Wikipedia and the Ecosystem of Knowledge

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Abstract
Thanks to a vibrant community united by a few core principles, plus detailed policies and safeguards against trolls and vandalism, Wikipedia has already become a piece of the knowledge ecosystem. Like science, its aim is to propose a synthesis of existing knowledge and conflicting interpretations of reality. It also changes the way people interact with knowledge thanks to its extensive use of hyperlinks, portals, and categories. As a consequence, I suggest academics contribute to articles in their field. They could also use Wikipedia as a course assignment and make sure that the topics related to their discipline are fairly presented in this encyclopedia.

Keywords
Wikipedia; Knowledge dissemination

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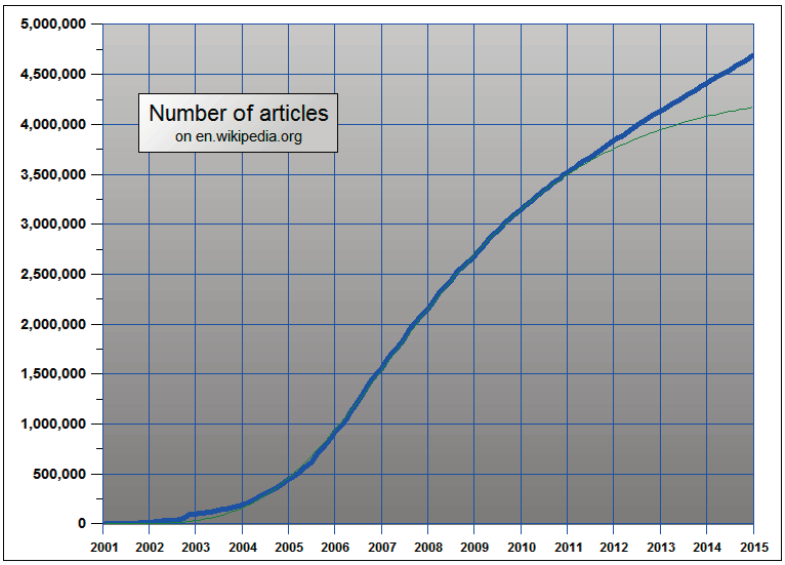
When Larry Sanger and Jim Whales launched Wikipedia in 2001, they saw it as an "informal laboratory and developmental site for Nupedia articles" (Leitch, 2014, p. 94). But the project soon grew exponentially and evolved from a playful activity into a full-fledged encyclopedic project, competing with the *Encyclopædia Britannica*, the venerable leader in the field. The concept of an encyclopedia that anyone could edit attracted a lot of criticism, in many cases founded on disturbing instances of vandalism (see notably Carr, 2010; Encyclopædia Britannica, Inc., 2006; Keen, 2007; Waters, 2007). In the eyes of its opponents, Wikipedia is so full of errors that it is quite acceptable to vandalize it. For example, the French author and journalist Pierre Assouline asked his students to insert falsities in Wikipedia articles in order to see how much time it would take for them to be corrected (Vandendorpe, 2008). At the dawn of Web 2.0, the idea of inviting the general public to contribute to a specialized domain was seen as ludicrous. Today, however, things are changing and crowdsourcing, in the words of Mia Ridge, "is increasingly common in museums, libraries, archives and the humanities" (2014, p. 1).

In spite of that, the media barrage against Wikipedia was so effective that even in 2014, wrote Thomas Leitch, "many teachers categorically forbid their students to cite Wikipedia in their assignments, though this interdiction does not prevent students, or indeed the teachers themselves, from consulting Wikipedia without citing it. Wikipedia is the source everyone uses but no one is supposed to use or admits using" (2014, pp. 4-5). According to Leitch, this is typical of the "new paradoxes of authority" (p. 6) posed by the collision between the bottom-up model of knowledge incarnated by Wikipedia and the top-down model of authority at the core of a liberal education.

