However, Wikipedia does impose controls on its contributors. The pageview statistic on the English language version begins on July 1, 2015, and simply counts how many times someone accessed the page, thus a rough measure of the popularity of the topic.

Given that Wikipedia was born in the United States, and the English version dominates with 6,512,404 articles as of June 13, 2022, other languages often translate but also adapt the original articles. However, in the case of an international social movement, its early advocates may create Wikipedia articles as instruments of promotion. The English-language page for Pirate Parties International was created by a German-speaker who later left Wikipedia in anger over its policies; the second contributor to that page had already created the page about the Pirate Party Germany; the third had edited the article on Pirate Party (Ireland), and the fourth was a Romanian whose user page proclaims: “Big Brother is watching this user. This user supports the worldwide Pirate Party movement.” Second place among popular wikis is held by the German Wikipedia, with 2,697,739 articles, but it does not report pageviews so cannot be included in the analysis. The top rows of Table 1 concern several components of the Pirate Party movement, and the bottom rows support a wider discussion.

Table 1: Wikipedia Pageviews in 2021 Measuring Culture Conflict

Article Topic	English	French	Italian	Spanish	Swedish	Russian
Pirate Party	127,366		16,703	16,632	284	12,799
Pirate Parties International	26,352	5,060	2,008	2,080	383	4,124
Pirate Party of France	3,468	22,868				
Italian Pirate Party	1,464			271		193
Pirate Party (Spain)	1,902			5,523		
Pirate Party of Chile	2,575					
Pirate Party of Russia	3,290					20,481
Pirate Party (Sweden)	63,652	4,814	2,304	7,227	16,876	10,659

Pirate Party Germany	55,313	6,805	3,958	4,151		8,978
Pirate Party UK	15,816				38	412
United States Pirate Party	38,081					1,486
Minecraft	4,759,267	347,076	231,636	755,175	67,659	1,325,424
Markus Persson	823,111	46,701	27,232	76,986	46,496	109,733
EVE Online	242,265	17,508	6,153	23,217	1,989	80,861
Hacker	500,460	11,154	67,910	226,897	5,666	91,697
WikiLeaks	967,197	197,603	181,275	168,133	21,246	121,682
Anonymous (hacker group)	743,546	142,477	145,149	277,937	14,120	392,386
Scientology	2,149,295	290,537	315,856	396,225	91,915	604,602
Jediism	119,160	12,720	5,677	11,370	1,584	19,954

The blank cells in the table indicate that I could not find a page comparable to the English article, and that reflects two factors: (1) wikis often differ in the extent to which they divide a topic across multiple pages versus combining on one big page, and (2) the nations differ in the extent to which their Pirates belong to the Pirate Parties International alliance. The French wiki has a page for the PPI that serves the Pirate topic more generally, as does the page for Pirate Party of France. There also exists a secondary page named Liste des Partis Pirates, with just 1,912 pageviews, that lists fully 107 local branches across many nations, but does not provide any information about the movement generally, or other relevant text. The attempt to build an international movement ran into multiple problems, beginning with the resistance of standard politicians and societal institutions to consider revolutionary changes. That probably increased the tensions within and between the many fleets of pirates.

On February 11, 2015, Pirate Party Australia resigned from the Pirate Parties International, expressing disappointment in its performance: “The Party no longer believes that there is any potential for reform left in PPI, and we have spent all of the energy we are willing to in pursuit of that end. This was compounded by the callous abuse of power and outright hostile culture of the PPI board which has been very clearly demonstrated over the last week.”^{iv} By July 2016 these other national parties had also resigned: United Kingdom, Belgium, Iceland, Sweden and Canada. The perhaps outdated *uspirates.org* website implies the United States Pirate Party belongs to PPI, providing a link in: “We’re part of the international Pirate Party movement, the fastest growing political movement in the world.” Yet that link goes to the PPI website that does not link back and only mentions two US groups among the non-members that are “observers:” Pirate Party of New York and Pirate Party of Florida (“declared a no member due to dissolution 06.12.2019”).^v We may hope that European social scientists will conduct more detailed and illuminating studies of the global movement’s history.

Markus Persson, creator of the very popular 2011 user-centered online game, *Minecraft*, has been a supportive member of the movement, frequently quoted for proclaiming: “Piracy is not theft” (Tassi, 2011; Battjes, 2011). *Minecraft* exists in many forms, and players can set up their own servers, such as the one Jessie

Craft (2016) created as a laboratory for teaching about Roman civilization, where students could build models of many well-documented ancient temples. An anarchistic simulation of war created in Iceland back in 2003, *EVE Online*, is less popular but among the most respected massively multiplayer games, set in a galaxy where only the starting areas are civilized (Bergstrom, Carter & Woodford, 2016), as we shall explain in the third section of this article. *Minecraft*'s own wiki, which currently has 8,153 articles, explains: "*Minecraft* multiplayer servers have developed to include their own rules and customs, guided by their administrators and moderators. The term griefer, meaning a player who causes grief, is a typical term on the internet but has taken up its definition on *Minecraft* servers: a person who destroys or defiles other users' creations on servers."^{vi} The total number of pageviews above *Minecraft*'s row in the table is 516,396, far less than the game's 4,759,267, which partly reflects the fact the Pirate movement had started disintegrating before the first pageviews were made public by Wikipedia, long before these 2021 data, but also may suggest that people often seek activities they themselves might want to become engaged in: *activism requires activities*.

Griefers have some of the quality of *hackers*, although the definitions of both vary across countries and applications. The original benign hacker subculture emerged in the 1960s at the Massachusetts Institute of Technology, as described by Brian Hayes (2015, p. 12): "The enthusiasts who called themselves hackers, most famously situated at MIT among members of the Tech Model Railroad Club, saw computer programming as a puzzle to be solved, a world to explore, a medium of self-expression. They saw it as fun. They resisted the idea that only an elite with engineering credentials would be allowed access to the machinery. The notion that programming could be regulated or restricted was further undermined when personal computers became widely available and affordable in the 1980s." Google Translate renders "hacker" into French as "pirate," which may explain the relatively low number of pageviews for "hacker" in the French version of Wikipedia, and reminds us that some of the pageviews on any of the pirate pages may have been by people seeking information about a different topic.

