World Heritage Sites on Wikipedia: Inscription Controversies in a Context of Constrained Agency for Cultural Heritage Activism

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UNESCO World Heritage sites are places of outstanding significance, and often key sources of information that influence how people interact with the past today. The process of inscription on the UNESCO list is complicated and intersects with political and commercial controversies. But how well are these controversies known to the public? Wikipedia pages on these sites offer a unique dataset for insights into public understanding of heritage controversies. The unique technicity of Wikipedia, with its bot ecosystem and editing mechanics, shapes how knowledge about cultural heritage is constructed, and how controversies are negotiated and communicated. In this article we investigate the patterns of production, consumption and spatial and temporal distributions of Wikipedia pages for World Heritage cultural sites. We find that Wikipedia provides a distinctive context for investigating how people experience and relate to the past in the present. The agency of participants is highly constrained, but distinctive, behind-the-scenes expressions of cultural heritage activism are evident. Concerns about state-like actors, violence and destruction, deal-making, etc. in the World Heritage inscription process are poorly represented on Wikipedia’s World Heritage pages, instead hyper-local, and process issues dominate controversies on Wikipedia. We will consider how this kind of research, drawing on big data and data science methods, adds new dimensions to the debate on heritage controversies, especially its unique contributions, and also its limitations.

# Introduction

Heritage is the processes and outcomes of people engaging with elements of the past – material and immaterial – and attributing social and cultural meanings to them in the present (Smith 2006; Harrison 2013). These are important to understand because they shape peoples’ identities and influence how they think and behave towards other people. Digital heritage are these engagements that are enabled by the Internet (Bonacchi and Krzyzanska, 2019), leaving traces that can be identified and quantified using data science methods. Digital heritage studies represent a major turn from traditional heritage studies, characterized by post-modernism (Kristiansen, 2014), critical theory, and qualitative methods, towards novel ontologies, data-intensive ethnographies, and a new role for heritage scholars as data scientists. Bonacchi et al. (2019; 2018) have sketched out the new digital heritage research program with their combination of data-intensive and qualitative investigations of 1.4m Facebook posts in Brexit-related community groups. They found recurring parallels – both pro- and anti-Brexit – made by Facebook users between the European Union, the Roman Empire and “barbarians” as they use heritage to support their political activism. They demonstrate the potential for understanding public perceptions and experiences of the past in contemporary society using big data obtained from social media. In this paper we extend the digital heritage research program in two important new directions. First, we introduce Wikipedia as an example of an online peer production community where people engage with elements of the past in measurable ways. Second, present a case study using data science methods to investigate the ways people create and consume Wikipedia articles on cultural sites inscribed on the UNESCO World Heritage List (hereafter CS-WHL).

While social media is a vast and diverse online space that we are only just beginning to explore how people engage with the past, there are other contexts of online interactions where heritage is practiced in distinctive, if poorly understood, ways. We can contrast social media, with its fundamental elements of identity, conversations, sharing, presence, relationships, reputation, and groups (Kietzmann et al., 2011), with peer production communities, where online users participate in the collaborative, asynchronous creation, sharing, promoting, and classification of content in highly structured and goal-directed ways (Wilkinson, 2008). Online peer production communities are comparable to more traditions kinds of voluntary associations where groups set and execute goals, with explicitly democratic organizational ideals. While the ideals of many online peer production communities emphasize non-hierarchical and non-bureaucratic organization, analysis of large amounts of user activity indicates that most of these communities are actually undemocratic and noninclusive, functioning as entrenched oligarchies (Shaw and Hill, 2014). This emphasis on governance and management of collective action is a key detail that distinguishes online communities on social media from online communities on peer production projects. It follows that user interactions in the process of generating context in online peer production communities includes technological and social mechanisms that enact the community’s governance policies, for example, limiting a user’s activity according to their status in the community’s hierarchy, or managing conflict with highly structured procedures. These distinctive organizational and technical qualities of online peer production communities make them an intriguing novel context of heritage production to study digital traces of human activity resulting from engagement with the past

