

Encyclopedias, hive minds and global brains

A cognitive evolutionary account of Wikipedia

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Abstract

Wikipedia, the crowd-sourced, hypermedial encyclopedia, available in more than 290 languages and consisting of no less than 40 million lemmas, is often hailed as a successful example of the 'wisdom of the crowds'. However, critics not only point at the lack of accuracy and reliability, uneven coverage of topics, and the poor quality of writing, but also at the under-representation of women and non-white ethnicities. Moreover, some critics regard Wikipedia as an example of the development of a hive mind, as we find it in social insects, whose 'mind' rather than being a property of individuals is a 'social phenomenon', as it has to be located in the colony rather than in the individual bees. In this article an attempt is made to throw some light on this controversy by analyzing Wikipedia from the perspective of the cognitive evolution of mankind. Connecting to *Origins of the Modern Mind* (1991) of neuropsychologist Merlin Donald, in which three stages in the cognitive evolution - characterized by a mimetic, an linguistic, and an external symbolic cognition respectively - are distinguished, it is argued that the development of the internet, and crowd-sourced projects like Wikipedia in particular, can be understood as a fourth, computer-mediated form of cognition. If we survey the cognitive evolution of hominids and the role played in this evolution by cultural and technical artefacts like writing, printing press, computers, and internet, we witness a process of increasing integration of individual minds. With outsourcing and virtualization of the products and processes of thinking to external memories, and the fast development of implanted computer interfaces, we appear to be at the edge of the materialization of the hive mind in a 'global brain'. The article ends with some speculative predictions about the future of human cognition.

Keywords: encyclopedias, Wikipedia, wisdom of the crowds, cognitive evolution, hive mind, global brain

A sinner's confession

Let me begin this article with a confession. I'm a sinner, too. According to Michael Gorman, former president of the American Library Association, "A professor who encourages the use of Wikipedia is the intellectual equivalent of a dietician who recommends a steady diet of Big Macs with

everything” (quoted in: Jemielniak 2014b). To make my case worse, I not only encourage my students to use Wikipedia, but I’m also guilty of using Wikipedia myself quite frequently. However, I immediately like to add that I hardly ever eat Big Macs, and almost ever read and discuss primary texts and reliable secondary literature with my students.

So why do I sin? Well, probably the most obvious reason is the overwhelming amount of information to be found on Wikipedia. At this moment - August 3, 2017 - the number of articles in the English version alone already has reached 5,453,005, and if we include the articles written in the more than 290 Wikipedias in other languages (including the 1,070,000 articles the Japanese Wikipedia had in July 2017), the number exceeds 40 million. Moreover, no other encyclopedia is so up to date (the fact that I was able to mention the exact number of articles in the English version of Wikipedia today, is because the Wikipedia’s lemma on Wikipedia just has been updated). No wonder that I’m not the only sinner: as of February 2014, Wikipedia has 18 billion page views and nearly 500 million unique visitors each month! A second reason I love Wikipedia is the free-access and free-content character of this encyclopedia, offering – worldwide - millions of people, many of them deprived of books and libraries, a wealth of information, knowledge, and sometimes even wisdom.

It seems that Wikipedia even has a divine ring. It promises to provide us with an *omniscience* that once was attributed to God. Together with technologies like telepresence and virtual reality – which express the human desire to obtain two other divine qualities: omnipresence and omnipotence– Wikipedia promises to guide us right through “the pearly gates of cyberspace” (Wertheim 1999).

Why then this guilty feeling when I use Wikipedia? Well, maybe my feeling to be a sinner is not the result of violating my beliefs, but rather of catching myself believing. After all, I do not have a real talent for religion, both in its sacral and profane forms. Being an academic, having digital culture as one of my research subjects, I’m well aware of the drawbacks of Wikipedia. Most of them are related to the fact that Wikipedia is a crowd-sourced project, so that every user in principle can be an editor as well. The English version alone has about 130,000 active editors (out of 27 million registered users) and more than 1300 administrators (editors who have been granted the right to perform special actions like deleting articles, blocking malfunctioning editors etc.). Because of this open character Wikipedia lacks, according to its critics, accuracy and reliability. There is, for example, no methodological fact-checking. Moreover, there is a rather uneven coverage of topics, the quality of the writing often is poor, and there are many cases of deliberate insertion of false and misleading information and other types of ‘intellectual vandalism’. Other issues that have raised criticism are explicit content (like child pornography), sexism, and privacy violations. Indeed, for many reasons the Wikipedia community resembles a church. And the list of drawbacks I just gave is far from exhaustive. (For a more complete list – oh irony - it is worthwhile to visit the lengthy and well-documented Wikipedia’s lemmas such as ‘Criticism of Wikipedia’ and– ‘Academic studies about Wikipedia’).