We already noted the affinity between Pirate Parties International and WikiLeaks, although in cyberlingo we might distinguish them as hackers versus griefers. Political scientist Bruce Altschuler (2015, p. 414) has considered WikiLeaks in comparison with the Pentagon papers case in which secret information about American involvement in the Vietnam War was revealed: "Although it has servers in countries such as Sweden and Germany, WikiLeaks has no geographic headquarters. Instead, it consists largely of networks of supporters and mirrored sites in cyberspace. The organization invites anonymous leaks from around the world." In 1971, Daniel Ellsberg began sharing documents with the *New York Times* and other well-established news media, which exercised some care about what to share with the public and could be restrained by legal injunctions. Altschuler notes that recently the US government has been more aggressive in prosecuting leakers like Bradley Manning, perhaps because the communication context had become much more chaotic and institutional controls had therefore weakened. WikiLeaks is often compared with Anonymous, to which terms have been applied like *hactivists*, *e-bandits* or *Robin Hoods* (Wong & Brown, 2013; McCarthy, 2015). Unlike them, Pirate Parties value privacy for all human beings, but does not demand anonymity for themselves.

While WikiLeaks gathers and publicizes confidential information, the Anonymous hacker group has staged online attacks, beginning in 2008 with

Project Chanology that targeted the Church of Scientology, not only by posting much negative propaganda online, but even blocking access to Scientology's own websites. The symbol of Anonymous is a surreal mask representing the face of Guy Fawkes, who planned the unsuccessful attempt to destroy the English parliament building in 1605, as represented in the politically radical 2005 movie, *V for Vendetta* (Waites, 2011). One irony is that Scientology is a prominent technological religion, that uses an electronic device called the e-meter during spiritual discovery sessions and was created by a former science fiction author (Lewis, 2009; Westbrook, 2019). Another irony is that the screenplay for *V for Vendetta* was written by an avatar named "The Wachowskis" who had been a pair of brothers, became a pair of sisters, and was the creator of the 1999 movie *The Matrix* that explained how information technology could be used to enforce infinite tyranny.^{vii}

The last row of Table 1 concerns Jediism, a quasi-serious religious and technological social movement based on the *Star Wars* mythos, comparable in various ways with Scientology and the Pirate Party (Williams, Miller & Kitchen, 2017; Farley, 2017). Jediism is worth including here because it connects to many other potentially transformative subcultures and has been studied extensively (Decker & Eberl, 2005; McDowell, 2007). For example when Luke Skywalker meditates while attacking the Death Star in the original 1977 movie, he is acting out *Zen in the Art of Archery* by Eugen Herrigel (1953). Tens of thousands of people have proclaimed themselves members of the religion of the Jedi Knights, whether as a proclamation of faith or a prank or an expression of secularism, and they assert the right to adapt the culture as they themselves choose (Lyden, 2012).

Striking examples entirely in harmony with the Pirate Party are three *rogue servers* of a massively multiplayer online (MMO) game or virtual world: *Star Wars Galaxies Legends*, *Star Wars Galaxies' Restoration* and *Star Wars Galaxies's SWGEmu* (Royce, 2022). In 2011, the high-quality but only moderately popular MMO, *Star Wars Galaxies*, was shut down, because the Lucasfilm company was transferring the rights to a new and more constricted MMO, *Star Wars: The Old Republic* (Bainbridge, 2016a). A few thousand Jedi role-players loved the freedom of *Star Wars Galaxies*, which was more like a virtual world where participants could set up their own towns, make a vast variety of virtual furniture for their online homes, and even create missions for each other. The rogue servers are technically illegal emulations of the original, violating copyrights that belong to Lucasfilm, thus illustrating online piracy even as they fulfill the personal needs of autonomous Jedi knights.

3. Citizen Science and Informatics

Online social media are complex combinations of opportunities and challenges, that interact in difficult ways with the motives and skills of their users, within a wider environment that seems increasingly chaotic. An example of the global variations is the fact that Pirate Parties International harmonized better with parliamentary systems, such as the Swedish Riksdag where many parties hold at least a few seats, than with the essentially two-party system in the United States. Even a small number of Riksdag members would have a platform to promote ideas about changes in copyright laws. To do so, they would need to be public, rather than concealing their personal identities as members of Anonymous and contributors to Wikipedia do. While people may register on Wikipedia with their real name, or could even contribute without full registration (Champion et al.,

2019), they are encouraged to develop a new virtual identity: “Having an account gives you a fixed Wikipedia identity that other users will recognize. While we welcome contributions from unregistered editors, logging in under a user name lets you build trust and respect through a history of good edits, and makes it easier for veteran users to assume good faith, communicate and collaborate. Having a good name (or a pseudonym to protect your identity) promotes more responsible editing, and more civil discourse.”^{viii}

Launched in 2001, Wikipedia grew rapidly for a decade until researchers began reporting a considerable rate of turnover of contributors, recognizing that some early participants had already made their best contributions, while newcomers could contribute new information even while the increasingly demanding norms and technical aspects of the system may have discouraged them (Ransbotham & Kane, 2011; Halfaker et al., 2012; TeBlunthuis, Shaw & Hill, 2018). One recent study examined the likely causes of under-representation of women among the sociologists who have Wikipedia articles, reporting that the bias seemed to be primarily at the early stage of submitting a draft article, rather than any gender bias in cases when an article was accused of promoting someone who was not already prominent (Adams, Brückner & Naslund, 2019). To be eligible for an article, a sociologist with an academic position needed to have achieved measurable prominence, for example being a full professor with many publications, so Wikipedia may reflect bias in the world at large, but also articles were less likely to be contributed about women who met the criteria than about men who did. As in my own research on Wikipedia (Bainbridge, 2020), the article’s findings raise the concern that Wikipedia has become to a significant extent a free advertising medium, where individuals, companies, and social movements promote themselves, using privacy norms to conceal their motivation.