## Wikipedia as a Context of Heritage Production

Here we present a study of how people engage with elements of the past in one of the largest and long-lived online peer production communities, Wikipedia. Originating in 2001, this is a highly influential and well-known online encyclopedia, currently with 11 billion page views per month (<https://stats.wikimedia.org/#/en.wikipedia.org>), that anyone can edit. Although anyone can edit, most internet users do not, and the characteristics of people who do edit are important to understand to identify biases in the encyclopedia’s content. In a survey of 1,512 American adults, Shaw and Hargittai (2018) found that majority of internet users (96.5%) had heard of Wikipedia, and 82.5% of those said that they had ever visited the site. Just over two thirds (67.3%) knew that Wikipedia can be edited, but only 8.2% of the full sample had ever edited any page. Factors that strongly predict if a user has ever edited Wikipedia include their gender (male), age (younger), education level (has BA), Internet use frequency (higher) and Internet use skills (higher). Hill and Shaw (2013) a similarly found that among U.S. adult contributors to the English-language edition of Wikipedia, at least 75% are male. While gender disparities have been documented throughout Wikipedia (Adams and Brückner, 2015; Ford and Wajcman, 2017), there are also geographical disparities. Johnson et al. (2016) examined 218,709 English geotagged articles about places in the contiguous United States and 46,124 Chinese geotagged articles about places in China to investigate differences in articles about urban and rural places. They found that articles about rural areas have systematically lower quality, are less likely to have been produced by contributors who focus on the local area, and are more likely to have been generated by bots (automated software agents). These studies indicate that inequalities on a range of variables mean that participation in online peer production communities often exacerbates existing patterns of social exclusion.

An additional consideration for understanding participation in online peer production communities are the technical schemas of the software that Wikipedia runs on, MediaWiki. This is a complex toolkit that enables participation in Wikipedia in highly structured ways. On one hand, these structured behaviours produce structured datasets that are well suited to data science methods for efficient computational analysis of large numbers Wikipedia articles. On the other hand, they constrain and limit the agency of the user, canalizing their behaviour into a small number of possible actions and acceptable modes of discourse and engagement with other users (Iba et al., 2010). While Wikipedia has elements that are ubiquitous on the Internet, such as links on articles that take the user to other articles or other pages on the Internet, it also has several less common elements that contribute to its unique technicity, resulting in very specific types of relationships between human users and the technical elements of the Wikipedia project (Niederer and Van Dijck, 2010). For example, every edit to an article is tracked in a publicly accessible version control system attached to that article. This exposes the article creation process in highly granular detail; for any given article, we can see how many editors contributed, the size of their edits and their distribution over time, among other things (Priedhorsky et al., 2007). Wikipedia has a special category of edit called the ‘revert’ which allows a user to restore an article to an earlier state to remove recent vandalism (such as the addition of irrelevant or offensive material). This special revert action, combined with a ‘talk’ page attached to each encyclopedia article for threaded discussion among editors, allows us to detect and study the dynamics of conflicts arising from the creation and editing of articles (Suh et al., 2007). For example, a high proportion of ‘revert’ type edits, and a high word count on the talk page can indicate the controversiality of an article (Yasseri et al., 2012).

Table 1: Summary of Wikipedia bot types and functions, from Zheng et al. (2019)

|  |  |  |
| --- | --- | --- |
| Role | Function | Example |
| Generator | Generate article pages based on predefined templates. | Rambot, RussBot |
| Fixer | Fix errors in article pages in order to keep the information neat and correct. | CmdrObot, Yobot |
| Connector | Connect Wikipedia with other sites and databases | KasparBot |
| Tagger | Tag articles with different templates and categories | AnomieBot, Smackbot, Cydebot |
| Clerk | A variety of tasks including updating statistical information, documenting user status, updating maintenance pages | AnomieBot, Smackbot |
| Archiver | Archive closed discussions and maintain the archived content by assigning an index and sorting them alphabetically | AnomieBot, Cyberbot\_I |
| Protector | Detect and regulate destructive behaviors | ClueBot NG |
| Advisor | Provide editors with suggestions about articles that they might want to contribute to. | SuggestBot |
| Notifier | Deliver messages to editors. | NoomBot |