Encyclopedias and hive minds

Instead of giving an exhaustive overview of its drawbacks, in this article I want to focus on one essential characteristic of Wikipedia, which has led to much controversy: its collective character. According to enthusiastic supporters of Wikipedia, this project is a paradigmatic example of the so-called Wisdom of Crowds. According to this idea, popularized by James Surowiecki's book with that title from 2004, group decisions are often better than could have been made by any single member of the group (Surowiecki 2004). As the accuracy of crowd wisdom largely depends on the crowd's size and diversity, is it not surprising, according to Wikipedia supporters, that a survey of Wikipedia, published in *Nature* that same year, which was based on a comparison of 42 science articles with *Encyclopedia Britannica*, found that Wikipedia's level of accuracy closely approached this esteemed encyclopedia (Giles 2005). The diversity of the crowd guarantees the *neutral point of view*, which is one of the key editorial principles of Wikipedia, aiming at a fair and proportional representation of all of the significant views on the topics.

However, more critical minds rather see Wikipedia as a result of 'the stupidity of crowds'. According to computer scientist and philosopher Jaron Lanier – who, as one of the pioneers of virtual reality, cannot easily be accused of hostility against digital culture - the most questionable aspect of Wikipedia is what he calls digital Maoism and the Oracle illusion. In *You're not a Gadget* Lanier argues that, just as in the heydays of cultural revolution in China, in Wikipedia the majority-opinion perspective rules (Lanier 2010). Despite of the open character of the Wikipedia project, which, in principle at least, can be joined by everybody and welcomes a variety of opinions, in reality controversial topics often evoke so-called 'edit wars', in which particular entries are updated at a rapid-fire rate by representatives of competing political, religious or ethnic ideologies. According to Dariusz Jemielniak, a long time editor of Wikipedia and the author of the informative book *Common knowledge?: An Ethnography of Wikipedia*, conflict is the dominant mode of interaction in the Wikimedia community (Jemielniak 2014a).

Actually, the majority, having the loudest and most persistent voice, rules. Or rather, we must say, a *particular* majority rules, as Wikipedia exhibits systemic bias, too. The Wikipedia community is heavily dominated by young, male, white, wealthy, English speaking techno-geeks, whereas women and non-white ethnicities are significantly under-represented. For example, in a data analysis of Wikipedia's lemmas, the Oxford Internet Institute found that only 2.6% of its geo-tagged articles are about Africa, which accounts for 14% of the world's population (Oxford Internet Institute 2012).

Moreover, according to Lanier, "open culture, [especially] web 2.0 designs, like wikis, tend to promote the false idea that there is only one universal truth in [...] arenas where that isn't so". As a consequence, Wikipedia's digital Maoism evokes what Lanier terms the Oracle illusion. As he explains in his book *You're not a Gadget*:

Wikipedia, for instance, works on what I call the Oracle illusion, in which knowledge of the human authorship of a text is suppressed in order to give the text superhuman validity. Traditional holy books work in precisely the same way and present many of the same problems. This is [one] of the reasons I sometimes think of cybernetic totalist culture as a new religion. The designation is much more than an approximate metaphor, since it includes a new kind of quest for an afterlife. It's so weird to me that Ray Kurzweil wants the global computing cloud to scoop up the contents of our brains so we can live forever in virtual reality. When my friends and I built the first virtual reality machines, the whole point was to make this world more creative, expressive, empathic, and interesting. It was not to escape it (Lanier 2010).