The main criticism against Wikipedia is that it is a free-for-all domain without any professional standards. Yet even if Wikipedia has to be used with caution, it is not a free-for-all. On the contrary, the Wikipedia community has developed a consistent set of principles, rules, policies, and guidelines that have helped build consensus among a community of thousands of contributors (Jemielniak, 2014).

Figure 1: Growth of the English Wikipedia



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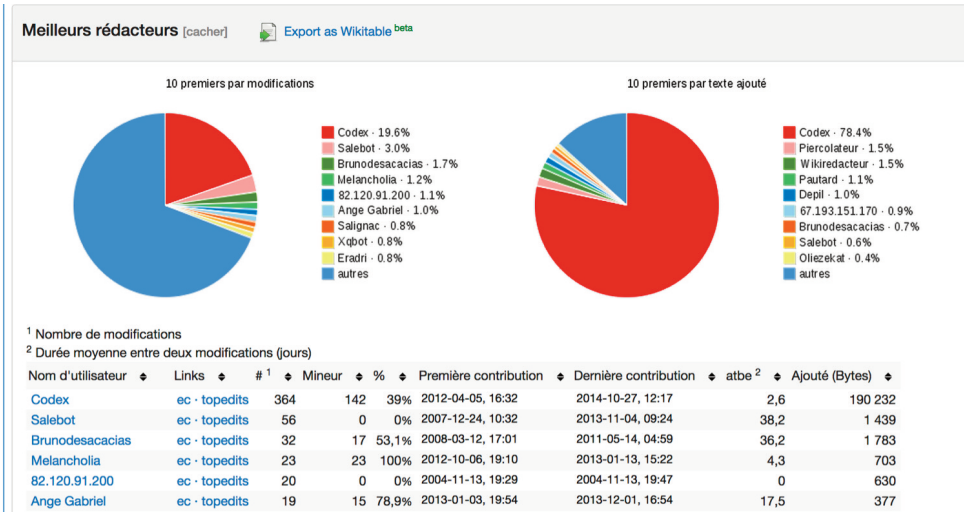
As a living organism, Wikipedia shows remarkable vitality. Since its creation, many Cassandras have predicted its imminent demise, either because of the perceived unreliability of articles anonymously written or the demise of its contributors. As we know, these predictions did not materialize. On the contrary, WP is now much bigger than any encyclopedia ever printed. It has been growing steadily (see Figure 1), not only in the number of articles – offering today a wealth of information unlike any other, on almost any topic – but also as a universal archive of world events and of their interpretations, serving as a chronicle of the various and sometimes conflicting ways history has been understood. It has also grown in readership. In September 2014, Wikipedia was ranked fifth globally among all websites, with 22 billion page views and nearly 500 million unique visitors a month (Zachte, 2014), which places it just after Yahoo!, Facebook, Microsoft, and Google.

On the technical level, Wikipedia owes its strength to the wiki software that Ward Cunningham invented in 1995 as a tool for sharing knowledge on the Web and easily creating and interlinking Web pages (Lih, 2009). First seen as a curiosity, the wiki soon attracted an enthusiastic community and went through various mutations (CvWiki, AtisWiki, UseModWiki) before its adoption by Wikipedia. It combines ease of use, transparency, and automatic archiving of every edit. These qualities make the wiki very well suited for collective writing, since every statement can be challenged, discussed, and nuanced. The Wikipedia community came originally from this open source software movement, which produced, notably, Linux and Debian.