In addition to the human users and the technological system that enables and constrains their activities on Wikipedia, there is an important third element of the ecosystem that contributes to Wikipedia’s uniqueness: the bots. Wikipedia bots are computer scripts that automatically handle repetitive and mundane tasks to develop, improve, and maintain the encyclopedia. While bots are not unique to Wikipedia, they are important contributors, responsible for a large proportion of edits, and shape the human experience in significant ways (Geiger, 2014; Niederer and Van Dijck, 2010, ’ @geiger2009social). They also evolve and autonomously engage in complex interactions with other bots to modify the encyclopedia (Geiger and Halfaker, 2017; Tsvetkova et al., 2017). Zheng et al. (2019) studied all 1,601 bots that were registered at the time of their study, and classified them into 9 bot roles and 25 associated bot functions. Table 1 shows the bots that were identified in our study and their categories and functions according to Zheng et al. (2019).

## UNESCO World Heritage Cultural Sites as foci of Conflict

We investigate how the unique technicity of Wikipedia shapes interactions between people and the past with a case study on the processes of constructing knowledge about cultural sites inscribed on the WHL. We chose the CS-WHL as a bounded set of cultural heritage elements with several characteristics that make it of general interest. It has a global geographic distribution, broad public interest at local and international scales, in both online and face-to-face communities; a wide temporal distribution in both the age of the cultural sites, the ages of inscription on the WHL, and the ages of their appearance on Wikipedia; and finally many CS-WHL have a high intensity of cultural and political discussions that surround events affecting these sites, such as their inscription on the WHL. These qualities make it an ideal data set as an entry point for case studies of digital heritage in online peer production communities, where activities are typically goal-driven (e.g. ‘write quality articles’) compared to social media activity where user activities are more often event-driven (e.g. ‘share reactions to Brexit’).