However, Wikipedia is only one of thousands of wikis, and many of the others were focused on narrow topics that encouraged accuracy rather than endless growth in pages and contributors (Foote, Gergle, & Shaw, 2017). A team led by Yolanda Gil (2013) reported results of their research on 20 wikis that employed rigorous methods for conceptual organization:

Semantic wikis are wikis with extensions that support the creation of structured content. Traditional wikis support some ways to structure content, for example by assigning categories to topic pages. In Wikipedia, for example, infoboxes are defined for countries, soccer players, etc. A semantic wiki allows users to organize topic page categories as classes in an ontology, and to define properties that apply to each class. Semantic wikis allow users to constrain properties by the range of values that they can take, which are called structured properties. As content is added using these structured properties, the semantic wiki can use reasoning and inference. Users can then query the content to generate dynamic content for wiki pages.

By chance, one of the 20 wikis, Scientolipedia, belongs to the Church of Scientology, which indeed has a distinctive ontology. Another was a “fan site of the Navi in the movie Avatar” which I was not able to find a decade later, but I did find two competing wikis for this science fiction series that was finally about ready to release sequels: avatar.fandom.com (13,976 pages) and james-camersons-avatar.fandom.com (1,176 Pages). Note that the host company for thousands of wikis used to call the system “wikia.com,” with the implication that a very wide

range of topics and subcultures were included, but now is “fandom.com,” a payment and advertising-supported expression of popular culture, predominantly in these genres: games, movies, TV, anime, books, music and lifestyle. Frankly, some fraction of the wikis may have been created anonymously by the companies and may entirely lack volunteer contributions. That suggests the deep question of whether online democracy is currently feasible, or it is necessary for each online source of information to be hosted by a well-structured, real-world organization whose leadership is far from anonymous.

A good source of insight and inspiration is the wide range of research grants from the National Science Foundation, an agency of the United States government, that relate in some way to *citizen science*. A September 30, 2015, news item from NSF proclaimed:^{ix}

So you want to be a citizen scientist? The National Science Foundation (NSF) has got you covered. NSF supports citizen science and crowdsourcing efforts across all areas of science, whether your passion is to scan the night sky, explore your own backyard or play video games... Citizen science not only opens new research avenues, but brings diverse perspectives and skill sets to research and allows everyone to deepen their understanding and appreciation for science.

A vastly more complex message about citizen science can be obtained from NSF’s public grant abstracts database, using its advanced search tool and downloading the results as a spreadsheet for analysis.^x In late June 2022, I entered “citizen science” into the keyword field of the search engine and clicked the box labelled “expired awards” to include completed projects that had submitted their final reports. The result was fully 885 abstracts of grants that at that point had received \$618,664,724 of funding. Some of the most recent grants still expected future funding increments, but these numbers were so high because in many cases - probably most - citizen science was merely a small component of the research. In the rare cases when a grant was transferred from one institution to another, the resulting two abstracts may report some dollars twice. Our goal here is not a precise assessment of NSF’s support for citizen science, but to identify general principles for future research on formally-organized volunteer work. Anyone can download the same data for deeper analysis. Notably three of the abstracts described large projects, each of which was funded above \$20,000,000, from proposals submitted in fiscal years 2012 to 2014:

Award 1458952 for \$21,066,907, Gravitational Wave Astronomy and the Appalachian Freshwater Initiative: “An interdisciplinary team of researchers with expertise in biology, ecology, environmental engineering, chemistry, and geology will develop analytical facilities and expertise through the Appalachian Freshwater Initiative (AFI) to understand and detect ecological and biological impacts of complex mixtures of contaminants in water under varying climate change scenarios... Public engagement will occur through citizen science efforts, as well as museum and planetarium displays and programs.”

Award 1208732 for \$20,170,787, iUTAH-innovative Urban Transitions and Aridregion Hydro-sustainability: “This Research Infrastructure Improvement (RII) Track-1 award considers one of the most important problems facing

the Western US, the problem of current (and future) water provision under climate change coupled with increasing urbanization and demand for water... Activities span K-12 students and teachers; undergraduates, graduate students, postdoctoral fellows and faculty; citizen science and industry and federal government.”

Award 1246537 for \$21,000,000, NEON Initial Operations: “Our fundamental understanding of the effects of climate and landuse change, and invasive species on the biosphere requires an instrument platform that has the capabilities to measure the structure, composition, processes, and dynamics of the biosphere from sub-meter to regional scales, regional scales to the continental scales, and beyond... The NEON Citizen science products... and all educational components of the NEON web portal will be operational.”

Clearly, these are major research infrastructure investments that include citizen science within their educational and outreach activities, and thus are models of how activist social movements might add citizen science to their methods of innovation and promotion. Each grant is managed in a particular program, division, or large-scale directorate of NSF. The first two described above were multidisciplinary projects managed in the Office of the Director, while the third was managed in the Directorate for Biological Sciences. Table 2 tabulates all the abstracts across the directorate structure, by fiscal year of proposal submission. There are several ways the analysis could go deeper than Table 2, for example counting the numbers of principal and co-principal investigators, who are identified by name in each abstract.

Table 2: National Science Foundation Grant Abstracts Containing “Citizen Science”

NSF Directorate	Number of Funded Proposals by Fiscal Year Submitted						Total
	1995-99	2000-04	2005-09	2010-14	2015-19	2020-22	Investment
Biological Sciences	0	1	15	69	180	62	\$169,280,961
Computer & Information Science & Engineering	0	0	4	32	47	10	\$73,683,697
Education & Human Resources	1	8	18	41	45	18	\$147,990,122
Engineering	0	0	2	5	47	13	\$41,666,879
Geosciences	0	0	2	19	68	43	\$71,668,115
Mathematical & Physical Sciences	0	0	2	10	30	18	\$33,906,100
Office of the Director	0	0	6	8	3	0	\$68,075,515
Social, Behavioral & Economic Sciences	1	2	2	12	30	10	\$10,819,021
Technology, Innovation & Partnerships	0	1	0	2	5	1	\$1,574,314

Total	2	12	51	198	455	175	\$618,664,724
-------	---	----	----	-----	-----	-----	---------------

The dollar figures are not adjusted for inflation, and some projects were collaborations between universities, or transferred from one to another and gained a second abstract, so there is some noise in the counts of grants. For an extreme example, 5 collaborative grants from 2009 were managed in the Office of the Director “to support cyber-enabled research that requires analyses of large datasets... will partner with citizen science groups to inform the public.” The 6th grant managed by the Office in 2009 was for only \$19,955, but funded an important joint planning meeting between the United States and United Kingdom related to the centrally important citizen science organization, Zooniverse, that we shall describe later. The Directorate for Technology, Innovation and Partnerships, the last listed in Table 2, was actually created in 2022, but inherited some programs from the Engineering directorate, so their old grants are now listed within it.