The phenomenon Lanier refers to is also known as the *hive mind*, as we find it in social insects, whose 'mind' rather than being a property of individuals is a 'social phenomenon', as it has to be located in the colony rather than in the individual bees (Queller and Strassmann 2009). In a sense, human individuals are social phenomena in the aforementioned meaning too, as our bodies also are societies of cells that function together to make us walk, clean our blood, digest our food, think, etc. And even the cells in our body actually are a collection of organelles, or tiny organs, like the energy-producing mitochondria. And if we look at human life on a larger scale, tribes and cities can also be conceived of as superorganisms, displaying hive minds. Thus, both on the micro- and on the macro-level, humans in a very basic way are individuals rather than individuals. At the macro-level, we could regard the technical infrastructure of Wikipedia as (a tiny part of) an emerging global brain, and the practice of editing and using this global encyclopedia as part of the accompanying 'hive mind'.

An interesting question is what would inspire a group of multicellular organisms like ants or humans to form a superorganism? In *The Superorganism: The Beauty, Elegance, and Strangeness of Insect Societies*, biologists Hölldobler and Wilson argue that the emergence of superorganisms is a complex process involving genetic evolution and environmental pressures. Generally, a group of insects like bees will move from behaving as individuals to forming colonies when they are storing food (like honey or pollen) that comes from multiple sources. At that point, a colony has a better chance of surviving than an individual (Hölldobler and Wilson 2009). This criterion seems to be satisfied by humans as much as by social insects. However, as population genetics suggests, another precondition for the emergence of superorganisms is a strong genetic similarity. This is the case with social insects like ants and bees, and also with the cells in our bodies, but is much less the case with human individuals. For that reason, human interaction is characterized by conflict as much as by cooperation. Wikipedia is a good example here, although a paradigmatic example of global cooperation, the aforementioned drawbacks like the edit wars, uneven coverage of content, underrepresentation of women and ethnic groups, the deliberate insertion of false and misleading information show a 'generous' variety of conflicts as well. This seems to make the emergence of a real superhuman organism unlikely. As Joan Strassman, an authority on superorganisms, states in

an interview: “That [the emergence of a human superorganism] could happen with higher relatedness. But right now there’s far too much conflict.’ She pointed out that the best kinds of cooperative groups for forming an organism are clones, and humans are far from being genetic clones of each other” (Newitz 2012).

However, as we saw, it is precisely Lanier’s fear that Wikipedia is a symptom of a mental ‘clonization’ which threaten to eliminate diversity and individual perspectives. In Lanier’s view, Wikipedia functions like the Borg in the Star Trek Saga, the extraterrestrial species aiming at assimilating all life in the universe, famous for their standard greeting: “We are the Borg. Your biological and technological distinctiveness will be added to our own. Resistance is futile”.

Should we consider Wikipedia as the pinnacle of ‘the wisdom of the crowds’ or rather as ‘the spectre of a Maoist hive mind’? It is clear that at least with regard to this question there is conflict rather than agreement in the discourse on Wikipedia. How to evaluate these sharply contrasting views? In the next section, I will try to find a way out of this controversy by analyzing Wikipedia from the perspective of the cognitive evolution of mankind, focusing on the role computer networks play within this development.

Wikipedia in evolutionary and historical perspective

The emergence of information technologies can be regarded as a milestone in the cognitive evolution of mankind, comparable to the two other major transitions of the cognitive structure of the genus *Homo*: the development of spoken language, and the invention of writing. In his book *Origins of the Modern Mind: Three Stages in the Evolution of Culture and Cognition*, the neuropsychologist Merlin Donald gives a fascinating reconstruction of this cognitive evolution of hominids (Donald 1991). Donald distinguishes three stages in this evolution, characterized respectively by a *mimetic*, a *linguistic* and an external *symbolic* cognition.

In his view the highest primates from which man is descended had an *episodic cognition*, that is to say, non-reflexive, concrete, and situation-linked, taking place in a continuous present. At least from *Homo erectus* on, however, a *mimetic cognition* emerged, characterized by the production of conscious, self-initiated representations which were intentional but not (yet) linguistic (see Figure 1). One might think of the imitation of the behavior of animals and fellow men. According to Donald this evolution had important social implications. Not only did mimetic capability lead to the development of group rituals and bonding in the prehistoric tribes, phenomena that characterize the behavior of small groups right up to the present day, it also resulted in a great increase in mutual communication and cooperation, as well as in the transfer and conservation of knowledge. This resulted in what we might call a ‘hive mind light’, which probably played an important role in the reproductive success of the genus *Homo* and its distribution all over the globe.