Figure 2: Statistics showing the main contributors to the French article on Balzac, ordered by the number of edits (left) and the quantity of text added (right)



Nom d'utilisateur	Links	# [1]	Mineur	%	Première contribution	Dernière contribution	atbe [2]	Ajouté (Bytes)
Codex	ec · topedits	364	142	39%	2012-04-05, 16:32	2014-10-27, 12:17	2,6	190 232
Salebot	ec · topedits	56	0	0%	2007-12-24, 10:32	2013-11-04, 09:24	38,2	1 439
Brunodesacacias	ec · topedits	32	17	53,1%	2008-03-12, 17:01	2011-05-14, 04:59	36,2	1 783
Melancholia	ec · topedits	23	23	100%	2012-10-06, 19:10	2013-01-13, 15:22	4,3	703
82.120.91.200	ec · topedits	20	0	0%	2004-11-13, 19:29	2004-11-13, 19:47	0	630
Ange Gabriel	ec · topedits	19	15	78,9%	2013-01-03, 19:54	2013-12-01, 16:54	17,5	377

These "epistemic communities" (Conein & Delsalle, 2005) are glued together by the common goal of making the best possible product. As noted by various observers, "the community is sustained not necessarily through strong ties among the members but rather by the ties between members and the community" (Jemielniak, 2014, p. 85). The reward for developing the encyclopedia is the conviction of contributing to a valuable and frequently consulted project, as well as the status or reputation a good contributor will gain in the Wikipedia community through their actions. Since every action is

recorded, archived, and visible to everyone thanks to very detailed statistical tools, the level of contributions of any individual can easily be checked by everyone, detailing the number of edits as well as the quantity of text added in each article and the percentage of reverted edits (Figure 2).

Wikipedia encourages contributors to edit articles, and to reach consensus by engaging in discussion on the "talk page" in case of a disagreement. The process is typically Hegelian in nature: make an edit, then wait for the next change, and if there is opposition, seek a compromise. A variant of this policy is the *BOLD, revert, discuss* cycle: bold editing is openly encouraged in the policies, as it leads to discussion, which helps make articles better. This collaborative culture, which is unique to Wikipedia, makes the community a living organism, growing continuously, adapting to its environment and answering its critics.

There is also a kind of soft and hidden competition between the 285 communities forming Wikipedia. Contrary to a common belief, articles in foreign versions are not translated from the English version but are the product of their own community. Even if the English community is well ahead, both in the number of articles and their general quality and completeness, other communities try to catch up, and many small cultures show an impressive level of investment. In 2014, while English had a median of 21 editors per million native speakers, Dutch, Catalan, and Czech had 46, Swedish 69, Finnish 78, Scots 143 and Hebrew 145 (Zachte, 2015).

Like an organism, Wikipedia is made of a variety of organs (i.e., contributors), who are diverse in age and education. According to a poll made in 2009 and cited by Wikipedia in its eponymous article, most contributors are male, under 30, with no partner and no children, and more than half have an undergraduate degree, a master's or a PhD ("Wikipedia," 2015). Many collaborators do not write articles at all, but check recent changes for vandalism, fix links, discuss the quality of articles, add images, or scan books for Wikisource.

Wikipedia is also a part of the ecosystem of knowledge, since it helps to build "a consensus of rational opinion over the widest possible field," which is the goal of science, according to John Ziman (1968, p. 3). An ecosystem is a network of interactions among organisms, and between organisms and their environment. A historical perspective shows that encyclopedias have preserved knowledge during dark eras and helped it flourish when the environment was adequate. Throughout history, encyclopedias have been not only repositories of knowledge, but also places offering a reflection on the nature of knowledge and the way it should be organized. This is exemplary in *Novum Organum*, by Francis Bacon (1994), who insisted on experimentation in sciences and whose unfinished novel *New Atlantis* envisioned the modern research universities.

Since encyclopedias go hand in hand with the development of science, their production accelerated in the eighteenth century with Vicenzo Coronelli in Italy, John Harris in England, followed by Ephraïm Chambers, and, first and foremost, l'*Encyclopédie* by Diderot and d'Alembert, a project that would inspire the *Britannica*.

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With its 72,000 articles, l'*Encyclopédie* was a huge accomplishment. It brought also a revolution in the conception of knowledge, because it includes mundane knowledge that was until then excluded from the field of an encyclopedia. In the nineteenth century, the production of encyclopedias was a bonanza for publishers, with a median of one new encyclopedia published per year globally.