The first grant in this set, award 9802248 starting July 15, 1998, invested \$1,428,155 in an experimental education project: “The Parents Involved/Pigeons Everywhere (PIPE) project is a collaboration between KCTE-Community Television of Southern California, The American Association for the Advancement of Science, and the Cornell Laboratory of Ornithology. They are developing a three-year model project to engage parents in science education with their children through Project PigeonWatch, a citizen-science program run by Cornell University.” By 2002, this exploration had led to the development of eBird at the Cornell Laboratory of Ornithology, which two decades later had grown into a worldwide scientific collaboration between scientific ornithologists and amateur birdwatchers, that collects data on the changing distribution of birds, now over the years as well as months, thus providing information about the evolving ecology more generally. One year after eBird took flight, Levin and Cragin (2003, p. 19) observed:

A particularly ambitious example of enlisting amateurs is eBird (www.ebird.org), which aims to utilize the popularity of bird watching to compile an extensive bird census database for North America. Quality assurance needs that arise with such data can be addressed in various ways. Developing methods for delivering identification tools to the field, possibly augmented by real-time connections with professional scientists in the laboratory, can improve quality assurance. Integration of quality control tools directly into the data gathering process offers still further improvement. For example, eBird responds with specific identification queries when rare, difficult-to-identify or out-of-range species are entered into the database. Field data entry using handheld computers linked through satellites to remote databases could further increase data gathering efficiency for both amateurs and professionals and could even be used to generate labels for specimens as they are collected.

The second grant, starting August 5, 1999, invested just \$84,091: award 9975518 Citizen-Science Alliances in Contested Environmental Diseases. The focus was human illnesses that might be caused, at least in part, by environmental pollutions such as toxic chemicals, but that doctors were attributing entirely to heredity and bad diet or personal habits. Two specific areas included the Gulf War syndrome that primarily affected men, and breast

cancer that affected women (Brown et al., 2001; Zavestoski, 2002; McCormick, Brown & Zavestoski, 2003). The online grant abstract remarkably emphasized how ordinary citizens may seek help from scientists to achieve public goals: “1) How do laypeople decide they need science allies and seek them out? 2) Where are allies found? 3) How do scientists who serve as allies think about their role? 4) How successful are the processes and outcomes of citizen-science alliances? 5) Do science allies face discouragement, condemnation, or bias as a result of their activities? 6) Should policymakers and regulatory agencies create new organizational contexts, based on laypeople’s experiences, that will provide science allies?”

In considering how to mitigate harm from industrial pollution of the environment, the researchers evoked the *precautionary principle* that requires careful assessment of potential negative broader impacts before a technological innovation is broadly applied: “Activist organizing around the precautionary principle seeks more public input in science, through citizen participation and through popular challenges to the dominant ideas and institutional practices regarding the use and disposal of chemicals and other toxic substances. For these reasons, the precautionary principle is a public paradigm” (Mayer, Brown & Linder, 2002, p. 117).

NSF was an early supporter of the prominent Zooniverse alliance, that began with the Galaxy Zoo astronomy project, where amateur astronomers helped classify photographs of galaxies, that launched in 2007 and then expanded to cover a diversity of citizen science activities (Lintott et al., 2011). The small 2009 grant for an international Zooniverse planning meeting was but one of four supporting that vast project that year, two big ones being from the Directorate for Education and Human Resources: 0941610 Zooniverse - Conquering the Data Flood with a Transformative Partnership between Citizen Scientists and Machines (\$1,889,993) and 0917608 Investigating Audience Engagement with Citizen Science (\$926,327). The fourth, from the Astronomy division of the Directorate for Mathematical and Physical Sciences, was smaller: 0958508 Giving Zooniverse a Face: A Citizen Science Facebook Application (\$97,638).

Of course not all relevant grants were turned up in the simple search for “citizen science,” and one way to find more is to search again using the names of the principal investigators (PIs) from relevant grants that had already been located. Lucy Fortson was the PI of the 2009 meeting grant, and PI or CO-PI of 17 others, including this predecessor to Galaxy Zoo: 0537460 Introducing High School Science Teachers to 21st Century Research Techniques made Possible by Cyberinfrastructure (\$270,763), for which the institution was Adler Planetarium in Chicago. Astronomical topics remain central, but many of the smaller Zooniverse projects now examine biology, environment and human culture. Table 3 offers the popularity of the subset of 5 out of 105 projects that earned their own Wikipedia articles and had statistical reports on the Zooniverse website, arranged in descending order of their numbers of volunteer citizen scientists.

Table 3: Popularity of the Most Prominent Zooniverse Citizen Science Projects

	Wikipedia Pageviews	Zooniverse Data
--	---------------------	-----------------

Title	2016	2021	Volunteers	Classifications
Galaxy Zoo	14,359	12,911	86,545	4,833,426
Backyard Worlds	0	5,040	73,488	248,377
Planet Hunters	8,513	6,339	19,993	319,708
The Milky Way Project	1,242	886	15,496	241,056
Disk Detective	789	473	10,197	227,254

A large fraction of the popular Zooniverse projects ask volunteers to classify images that had been gathered by professional scientists, as in Galaxy Zoo which had volunteers classify galaxies by their shapes in regular telescope images, but in some cases the visual display is more dynamic. Backyard Worlds was funded by the National Aeronautics and Space Administration and launched in 2017, searching for objects at the far borders of our solar system, including the proverbial ninth planet that Pluto used to be, before being demoted to the status of dwarf planet. The method flashes two different images of the same view taken some time apart, and the citizen scientist looks for anything that seems to move. Planet Hunters, also NASA-funded, displays the changing brightness of a star as a graph, and on rare occasions citizen scientists have detected the slight darkening when a planet passes between the star and the space telescope that collected the data (Fischer, 2012). Setting aside the technical details, we need to consider what motivates people to participate in citizen science, how their privacy is protected, and what methods are used to monitor and control their behavior.