Linguistic cognition made its appearance with *Homo sapiens*. In the course of evolution, the ability to (re)combine basic actions (which, among other things, had developed through the

working of stones) shifted to the production of sound, making articulated language possible. As opposed to mimetic communication this language makes use of arbitrary symbols, and is characterized by semantic compositionality, which – in comparison to earlier types of animal and human communication, enabled *Homo sapiens* – at least in principle - to utter an infinite number of different sentences with a limited number of words ('John loves Mary', 'Mary loves John', 'My brother thinks that John loves Mary', 'I know that my brother thinks that John loves Mary', 'You don't believe that I know that my brother thinks that John loves Mary' etc.). The implication of this development was another substantial increase of bonding, communication, and cooperation. Moreover, it was also closely connected with the increasing

speed of the development, transfer and conservation of new knowledge and technologies. A hypothesis shared by many biological anthropologists, is that linguistic cognition has played a crucial role in the marginalization and eventually extinction of the 'archaic' varieties of the *Homo sapiens* (such as the *Homo erectus*, *denisova*, and *neanderthalensis*).

In the context of Wikipedia the third transition, from linguistic to symbolic cognition, is of particular importance. Symbolic cognition is used here as an umbrella term for cognition mediated by external symbols (level IV in Figure 1).¹⁾ Although the origin of this kind of cognition can already be located in archaic *Homo sapiens* (for example in body painting, markings in bones, which date back to at least 300,000 years), symbolic cognition especially emerged in our own species, *Homo sapiens*. From the cave paintings (ca. 40,000 years ago) on, in the last 6000 years it resulted via the icon-based Egyptian hieroglyphs and Chinese ideograms in the modern phonetic alphabet. Especially the invention of writing gave the cultural development of humankind an enormous momentum. The power of written culture with respect to the preceding oral culture lies in the fact that it is no longer so difficult to retain and pass on knowledge vital for survival, as such knowledge can now be recorded in an External Symbolic Storage System, duplicated and consulted to an almost unlimited degree.

The transition from oral culture to symbolic culture is a fundamental cognitive transformation. This transition implies that one of the key elements of cognition, memory, was transferred (or perhaps more appropriately put in this context: outsourced) to a non-biological and culturally shared medium. It not only makes man, to use an expression of the biologist and philosopher Plessner, into a species that is artificial by nature (to phrase it differently: from the very beginning being *Homo sapiens sapiens*, has been a cyborg: partly organic, partly technological), but it also

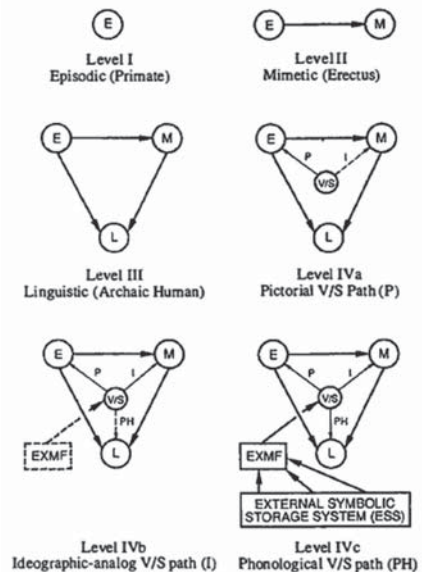


Figure 1 Four levels

implies the emergence of the first material building block of the global brain of a superorganism.