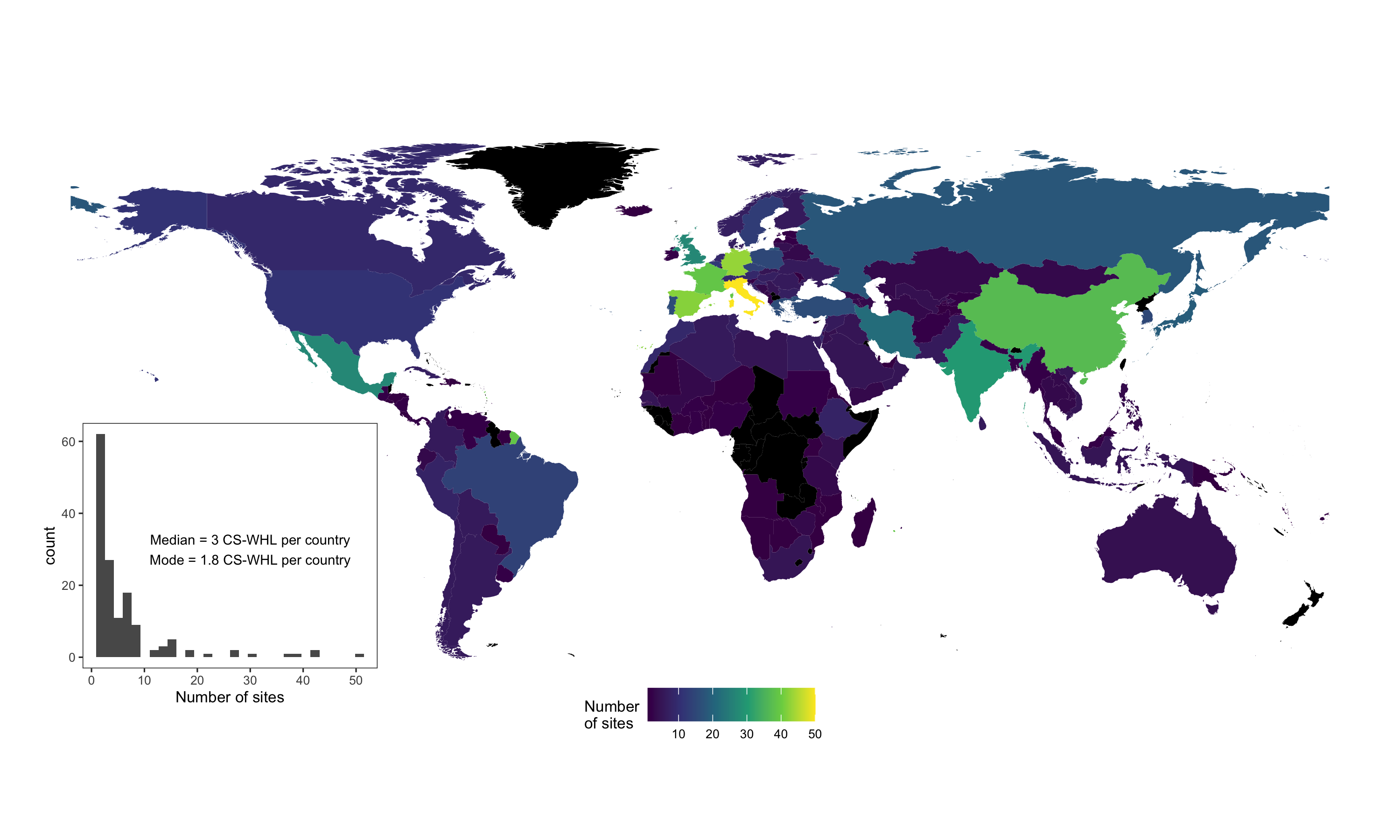


Figure 1: Cultural Sites on the UNESCO World Heritage List. Countried coloured black currently have no listed cultural sites. Inset shows the distribution of sites per country. Map data from naturalearthdata.com

UNESCO was established in 1945, shortly after the end of the Second World War, for the purpose of helping to rebuild after the war, and preserve peace by promoting the international exchange of ideas. In 1975 the UNESCO-drafted “Convention Concerning the Protection of the World Cultural and Natural Heritage” came into force and established the World Heritage List (WHL) to protect natural and cultural sites and landscapes around the world that have outstanding universal value. Currently there are 869 cultural properties on the UNESCO WHL, with the first sites inscribed in 1978. On average, most countries have 2-3 sites, with most sites located in Italy and western Europe, and several countries having no sites at all, for example, several central African countries, Taiwan, and New Zealand (Figure 1).

In her institutional ethnography of UNESCO’s role in protecting world heritage, Meskell (2018) argues that the WHL is less about preserving heritage than about political and economic transactions between states and state-like actors. Sites that are listed, or candidates for listing, are often foci of disputes and negotiations about territory, sovereignty, and security, as well as international corporate activity (Meskell, 2018). This is because the process of selecting of sites to be inscribed on the WHL has become politicized and driven by countries’ political influence and national strategic interests (Bertacchini et al., 2016). For example, the members of the World Heritage Committee are mostly career diplomats rather than heritage specialists, indicating that the processes and decisions of this committee may be motivated more by political trade-offs than by heritage expertise and judgment (Von Droste, 2011).

Several CS-WHL sites are notable for the conflicts and tensions that have surrounded their inscription. The 1992 inscription of Angkor (an ancient city and empire in Cambodia, prominent during the 9th to the 15th centuries AD) was supported by exiled supporters of the genocidal Khmer Rouge regime, hoping to strengthen territorial claims (Locard, 2015). They appropriated Western discourse on national cultural heritage to argue for the safeguarding of Angkor as part of their quest for national independence and international recognition. Early in the Khmer Rouge regime Angkor was declared a symbol of enslavement by a primitive culture, but when the Khmer Rouge adopted a new rhetoric of a supposedly civilizing mission, they presented it as the site one of the great world civilizations (Falser, 2015). The 2003 inscription of Mapungubwe (the site of the first indigenous kingdom in Southern Africa, 900-1,300 AD) was preceded by a recommendation from ICOMOS (International Council on Monuments and Sites, a professional association that is a key advisory body to the World Heritage Committee) not to inscribe because of the farming and mining activity in highly sensitive areas near the site, and the unclear ownership of the mining rights at the time (Meskell, 2011). Despite this negative recommendation, geopolitical machinations within the Committee, especially by the Indian and Russian delegates, led to Mapungubwe being inscribed on the list, although without the typical prerequisites of an integrated management plan or complete buffer zone (Meskell, 2012). These examples of Angkor and Mapungubwe demonstrate the attention that the WHL inscription process can generate due to political activitsm, conflicts and intrigue.