A big advantage for eBird was that a rather large community of birdwatchers already existed. Dedicated *birders* do not merely gaze out the kitchen window at sparrows on their lawn, but hike into fields and forests, gaining healthy exercise and communion with nature, often developing enduring friendships with fellow “birders” of their area. A study completed just before Internet became popular administered questionnaires to birdwatchers, and confirmed earlier research that showed a broad spectrum from casual beginners to advanced experts (McFarlane, 1994, p. 367): “Only advanced birders were associated with primarily an achievement motivation of improving birding skills and knowledge. The casual birder sought an appreciative experience of enjoying nature and the outdoors. At this stage birdwatching may serve as a means to experience nature with little emphasis on birds per se. Novice and intermediate birders were interested in contributing to conservation.” Logically, the motivations of citizen scientists would differ by field of science and research methodology. Amateur astronomers were active long before Internet, and they may feel a connection with nature despite the infinitely greater distance to stars than to birds. Yet discovering planets circling those distant suns does not have obvious implications for conserving nature on our own planet, as bird watching does.

When a birder sends data from the field to eBird, it reveals where the birder is as well as the bird. That is an example of how issues of personal privacy may unintentionally arise in citizen science. Local groups of birders share their real identities among the membership, while online groups differ greatly in whether membership is anonymous, as the complex example of Wikipedia already illustrated. There is considerable variation among users of social media concerning awareness of the privacy-related risks they face and what the norms

should be (Shipman and Marshall, 2020). A study of multiple citizen science projects found that “volunteers take complex social factors and norms into account while making judgments about when and how to be concerned about privacy in citizen science. Both project coordinators and volunteers are aware of potential privacy violations associated with participation in citizen science. Yet, the norms and values of this context promote a shared culture that prioritizes openness, rather than data protection” (Bowser et al., 2017, p. 2132). While phrased optimistically, this quotation implicitly reminds us that the social sciences often study human conflict, with the unfortunate consequence that human subjects ethical rules are difficult to enforce when citizen scientists are sent into the field to observe people rather than birds. That may be one of two causes of the low dollar investment in citizen science by NSF’s directorate for Social, Behavioral and Economic Sciences, reported in Table 2, the other reason being low support for social science research more generally.

4. A Dystopian Eden

Research concerning criminal or military online behavior is, to say the least, difficult for academic scientists to do, beyond very technical computer science engineering to increase the security of current communication systems. One alternative is using violent online games as if they were simulations of more serious conflict. For example, a team led by Dmitri Williams has been studying behavior in *World of Tanks*, in which small teams of players battle each other in simulated military vehicles. The online Steam store had 32,899 player reviews, 80% of which were positive, and proclaimed: “More than 600 tanks and military vehicles from history’s greatest tank-building nations are waiting for you! Choose from one of five vehicle types and familiarize yourself with their unique features and specialties. Find the perfect combination of vehicle and nation that fits your playstyle and be unstoppable!” The research explored causes and consequences of prejudicial treatment of some players by others, finding factors that operate also in real life but may be more significant online when mitigating factors like well-established personal identities and sympathetic perceptions are lacking (Nguyen, Sun & Williams, 2021).

A simulation of much wider-scale conflict is *EVE Online*. Instead of driving tanks in brief battles on small battlegrounds, the players have constantly been at war since 2003 in an entire galaxy. Named New Eden, it was colonized from Earth but fell into a Dark Age and forgot its origin, after which competing cultures arose. Players create their own alliances to control vast territories, and hundreds of player spaceships often enact huge battles. As I reported in a comparative study titled *The Virtual Future*: “*EVE Online* stresses conflict between people even more than many of the other examples do, leaving much of the galaxy wide open for player-versus-player (PvP) combat” (Bainbridge, 2011, p. 124). *EVE*’s Wikipedia page notes: “Owing to the game’s focus on freedom, consequence, and autonomy, many behaviours that are considered griefing in most MMOs are allowed in Eve. This includes stealing from other players, extortion, and causing other players to be killed by large groups of NPCs” [non-player characters].^{xi} Some players create multiple accounts, so that they can use a secondary account to place avatar spies inside the alliance that is at war with the alliance to which avatars in their primary account belong.

Astronautical progress in the New Eden galaxy requires a player to experiment extensively and to enlist avatars in lengthy training programs, so they

will gradually develop the knowledge required to construct their own fleets of spaceships that also mine asteroids for the required materials (Bainbridge, 2016b). *EVE Online* included a real citizen science project called Project Discovery, comparable to Planet Hunter but using data from a different telescope, which players could switch to in-game when they needed a rest from conflict.^{xii} An ethical player organization that stands apart from the galactic war and assists beginner players, EVE University, posted an interesting real-world warning on its website:

Please note that the information found here may be in violation of the laws of the country or jurisdiction from where you are viewing this information. E-UNI does not encourage the violation of any laws, but this information is stored on a server in the State of Florida in the United States of America, and is maintained in reference to the protections afforded to content providers and readers in that jurisdiction. The laws in your country may not recognize a similarly broad protection of free speech; E-UNI cannot be responsible for potential violations of such laws, should you link to this domain or reuse any of the information contained herein.^{xiii}

When an avatar is created in *EVE Online*, it needs to be assigned to one of four factions: the theocratic Amarr Empire, the capitalistic Caldari State, the sensuous Gallente Federation, or the inventive Minmatar Republic. They have achieved a precarious but well-imposed peace in part of the EVE galaxy, but once players have adapted to the challenging technology for building spaceships and flying from star to star, they ignore the old factions and create their own new ones, to engage in violent battle in vast low-security space. Unlike games based on existing franchises, such as *Star Trek* and *Star Wars*, *EVE Online* had no existing story, and technically it was limited to simulation of flying a spaceship rather than diverse activities on the surfaces of planets. This required EVE's designers to give the players a good deal of freedom but also the responsibility to create interesting experiences to share with each other. As I suggested in a comparison of *EVE Online* with a newer space conflict game, *No Man's Sky*: "The result is that EVE simulates not merely spaceflight but the realistic development of an entire complex of societies, born in the chaos of war but increasingly organized" (Bainbridge, 2018, p. 149). Indeed, in our own supposedly real world, without war we might have no need of large nations capable of building the armies to protect our towns and cities from attack, so despite its fantastic context, *EVE Online* may simulate today's Earth.