This development had profound cognitive implications: in order to connect the individuals to the External Symbolic Storage System, new skills, such as writing and reading, had to be developed (a development made possible by the plasticity of the human neocortex). Liberating thought from the rich but chaotic context of the mainly narrative speech that characterized mythic culture - of which we still find an echo in the written version of originally oral narratives such as the *Odyssey*, the oral encyclopedia of the ancient world (Parry and Parry 1971) – it also allowed thinking to become more precise and abstract. For this reason, Donald says written culture is profoundly theoretical. Moreover, as has been argued by a number of scholars from the McLuhan school, such as Eric Havelock (Havelock 1986, 1976, 1963), and Walter Ong (Ong 1967, 1982, cf. De Mul 2010), with the medium also the message changed. This can be clearly seen in Plato's philosophy, which according to Havelock reflects the transformation from oral to written culture. Whereas the fleeting oral culture reflects the transient character of everyday reality, due to the fixation, abstraction and decontextualization brought forth by writing, in Plato's philosophy this transient everyday reality is supplemented by a world of eternal and unchanging Ideas.

Just like the emergence of mimetic skills and speech, symbolic cognition increased the reproductive success of the human species. It played a major role in the transition of hunting and gathering tribes into agricultural societies, characterized by – amongst other things – the emergence of cities, states, social hierarchies, and the revolutionary development of new forms of abstract knowledge and technologies. It also played an important role in social organization. One of the basic problems of agricultural civilizations was the fact that the size of its populations were so huge that the type of personal bonding, characteristic for prehistoric tribes, was no longer possible. For that reason, as it has been argued by Egyptologist Jan Assmann, it is no coincidence that agricultural civilizations gave rise to monotheist religions, functioning as institutions of social control and repression (Assmann 2006).

Tribal intolerance was replaced by fundamentalist intolerance, characterized by a belief in a universal truth and morality. Writing played an important role in this process, as this 'Monotono Theismus' (Nietzsche 1980, VI, 75) is closely connected with holy books. In this sense Jaron Lanier's linking of Wikipedia's ambition to become a kind of universal encyclopedia with the superhuman validity of holy books is not that strange. Or is it? In order to answer that question, we have to take a look at a fourth, more recent cognitive transition, the one from theoretic culture to information culture, characterized by computer-mediated cognition.

Merlin Donald published *The Origin of the Modern Mind* in 1991, and although he devotes a couple of pages to the question of what impact the computer might have on human cognition, and even includes a figure to illustrate his point, it is understandable, that he – two years before the launch of the world wide web – wasn't able to dig deep into this impact:

The very recent combination of this new architecture with electronic media and global

computer networks”, we read, “has changed the rules of the game even further. Cognitive architecture has again changed, although the degree of that change will not be known for some time. At the very least, the basic ESS [External Storage System] loop has been supplemented by a faster, more efficient memory device, that has externalized some of the search-and-scan operations used by biological memory. The computer extends human cognitive operations into new realms; computers can carry out operations that were not possible within the confines of the old hybrid arrangement between monads and ESS loops shown in the last few figures. For example, the massive statistical and mathematical models and projections routinely run by governments are simply impossible without computers; so, more ominously, are the synchrony and control of literally millions of monads. Control may still appear to be vested ultimately in the individual, but this may be illusory. In any case, the individual mind has long since ceased to be definable in a meaningful way within its confining biological membrane (Donald 1991, 358-59).

Now, almost 25 years after the publication of *The Origin of the Modern Mind* we are in a somewhat better position to point at some fundamental elements of this fourth transition (although I must immediately add that, because we are still at the beginning of this major transition, every analysis of it can only be tentative). I would like to point at three fundamental characteristics, and relate them to Wikipedia and the hive mind.

First, whereas in writing the products of thinking are outsourced to an external memory, in the case of computer-mediated thought, thinking itself – at least those aspects that can be expressed in computer algorithms – are outsourced to an external device. Of course, the computer can also be used as a memory device, but its distinctive character lies in the fact that it functions as an external symbolic processing system (ESPS). This is already the case with the search-and-scan operations Donald mentions in the quoted passage (Google being the most obvious example), but we should also think of expert systems, and –in the Big Data age – of all kinds of data mining and profiling.