Physical conflict at or near CS-WHL are also major events that galvanise public interest in these locations. World Heritage sites in Palestine, Mali, Syria, Congo and Cambodia have recently been sites of violence, in many cases the violence is specifically linked to their potential WHL nomination, listing or management. In 1998 anti-government and mostly Hindu Tamil groups bombed the holy Buddhist site of the Temple of the Tooth at the WHL site of Kandy (the last capital of the ancient kings of Sri Lanka), killing 17 people and substantially damaging the temple (Coningham and Lewer, 1999). In Mali during 2012, fighting between government and rebel groups lead to the damage and destruction of tombs at the CS-WHL sites of Gao and Timbuktu (Brioschi, 2017). The World Heritage Committee found itself powerless to intervene because of political gridlock (Meskell, 2015), and these Mali sites are currently among the 53 sites on the List of World Heritage in Danger (<https://whc.unesco.org/en/danger/>). In 2015, ISIS militants destroyed the Temple of Bel in Palmyra, Syria (a CS-WML site of monumental ruins, once great city at the crossroads between east and west in the ancient world) (Gornik, 2015). Preah Vihear, inscribed in 2008, is a CS-WHL located on a long-disputed section of the Thai-Cambodia border that has been a site of both violent military clashes and international political intrigue. Although both Thailand and Cambodia supported the nomination of the site to the WHL, the Thai government objected to maps in the nomination package that showed Cambodia as the owner of disputed land next to the temple, leading to protests and military clashes (Sothirak, 2013). Meskell (2016)’s analysis of US diplomatic cables released by WikiLeaks further reveals that settlement of disputes over Preah Vihear were intricately tied to broader issues of foreign policy and US and Chinese investment, especially access to natural gas reserves in the Gulf of Thailand. For example, the cables reveal negotiations for Cambodia to retain their temple, leading to the enhancement of Thailand’s underwater assets, and the United States negotiating for extended contracts with both countries.

# Methods

Our brief review of controversial cultural sites on the WHL shows the intensity and diversity of conflicts and tensions that surround these sites. Many CS-WHL are symbols of national, cultural, political, and religious identity, and the extent of political involvement in negotiations of WHL inscriptions indicates they are of great public interest among local and diasporic communities. Our goal in this study is answer the question of how this interest is expressed within the socio-technical constraints of Wikipedia. How are conflicts over CS-WHL enacted in the canalized interactions of the world’s largest encyclopedia? We attempt to answer this question by studying all the CS-WHL that have Wikipedia articles. We surveyed the basic characteristics of content (article length, number of wikilinks out to other pages, number of citations to non-Wikipedia items), consumption (page view counts, wikilinks in from other Wikipedia pages), and production (edit counts, edit densities, edit sizes, number of unique editors per article, talk page length, talk page topics). By comparing these basic characteristics of Wikipedia articles about CS-WHL to 10,000 random Wikipedia articles we will answer the question: how does engagement with the past compare via CS-WHL on Wikipedia compare to engagement with other topics? Do Wikipedia articles about controversial CS-WHL sites, such as those discussed above, get more attention than random Wikipedia articles? Can we detect conflict in the edit histories, bot activity, and talk pages for Wikipedia articles about CS-WHL sites, and how does this conflict relate to the types of controversies noted above?

The highly detailed edit histories that Wikipedia keeps for every article allow us to further investigate spatial and temporal questions relating to engagement with the past and conflicts surrounding CS-WHL sites. For example, when an article is edited by a user who does not have a Wikipedia user account (or is not logged into their account), their edit is identified by that person’s IP address. This IP address can be used to geo-locate the user to the city they were in when the made the edit. We geo-located all edits with IP addresses for all Wikipedia articles CS-WHL sites to determine the country of origin of those edits. This helps us to answer the question: are the editors of articles about CS-WHL located near the sites they edit, indicating local community interest in the online representation of their heritage? Or are editors located in other countries, implying a digital colonialism of world heritage information on Wikipedia where one community’s heritage is interpreted and communicated by another? The time and date stamps attached to every edit on every article allows us to investigate temporal patterns of activity on CS-WHL Wikipedia articles. Analyses of these data help us to answer the question: is Wikipedia editing activity correlated with events outside of Wikipedia relating to the CS-WHL sites, such as conflict events, or their inscription on the WHL?