Many theories have been proposed to explain the motivations or personality characteristics that drive people to invest significant fractions of their lives into computer games. Most influentially, Richard Bartle (2004) suggested that there were four kinds of active player, each with a different psychological goal: (1) achievement within the game context (achievers); (2) exploration of the game (explorers); (3) socializing with others (socializers); (4) imposition upon others (killers). Achievement combined with socializing requires ethical behavior within one's own faction, and violent imposition upon members of other factions, thus three of Bartle's categories may apply well to online factional conflict. Pure explorers face the problem of how to wander throughout New Eden without being killed, and pure killers may not be reliable allies. Leading *EVE* researcher Marcus Carter (2014, p. 312) reports:

A war in EVE is humbling. The largest Alliances have tens of thousands of players, and a war can involve two to three battles a day for weeks. Complex military command structures are established, dictating broader strategies and war theaters. Diplomatic efforts run parallel, cajoling, bribing, or threatening other Alliances into supporting (or keeping distance from) a war. Attacks are planned and led by ‘fleet commanders’ who lead hundreds, and occasionally thousands, of players into battle, flying ships that accord with carefully theorycrafted fleet doctrines. A single battle can see ships worth the equivalent of US\$300,000 permanently destroyed. Teams of players ensure local in-game markets are stocked with these ships, and control over the minerals to build them enters the strategy of wars.

In 2020, game journalist Joseph Bradford (2020) reported that EVE players were engaged in “the largest battle in MMO history,” and a fan named only Devon commented: “I love that EVE is still going, and how brutally vicious it is led by true life sociopaths like the real world. They are true life characters on the stage, playing to the depths of all that was human nature long before the wheel, now given space ships and endless space to be left or hunted alone.” This was not the first such mass conflict in *EVE*, and the Bloodbath of January 2014 had involved 2,670 players at its peak, in a solar system named B-R5RB.^{xiv} Guinness World Records confirmed that on October 6, 2020, *EVE* achieved the largest multiplayer videogame player-versus player battle and the most concurrent participants in a multiplayer videogame battle:

The epic battle saw 8,825 players taking part overall and 6,557 playing concurrently at its peak. *EVE Online* (developed by CCP Games, based in Reykjavík, Iceland) is renowned for its large-scale conflicts and the game has seen record-breaking encounters for largest battle and most concurrent players multiple times; they were previously set during 2014’s “Bloodbath of B-R5RB” and in 2018’s “Siege of 9-4RP2” respectively... This latest battle, aptly named “Fury at FWST-8”, saw a coalition named PAPI attempt to establish a beachhead Keepstar that would allow them to strike deeper into the Imperium’s territory with their force of supercapital ships. To prevent this, the Imperium fought for 14 hours to push PAPI forces back and destroy the Keepstar.^{xv}

Table 4 reports statistics from this major battle in a months-long war, using public data from a chain of *EVE* websites, focusing on the organizations of players that contributed at least 100 warriors to the battle.^{xvi} A news item published three weeks earlier personalized the conflict: “Eve Online player gets fired, starts war to ‘exterminate’ his old boss. The Mittani calls for reinforcements after months under siege by a former employee” (Hall, 2020). The Mittani was the infamous leader of the Goonswarm Federation that dominated the Imperium, while a former assistant of his named Vily had become fleet commander of Test Alliance that was central to PAPI. In *EVE*, volunteer player organizations are called *corporations* (corps), which can form *alliances*, and the specialized *EVE* wiki says: “Goonswarm was primarily a creation of the player corporation Goonwaffe, itself a creation of members of the SomethingAwful.com forums, along with Karmafleet, a player corporation created by users of reddit.com. The alliance itself is comprised of many different corporations. It is led by the CEO of Goonwaffe, The Mittani, and a directorate of officers from member corporations.”^{xvii}

Table 4: Major Participants in the Greatest Online Battle

Competing Groups of Alliances	Organization During the Battle			All Time Spaceship Data	
	Members in Battle	Total Members	Corps	Enemy Ships Destroyed	Own Ships Lost
Imperium:					
Goonswarm Federation	2,147	29,475	516	2,104,116	1,822,409
The Initiative	491	6,180	49	683,319	292,509
Tactical Narcotics Team	138	2,295	36	675,499	235,541
The Bastion	134	2,499	55	459,259	191,059
Dracarys	103	2,089	41	39,580	40,392
PAPI:					
Pandemic Horde	1,204	21,934	75	1,014,687	1,371,455
Test Alliance Please Ignore	1,003	15,826	79	1,342,710	1,269,225
Northern Coalition	571	3,794	28	999,833	311,220
Fraternity	554	15,614	119	518,451	502,840
Brave Collective	354	11,885	56	645,474	1,205,520
Pandemic Legion	257	2,375	13	1,149,473	272,118
Evictus	164	3,353	36	183,508	104,100
Ranger Regiment	119	2,726	38	128,689	131,092

As remarkable as the battle may be, even without major wars the players are constantly building spacecraft for their own use, using minerals they had mined from asteroids, and then employing the ships to destroy the spacecraft of other players. The final two columns of the table report the spaceship destruction history of the corporations, many of which had been active for several years. So the virtual *EVE* galaxy is based on the axiom that people are constantly at war with each other, at every level of scale from individuals to spontaneous teams to enduring corporations to dynamic alliances. The spaceships required for travel and battle represent the union of two different structures, engineering based on algorithms defining physical processes and a market economy. Over the period of months and years, the system evolves chaotically. Except for partnerships voluntarily sustained by trustworthy people, there may exist no fundamental principles of online social justice.

5. Conclusions

Among the many lessons we may take from the Pirates is that however logical new ideas may be, they cannot easily convince majorities of people either committed to archaic conventional cultures or dominated by modern tyrannies. Government supported citizen science may achieve incremental progress, but

typically operates under severe restrictions. *EVE Online* models how individuals can create new Internet alliances, potentially hostile to each other but also capable of cooperating, when the traditional large-scale social organizations become frozen in limited space. Especially among academics studying online games, there is much debate over how ethical versus unethical behavior transfers between real and virtual worlds (Yee, Bailenson & Ducheneaut, 2009; Yee, 2014). More generally, this analysis suggests that the social organization of future-oriented movements faces difficult challenges under current societal conditions. The example of government-funded citizen science suggests that progressive social movements may wish to recruit volunteers to undertake research and engineering projects to develop the means to achieve their worthy goals. The extreme examples of Pirates and Goonswarm imply that, in today's chaotic world, progress requires a good deal of autonomy, yet both freedom and ethics are difficult to define on a battlefield.