One should remember that encyclopedias were never at the forefront of science, with its goal of producing new knowledge, but were always in the business of presenting a synthesis of existing knowledge and conflicting interpretations. That being said, there is a feedback loop between the growth of science and the growth of encyclopedias. This was evident for the philosopher d'Alembert, for whom there was no doubt that dictionaries had fostered the development of knowledge in society.[1]

In fact, one could say that the appetite for knowledge grows in the human mind like a living seed in a fertile soil. And the same is true for culture. According to Barry Allen (2004), the field of culture is a replica, at the macrocosmic level, of what happens in our brain:

> [N]erve cells … tend to grow opportunistically where they can, in the micro-ecology of an infant's body. … If neurological development is this ecological, then it is conditioned by the whole body, as well as by the extra-corporeal ecology. At a next level, that body is an outcome of evolution, which situates it in the ecological economy of its whole habitat. And for us, ecological circumstances are always cultural circumstances, in which case local environment and economy contribute to the idiosyncratic architecture of every human brain. (pp. 184-185)

With the Internet, we live in a civilization where information flows freely from everywhere. It is quite different from the print society, where the royal power had instituted various systems of control over the circulation of information. Every piece of printed material had to bear the name of the printer and the date it was printed. Moreover, setting up a print shop was costly, which limited the number of publishers and made them easy to control. With the Internet, these controls are gone. Any kind of information may be posted on a blog and attract a steady stream of followers. With Twitter and Facebook, false news can spread like wildfire, coming from individuals or even major companies. That was the case with the tobacco industry during much of the past century, up to the point that, "in 1990, Philip Morris pondered acquiring an entire news service like Knight-Ridder or United Press International" (Proctor, 2012, p. 3). As we know from Proctor's book, "Global warming denialists cut their teeth on tobacco tactics, fighting science with science, creating doubt, fostering ignorance" (p. 4). And that fight is still raging in the public discourse.

Paradoxically, and contrary to the main criticism of its detractors, Wikipedia thus appears as a guardian of truth, a guarantee of validity, because any information posted in an article is scrutinized by a variety of contributors – particularly articles on questions prone to popular biases – allowing any suspicious information to be instantly deleted or challenged. For example, the article on greenhouse gas is watched by

306 contributors. The article on Darwin has 1,117 watchers, and the George W. Bush article has more than 2,000 (twice as many as the article on Bill Clinton). This level of oversight means that any change to these articles will be scrutinized for a possible error, falsity, or ineptitude. The more controversial an article, the more edits it will have and, quite naturally, the more vandalism it will attract.

In principle, every statement in a Wikipedia article should be referenced by a source. Not any source will be considered as valid. In that respect Wikipedia standards are as high as in the scientific community. According to its policies and guidelines:

> All content should ideally be supported by a reliable source, but content that is controversial or likely to be challenged will definitely require them! Unsourced material may be removed at any time and it is the obligation for the editor adding material to provide a reliable source. ("Help," 2015, para. 2)

Wikipedia has issued a list of suggested sources for the various domains of research. Some big libraries contribute too and offer Wikipedians access to scientific journals.

Content must be written objectively, without perceptible bias, merely presenting the facts and notable viewpoints from valid sources. Someone who tries to push their own point of view will see their edit reverted with the mention NPOV (neutral point of view). A third principle is that no original research will be accepted:

> [A]rticles may not contain previously unpublished arguments, concepts, data, opinions, or theories. This includes any new analysis or synthesis of these facts. Basically, Wikipedia is a record of human knowledge, viewpoints and summaries that already exist and are expressed elsewhere. ("Wikipedia: No Original Research," 2015)

This policy should reassure academics afraid that Wikipedia would make learned journals disappear. In fact, quite the contrary is the case. The need to reference every assertion creates an appetite for learned journals as never before. It will help, of course, if journals are open access, which makes their articles more susceptible to be cited in Wikipedia and spread into the public discourse.