We obtained data about Wikipedia articles by scraping the HTML pages with the rvest package for R (Wickham, 2019). We used the SelectorGadget (Cantino and Maxwell, 2017) extension for the Chrome web browser to identify specific elements of interest, or nodes, on the HTML pages, and wrote custom R functions to extract data from these nodes. We collected data during May 2019, and due to the dynamic nature of Wikipedia, it is highly likely that articles in our study have subtly changed since our data collection as users and bots continue their activity. It is unlikely that articles in our sample have been deleted from Wikipedia since our data collection, because of the high notability of CS-WHL, but it is possible that new articles have since appeared about sites that were not represented on Wikipedia since we collected the data.

# Reproducibility and Open Source Materials for This Study

To enable reuse of our materials and improve reproducibility and transparency (Marwick, 2017), we include the entire R code (R Core Team, 2020) used for all the analysis and visualizations contained in this article in our compendium at <http://doi.org/10.17605/OSF.IO/AY27G>. Also in this version-controlled compendium are the raw data for all the results reported here. All of the figures and quantitative results presented here can be independently reproduced with the code and data in this repository. In our compendium our code is released under the MIT license, our data as CC-0, and our figures as CC-BY, to enable maximum reuse (for more details, see Marwick et al. (2018)).

# Results

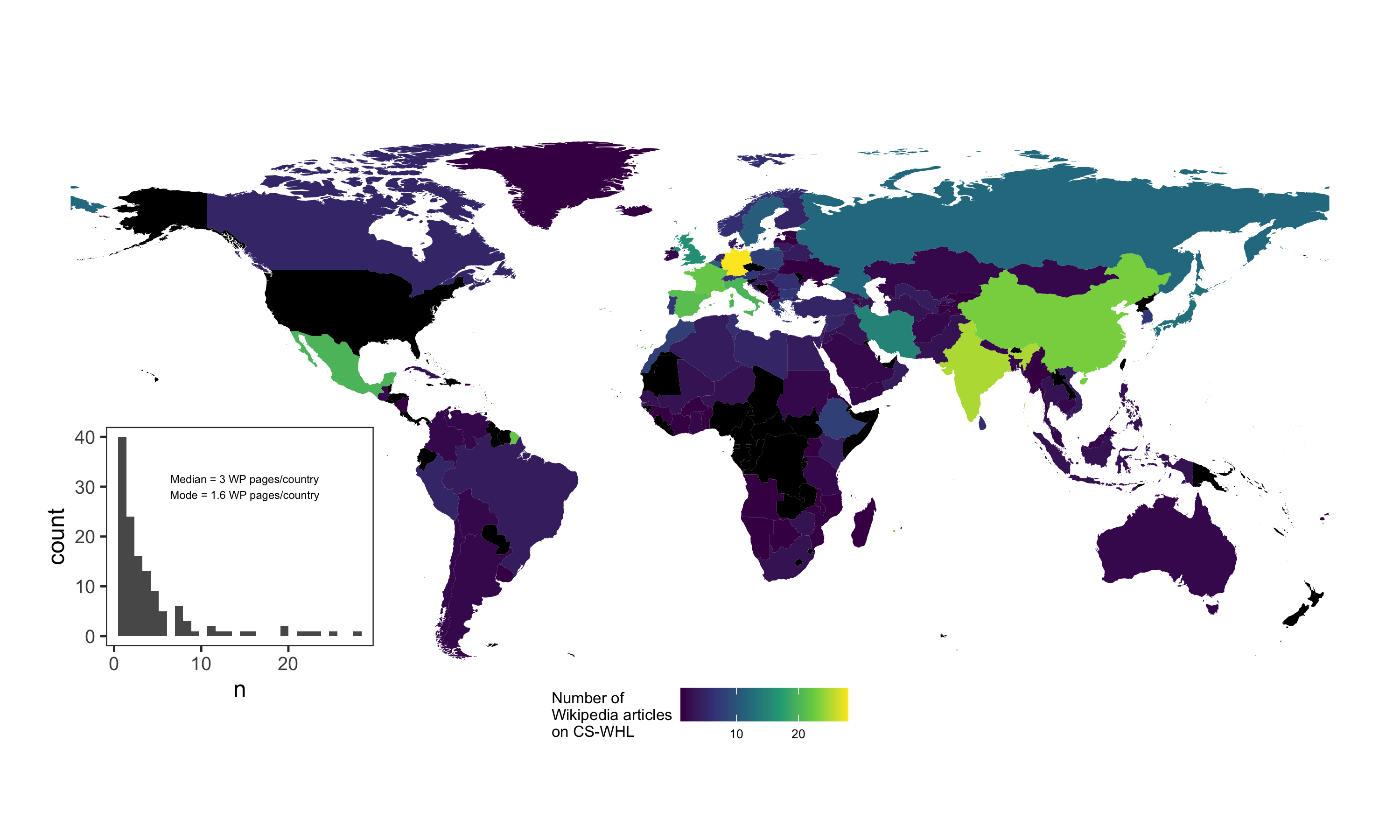


Figure 2: Wikipedia articles for Cultural Sites on the UNESCO World Heritage List. Countries coloured black currently have no Wikipedia articles for CS-WHL sites. Inset shows the distribution of articles per country. Map data from naturalearthdata.com

Of the 869 CS-WHL, we found Wikipedia articles for 575.

# Discussion

# Conclusion

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# References

Adams, J., Brückner, H., 2015. Wikipedia, sociology, and the promise and pitfalls of big data. Big Data & Society 2, 2053951715614332.