References

1. Adams, J., Brückner, H., & Naslund, C. (2019). Who counts as a notable sociologist on Wikipedia? Gender, race, and the "professor test." *Socius: Sociological Research for a Dynamic World*. doi.org/10.1177/2378023118823946
2. Altschuler, B. E. (2015). Is the Pentagon Papers Case relevant in the age of WikiLeaks? *Political Science Quarterly*, 130(3): 401-423
3. Bainbridge, W. S. (2011). *The virtual future*. London: Springer.
4. Bainbridge, W. S. (2012). Fluid democracy, In B. Hall (Ed.) *No safe harbor* (pp. 31-62). No place: United States Pirate Party.
5. Bainbridge, W. S. (2016a). *Star worlds: Freedom versus control in online gameworlds*. Ann Arbor, Michigan: University of Michigan Press.
6. Bainbridge, W. S. (2016b) Virtual interstellar travel. In K. Bergstrom, M. Carter & D. Woodford (Eds.), *Internet spaceships are serious business: An introduction to Eve Online* (pp. 31-47). Minneapolis: University of Minnesota Press.
7. Bainbridge, W. S. (2018). *Computer simulation of space societies*. Cham, Switzerland: Springer.
8. Bainbridge, W. S. (2020). *The social structure of online communities*. Cambridge, England: Cambridge University Press.
9. Bartle, R. A. (2004). *Designing virtual worlds*. (Indianapolis, IN: New Riders).
10. Battjes, N. H. (2011). "Piracy is not theft" go ahead, pirate Minecraft. Markus Persson will allow it. PC Games. Retrieved from pc-games.wonderhowto.com/news/piracy-is-not-theft-go-ahead-pirate-minecraft-markus-persson-will-allow-it-0126712/
11. Bergstrom, K., Carter, M., & Woodford, D. (Eds.). (2016). *Internet spaceships are serious business: an introduction to Eve Online*. Minneapolis, MN: University of Minnesota Press
12. Bowser, A., Shilton, K., Preece, J., & Warrick, E. (2017). Accounting for privacy in citizen science: ethical research in a context of openness. In CSCW '17: *Proceedings of the 2017 ACM conference on computer supported cooperative work and social computing* (pp. 2124-2136). New York, NY: ACM.
13. Bradford, J. (2020). EVE Online's wild changes the last few days have got me hooked again. *MMORPG.com*, October 14, www.mmorpg.com/editorials/eve-onlines-wild-changes-the-last-few-days-have-got-me-hooked-again-2000119740
14. Brown, P., Zavestoski, S., McCormick, S., Linder, M., Mandelbaum, J., & Luebke, T. (2001). A gulf of difference: disputes over Gulf War-related illnesses. *Journal of Health and Social Behavior*, 42(3), 235-257.
15. Carter, M. (2014). Emitexts and paratexts: Propaganda in EVE Online. *Games and Culture*, 10(4), 311-342.
16. Champion, K., McDonald, N., Bankes, Zhang, S. J., Greenstadt, R., Forte, A., Hill, B. M. (2019). A Forensic qualitative analysis of contributions to Wikipedia from anonymity seeking users, In *Proceedings of the ACM on human-computer interaction* 3. New York: ACM. doi.org/10.1145/3359155
17. Craft, J. (2016). Rebuilding an empire with Minecraft: Bringing the classics into the digital space. *The Classical Journal*, 111(3), 347-364.
18. Dawdy, S. L., & Bonni, J. (2012). Towards a general theory of piracy. *Anthropological Quarterly*, 85(3): 673-699.
19. Decker, K. S., & Eberl, J. T. (Eds.). (2005). *Star Wars and philosophy: more powerful than you can possibly imagine*. Chicago: Carus
20. Farley, H. (2017). Virtual knights and synthetic worlds: Jediism in Second Life. In C. M. Cusack & P. Kosnáč (Eds.), *Fiction, invention and hyper-reality: From popular culture to religion* (pp. 134-147). London: Routledge.
21. Fischer, D., Schwamb, M., Schawinski, K., Lintott, C., Brewer, J., Giguere, M., Lynn, S., Parrish, M., Sartori, T., Simpson, R., Arfon Smith, A., Spronck, J., Batalha, N., Rowe, J., Jenkins, J., Bryson, S., Prsa, A., Tenenbaum, P., Justin Crepp,... Zimmermann, V. (2012). Planet Hunters: the first two planet candidates identified by the public using the Kepler public archive data. *Monthly Notices of the Royal Astronomical Society*, 419(4), 2900-2911.
22. Foote, J., Gergle, D., & Shaw, A. (2017). Starting online communities: motivations and goals of wiki founders. *Proceedings of the 2017 CHI conference on human factors in computing systems*. New York: ACM. Retrieved from dx.doi.org/10.1145/3025453.3025639