If there is a conflict between contributors of an article, an "edit war" may take place, conducing to a series of deletions and reverts. In order to diffuse a war, the article is blocked after three reverts and opponents are invited to lay down their arguments on the talk page. Eventually, with the help of other contributors, a resolution will be found. Consensus however does not mean unanimity:

> In determining consensus, consider the quality of the arguments, the history of how they came about, the objections of those who disagree, and existing policies and guidelines. The quality of an argument is more important than whether it represents a minority or a majority view. ("Wikipedia: Consensus," 2015, sec. 1.3.1, para. 2)

Thanks to these rules, and a vibrant community working 24/7 in order to enforce them, Wikipedia is generally quite reliable, and it may prove difficult to find it wrong on a particular fact. It could become the main clearinghouse of knowledge, a place where all aspects of every question are documented, with links to new findings. That would fulfill the dream of the Viennese philosopher Otto Neurath, who founded the *International Encyclopedia of Unified Science* in the 1930s. Herbert George Wells pursued the same idea in a book titled *World Brain*, imagining "an international Encyclopædia Organisation that would store and continuously update every item of verifiable human knowledge on microfilm and make it universally accessible" (cited in Lodge, 2011, p. 485). For Wells, this encyclopedia would be like the brain of humankind and would help "dissolve archaic discords." Although we are still far from this ideal, Wikipedia is certainly on the right-path to help make it possible. It is the closest thing we have to a global encyclopedia, thanks to its 285 versions, which allow a user to immediately see how a specific question is treated by another community.

Moreover, thanks to the extensive use of hyperlinks, articles in Wikipedia may help build a different view of knowledge. Hyperlinks serve not only as navigational tools but also as instruments for expanding articles with sub-articles and giving a higher level of granularity to a topic. In principle, since there is no limit to this level of granularity, Wikipedia could have articles covering the most arcane bits of knowledge.

Hyperlinks also serve to categorize articles with links to related fields. All these hyperlinks and categories are transforming the way people in general interact with knowledge. They may live to new insights and connections. By converting the syntagmatic discourse typical of traditional articles into paradigmatic series, they allow readers to find common characteristics and intellectual companionship between very different authors, or surprising variations in the productions of creators from different periods, different nations, or different cultures.

The responsibility of academics

Academics should feel a particular responsibility toward WP articles pertaining to their specialty, and try to correct any inaccuracies or obsolete information they contain, redress eventual biases, and expand their scope by adding sub-pages on historical information or new interpretations. By contributing to Wikipedia, they would make sure their discipline is correctly represented in the encyclopedia, would learn to better communicate their research, and would have a chance to get useful feedback.

Professors could best contribute to Wikipedia, for example, when they are working on a new course. While doing extensive reading and developing syntheses for their teaching, they will almost necessarily stumble onto Wikipedia articles. Ideally, they should submit these articles to a series of questions with their students: Does the article take into account the best available research? Does it offer a good synthesis? Is it complete? Does it have biases? Are the related topics well covered? By examining these questions in the classroom, they will develop their students' critical thinking on a real corpus. They will also reduce the risk that students, who rely heavily on Wikipedia, will assimilate erroneous or biased information.

The next step would be to use Wikipedia as a course assignment, which is the aim of the Education Program launched by the Wikimedia Foundation and whose subtitle is "The end of throwaway assignments and the beginning of a real world impact for students." This initiative received a very good response from at least two big associations: the American Sociological Association (ASA) and the American Psychological Association (APA). Both are actively encouraging scholars and students to help develop Wikipedia. As explained by ASA's then-president Erik Olin Wright in November, 2011:

> Since [Wikipedia] is a reference source for sociologically relevant ideas and knowledge that is widely used by both the general public and students, … it is important that the quality of sociology entries be as high as possible. This will only happen if sociologists themselves contribute to this public good. (cited in Davis & Mathewson, 2014, p. 17)