Bertacchini, E., Liuzza, C., Meskell, L., Saccone, D., 2016. The politicization of unesco world heritage decision making. Public Choice 167, 95–129.

Bonacchi, C., Krzyzanska, M., 2019. Digital heritage research re-theorised: Ontologies and epistemologies in a world of big data. International Journal of Heritage Studies 25, 1235–1247.

Brioschi, G., 2017. Discourses of heritage: UNESCO and the local community in timbuktu (PhD thesis). Brussels School of International Studies.

Cantino, A., Maxwell, K., 2017. SelectorGadget: Point and click css selectors.

Coningham, R., Lewer, N., 1999. Paradise lost: The bombing of the temple of the tooth—a unesco world heritage site in sri lanka. Antiquity 73, 857–866.

Falser, M., 2015. Representing heritage without territory—the khmer rouge at the unesco in paris during the 1980s and their political strategy for angkor, in: Cultural Heritage as Civilizing Mission. Springer, pp. 225–249.

Ford, H., Wajcman, J., 2017. “Anyone can edit”, not everyone does: Wikipedia’s infrastructure and the gender gap. Social studies of science 47, 511–527.

Geiger, R.S., 2014. Bots, bespoke, code and the materiality of software platforms. Information, Communication & Society 17, 342–356.

Geiger, R.S., 2009. The social roles of bots and assisted editing programs, in: Proceedings of the 5th International Symposium on Wikis and Open Collaboration. pp. 1–2.

Geiger, R.S., Halfaker, A., 2017. Operationalizing conflict and cooperation between automated software agents in wikipedia: A replication and expansion of’even good bots fight’. Proceedings of the ACM on Human-Computer Interaction 1, 1–33.

Gornik, V., 2015. Can unesco do more to counter terrorists’ destruction of world heritage? Present Pasts 6.

Hill, B., Shaw, A., 2013. The wikipedia gender gap revisited: Characterizing survey response bias with propensity score estimation. PLoS ONE 8.

Iba, T., Nemoto, K., Peters, B., Gloor, P.A., 2010. Analyzing the creative editing behavior of wikipedia editors: Through dynamic social network analysis. Procedia-Social and Behavioral Sciences 2, 6441–6456.