Second, just as in the case of the transition from oral culture to writing culture, the nature of the human thinking transforms. As the outsourcing not only concerns the products of thinking, but

Culture	Cognition	Species
First Transition: From Episodic to Mimetic Culture	Mimetic (rituals)	<i>Homo ergaster/erectus</i> (2 million years BC)
Second transition: From Mimetic to Mythic Culture	Linguistic (speech)	<i>Homo sapiens</i> (100,000 years BC)
Third transition: From Mythic to Theoretic Culture	Symbolic (painting, writing)	<i>Homo sapiens sapiens</i> (50,000 years BC)
Fourth transition: From Theoretic Culture to Information Culture	Computer-mediated (software, network)	<i>Homo sapiens sapiens sapiens</i> (75 years ago)

Figure 2 Four transitions

the thinking process itself, the result is not so much a fixed product, but rather a virtual space for thinking, an interactive database that enables the user to combine and recombine the elements in a virtual infinite way. Computer games offer a good example. They do not so much offer a story (as the novel in writing culture does), but rather a story space, through which the gamer follows his or her own narrative path. In the same way, the scholar in information culture does not present a single argument (such as is the case with the journal article), but rather offers an argumentation space, in which the user creates his own lines of thought. One might think of simulations of organisms, economical transactions, or historical events, which enable the user not only to discover all kinds of hidden patterns in the domain of study, but also to make the transition from reality to possibility. Just like the post-mimetic arts, modal natural sciences like artificial physics, synthetic biology, and artificial intelligence not so much aim at a theoretical imitation of reality, but rather at the creation of new realities (Emmeche 1991). But we could also think of a Wittgenstein 2.0 database, in which the user can recombine the thousands of remarks Wittgenstein himself hoped to connect in a flexible network in order to go beyond the fixed character of traditional writing (De Mul 2008).

Third, whereas in Theoretic Culture the connection between individuals and the External Symbolic Storage System is still loose, the connectivity between individuals and the External Symbolic Processing System in the emerging Information Culture becomes increasingly more tight. Whereas the traditional mainframe computer was still clearly separated from the users, with the PC, laptop, smartphone, and smartwatch, human beings and computers come ever closer. And if we think of the fast-developing field of implanted computer interfaces - Google is already experimenting with them (Sherwin 2013) - we appear to be at the edge of the materialization of the hive mind.

Concluding remarks

Let me return to Wikipedia and conclude with the following realistic observations and speculative predictions (it is up to the reader to decide of these predictions refer to an informationistic heaven or hell).

Although Wikipedia so far has been quite successful as a collective, interactive project, the resulting product in many ways still resembles the products in the External Symbolic Storage System of Theoretic Culture. In spite of its hypertextual form and the outsourcing of all kinds of tasks to computer programs – according to Jemielniak (2014), the English version of Wikipedia alone at present has at least 50,000 bot editors, for example one that adds the lemma with the list of villages in China, including their geographical location - it offers the visitor an encyclopedia that in many respects still resembles the encyclopedia projects that have been launched from the Enlightenment on to the *Encyclopedia Britannica*.

As such Wikipedia also remains prone to the Oracle illusion Lanier (2010) is warning us for.

Although the continuous process of updating of Wikipedia prevents the user from believing in timeless truths, the fact remains that at the moment of visiting only one particular truth prevails. This violates the fundamental principle of information culture, that possibility stands higher than actuality. At this moment, so called 'point of view forks' - an attempt to evade the neutrality policy by creating a new article about a subject that is already treated in an article - are not permitted in Wikipedia. Although there is a good reason for this policy (avoiding confusion) and for the ambition to collect different viewpoints on an issue in a single article, it also evokes the danger of digital Maoism, and of ending in 'the middle of the road' of knowledge.

When I try to image the Wikipedia of the future, it will no longer resemble a book, but will rather be a pluralistic argumentation space, an encyclopedic database that will enable the user to traverse and create multiple paths through the subjects, to enter and tweak multimedial simulations of objects and events, and to explore possibilities beyond reality. The user of this *virtual multipedia* will not only think his own thoughts, but - being connected through the global brain with countless other minds - the thoughts of many others as well. However, this hive mind will not necessarily be monotontheistic, but - if we want - might turn out to be a domain of bewildering polytheistic creativity instead.

Endnotes

- 1) Figure1: This picture is copied from Donald's *Origins of the Modern Mind* (Donald 1991, 305).

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