The academics interested in this project got the support of the Wiki Education Foundation, an organization promoting digital democracy and whose goal is to provide guidance and expertise for teaching with Wikipedia to instructors in all departments. The program relies on what they call *Wikipedia Instructors,* who design classroom assignments that make sense for both the student learning and for Wikipedia. There are also *Wikipedia Ambassadors*, who support the instructors. A series of guides helps students to master the Wikipedia technicalities. In September 2014, over nine terms, the foundation had helped more than 300 instructors implement a Wikipedia assignment.

Since 2011, the American Psychological Association has encouraged its members to embrace this initiative. So far, more than 3,300 students in this discipline have participated. After three years, 34 sociology classes have participated and edited 967 unique articles (2,000 words per article). According to the APA (n.d.), using Wikipedia articles as an alternative to the traditional course paper assignment teaches students three main lessons: (a) to develop communication skills for general audiences; (b) to discover the importance of logic, strength of argument, flow and clarity of writing, and the need to cite the appropriate literature; and (c) to experience the significance of accuracy in scientific writing.

The free encyclopedia can also be "a laboratory for sharpening students' skills in negotiating claims about authority" and "developing a new kind of literacy," as advocated by Cory Doctorow, Danah Boyd, and many others (Leitch, 2014, p. 88).

Professors could contribute, personally or with their students, to other projects of the Wikimedia Foundation, such as Wikisource or Wiktionary, publish scholarly research in Wikibooks, or participate to the other related projects – Wikispecies, Commons, Wikiquote, Wikiversity, MediaWiki, Meta-Wiki, Wikivoyage, Wikinews, and Wikidata. Academics could also follow the lead of scientific disciplines, exemplified by the *PLOS Computational Biology* journal and the creation of *Topic* pages in relation with articles in Wikipedia synthesizing some aspects of their peer-reviewed research.[2]

These articles would thus have context because of the hyperlinks to articles in the same field and articles on a similar topic in other languages, and they would benefit from the input of a larger community. Most of all, the articles would be continuously updated and maintained. By nurturing an important piece of the knowledge ecosystem, academics would better serve their discipline and help spread their interests into the meme pool of culture.

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Wikipedia has grown enormously since its beginnings and is approaching 50 million articles in all its combined linguistic versions. With its 12 related projects, it offers an enormous wealth of information freely and permanently available to everyone.

Some people think that Wikipedia is close to saturation. In my opinion, the project is still far from the goal implicit in the encyclopedic endeavour, whose aim is to offer a comprehensive, totalizing, and reliable sum of knowledge, synthesized and rationally organized, able to give answers on any question an inquisitive mind might conceive. Moreover, the field of knowledge is itself expanding at an accelerated pace and humankind's thirst for knowledge, which is part of our genetic program, tends to be more intense as answers become more easily available. According to Barry Allen, knowledge is our destiny: "We have no option anymore about preferring and cultivating knowledge, or the soil, or life in cities. These are for us the circumstances of the now-global sapiens ecology, and they define the ultimate context for understanding knowledge" (2004, p. 215).

A collaborative encyclopedia appears well suited to this new ecosystem.

Notes

1. "On ne peut disconvenir que depuis le renouvellement des Lettres parmi nous, on ne doive en partie aux Dictionnaires les lumières générales qui se sont répandues dans la société, & ce germe de Science qui dispose insensiblement les esprits à des connaissances plus profondes" (d'Alembert, Discours préliminaire à l'*Encyclopédie*). ("It is undeniable that with the renewal of the Arts in our society, it is partially due to Dictionaries that generalized enlightenment has developed, as well as the spark of Science that makes minds open to deeper knowledge.")

2. See http://blogs.plos.org/biologue/2014/09/25/topic-pages-collection-in-plos-comp-biol/

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