23. Fredriksson, M. (2020). Information commons between enclosure and exposure. *International Journal of the Commons*, 14(1), 494-507.
24. Gil, Y., Knight, A., Zhang, K., Zhang, L., Ratnakar, V., & Sethi, R. (2013). The democratization of semantic properties: an analysis of semantic wikis. *Proceedings of the Seventh IEEE International Conference on Semantic Computing (ICSC)*. Irvine, California: IEEE. Retrieved from ieeexplore.ieee.org/document/6693519
25. Halfaker, A., Geiger, R. S., Morgan, J. T., & Riedl, J. (2012). The rise and decline of an open collaboration system: how Wikipedia's reaction to popularity is causing its decline. *American Behavioral Scientist*, 57(5), 664-688.
26. Hall, B. (Ed). (2012). *No safe harbor*. No place: United States Pirate Party
27. Hall, C. (2020). Eve Online player gets fired, starts war to 'exterminate' his old boss. *Polygon*, September 15, www.polygon.com/2020/9/15/21436851/ever-online-world-war-bee-2-interview-the-mittani-vily
28. Hayes, B. (2015). Computing science: Cultures of code. *American Scientist*, 103(1), 10-13.
29. Herrigel, E. (1953). *Zen in the art of archery*. New York, NY.: Pantheon Books
30. Ingdahl, W. (2011). Three planks of the Pirate Party's platform that should matter to doctors. *British Medical Journal*, 343(7837), 1280-1281.
31. Levin, G. A., & Cragin, M. H. (2003). "The Role of Information Science in Gathering Biodiversity and Neuroscience Data." *Bulletin of the American Society for Information Science and Technology*, 30(1), 18-21.
32. Lewis, J. R. (Ed). (2009). *Scientology*. New York: Oxford University Press.
33. Lintott, C., Schawinski, K., Bamford, S., Slosar, A., Land, K., Thomas, D., Edmondson, E., Masters, K., Nichol, R., Raddick, J., Szalay, A., Andreescu, D., Murray, P., & Vandenberg, J. (2011). Galaxy Zoo 1: Data release of morphological classifications for nearly 900 000 galaxies. *Monthly Notices of the Royal Astronomical Society*, 410(1), 166-178.
34. Lyden, J. C. (2012). Whose film is it, anyway? canonicity and authority in "Star Wars" fandom. *Journal of the American Academy of Religion*, 80(3), 775-786.
35. Mayer, B., Brown, P., & Linder, M. (2002). Moving further upstream: from toxics reduction to the precautionary principle. *Public Health Reports*, 117(6), 574-586.
36. McCarthy, M. T. (2015). Toward a free information movement. *Sociological Forum*, 30(2), 439-458.
37. McCormick, S., Brown, P., & Zavestoski, S. (2003). The personal is scientific, the scientific is political: the public paradigm of the environmental breast cancer movement. *Sociological Forum*, 18(4), 545-576.
38. McDowell, J. C. (2007). *The gospel according to Star Wars: faith, hope and the Force*. Louisville, Kentucky: John Knox Pres
39. McFarlane, B. L. (1994). Specialization and motivations of birdwatchers. *Wildlife Society Bulletin*, 22(3), 361-370.
40. Nguyen, S. H., Sun, Q., & Williams, D. (2021). How do we make the virtual world a better place? Social discrimination in online gaming, sense of community, and well-being. *Telematics and Informatics*, 66(101747). doi.org/10.1016/j.tele.2021.101747
41. Ransbotham, S., & Kane, G. C. (2011). Membership turnover and collaboration success in online communities: explaining rises and falls from grace in Wikipedia. *MIS Quarterly*, 35(3), 613-627.
42. Royce, B. (2022). Star Wars Galaxies Legends added apartments to Bepin to celebrate its sixth year as a rogue server. *Massively Overpowered*. Retrieved from massivelyop.com/2022/03/01/star-wars-galaxies-legends-added-apartments-to-bepin-to-celebrate-its-sixth-year-as-a-rogue-servering/
43. Shipman, F. M., & Marshall, C. C. (2020) Ownership, privacy, and control in the wake of Cambridge Analytica: the relationship between attitudes and awareness. In *CHI '20: Proceedings of the 2020 CHI conference on human factors in computing systems*. Retrieved from dl.acm.org/doi/pdf/10.1145/3313831.3376662
44. Tassi, P. (2011). Minecraft's notch: "piracy is not theft." *Forbes*. Retrieved from www.forbes.com/sites/insertcoin/2011/03/04/minecrafts-notch-piracy-is-not-theft/
45. TeBlunthuis, N., Shaw, A., & Hill, B. M. (2018). Revisiting "the rise and decline" in a population of peer production projects. *Proceedings of the 2018 CHI conference on human factors in computing systems*. New York, NY: ACM
46. Tonn, B., & Feldman, D. (1995). Non-spatial government. *Futures* 27, 11-36.
47. Waites, R. (2011). V for Vendetta masks: Who's behind them? *BBC News Magazine*. Retrieved from www.bbc.com/news/magazine-15359735
48. Westbrook, D. A. (2019). *Among the Scientologists: History, theology, and praxis*. New York, NY: Oxford University Press
49. Williams, A., Miller, B.-A., & Kitchen, M. (2017). Jediism and the Temple of the Jedi Order. In C. M. Cusack & P. Kosn    (Eds.), *Fiction, invention and hyper-reality: From popular culture to religion* (pp. 119-133). London: Routledge.
50. Wong, W. H., & Brown, P. A. (2013). E-Bandits in global activism: WikiLeaks, Anonymous, and the politics of no one. *Perspectives on Politics*, 11(4), 1015-1033.
51. Yee, N. 2014. *The Proteus paradox*. New Haven, CT: Yale University Press.
52. Yee, N., J. N. Bailenson, and N. Ducheneaut. 2009. The Proteus effect: Implications of transformed digital self-representation on online and offline behavior. *Communication Research*, 36(2), 285-312.
53. Zavestoski, S., Brown, P., Linder, M., McCormick, S., & Mayer, B. (2002). Science, policy, activism, and war: defining the health of Gulf War veterans. *Science, Technology, and Human Values*, 27(2), 171-205.

ⁱ en.wikipedia.org/wiki/Pirate_Party

-
- ii wiki.pp-international.net/wiki/index.php?title=Resolutions#Bradley_Manning
 - iii wiki.piratenpartei.de/Liquid_Democracy
 - iv lists.pirateweb.net/pipermail/pp.international.general/2015-February/015834.html
 - v pp-international.net/pirate-parties/
 - vi minecraft.fandom.com/wiki/Minecraft
 - vii en.wikipedia.org/wiki/The_Wachowskis
 - viii en.wikipedia.org/wiki/Wikipedia:Why_create_an_account%3F
 - ix beta.nsf.gov/news/be-citizen-scientist
 - x www.nsf.gov/awardsearch/advancedSearch.jsp
 - xi en.wikipedia.org/wiki/Eve_Online
 - xii www.eveonline.com/discovery
 - xiii wiki.eveuniversity.org/UniWiki:General_disclaimer
 - xiv en.wikipedia.org/wiki/Bloodbath_of_B-R5RB
 - xv www.guinnessworldrecords.com/news/2020/10/eve-onlines-record-breaking-fury-at-fwst-8
 - xvi fleetcom.space/battlereport/vD53uCMwihxDqZcpC; evewho.com/alliance/131511956; zkillboard.com/alliance/99004425/
 - xvii eve.fandom.com/wiki/Goonswarm