Johnson, I.L., Lin, Y., Li, T.J.-J., Hall, A., Halfaker, A., Schöning, J., Hecht, B., 2016. Not at home on the range: Peer production and the urban/rural divide, in: Proceedings of the 2016 Chi Conference on Human Factors in Computing Systems. pp. 13–25.

Kietzmann, J.H., Hermkens, K., McCarthy, I.P., Silvestre, B.S., 2011. Social media? Get serious! Understanding the functional building blocks of social media. Business horizons 54, 241–251.

Kristiansen, K., 2014. Towards a new paradigm. The third science revolution and its possible consequences in archaeology. Current Swedish Archaeology 22, 11–71.

Krzyzanska, M.A., Chiara Bonacchi, 2018. The heritage of brexit: Roles of the past in the construction of political identities through social media - chiara bonacchi, mark altaweel, marta krzyzanska, 2018. Journal of Social Archaeology.

Locard, H., 2015. The myth of angkor as an essential component of the khmer rouge utopia, in: Cultural Heritage as Civilizing Mission. Springer, pp. 201–222.

Marwick, B., 2017. Computational reproducibility in archaeological research: Basic principles and a case study of their implementation. Journal of Archaeological Method and Theory 24, 424–450.

Marwick, B., Boettiger, C., Mullen, L., 2018. Packaging data analytical work reproducibly using r (and friends). The American Statistician 72, 80–88.

Meskell, L., 2018. A future in ruins: UNESCO, world heritage, and the dream of peace. Oxford University Press.

Meskell, L., 2016. World heritage and wikileaks: Territory, trade and temples on the thai-cambodian border. Current Anthropology 57.

Meskell, L., 2015. Gridlock: UNESCO, global conflict and failed ambitions. World Archaeology 47, 225–238.

Meskell, L., 2012. The rush to inscribe: Reflections on the 35th session of the world heritage committee, unesco paris, 2011. Journal of Field Archaeology 37, 145–151.

Meskell, L., 2011. From paris to pontdrift: UNESCO meetings, mapungubwe and mining. THE SOUTH AFRICAN ARCHAEO LOGICAL BULLETIN 149–156.

Niederer, S., Van Dijck, J., 2010. Wisdom of the crowd or technicity of content? Wikipedia as a sociotechnical system. New Media & Society 12, 1368–1387.

Priedhorsky, R., Chen, J., Lam, S.(.K., Panciera, K., Terveen, L., Riedl, J., 2007. Creating, destroying, and restoring value in wikipedia, in: Proceedings of the 2007 International Acm Conference on Supporting Group Work. pp. 259–268.

R Core Team, 2020. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria.

Shaw, A., Hargittai, E., 2018. The pipeline of online participation inequalities: The case of wikipedia editing. Journal of communication 68, 143–168.

Shaw, A., Hill, B.M., 2014. Laboratories of oligarchy? How the iron law extends to peer production. Journal of Communication 64, 215–238.

Sothirak, P., 2013. Cambodia’s border conflict with thailand. Southeast Asian Affairs 2013, 87–100.

Suh, B., Chi, E.H., Pendleton, B.A., Kittur, A., 2007. Us vs. Them: Understanding social dynamics in wikipedia with revert graph visualizations, in: 2007 Ieee Symposium on Visual Analytics Science and Technology. IEEE, pp. 163–170.

Tsvetkova, M., Garcı́a-Gavilanes, R., Floridi, L., Yasseri, T., 2017. Even good bots fight: The case of wikipedia. PloS one 12.

Von Droste, B., 2011. The concept of outstanding universal value and its application. Journal of cultural heritage management and sustainable development.

Wickham, H., 2019. Rvest: Easily harvest (scrape) web pages.

Wilkinson, D.M., 2008. Strong regularities in online peer production, in: Proceedings of the 9th Acm Conference on Electronic Commerce. pp. 302–309.

Yasseri, T., Sumi, R., Rung, A., Kornai, A., Kertész, J., 2012. Dynamics of conflicts in wikipedia. PloS one 7, e38869.

Zheng, L., Albano, C.M., Vora, N.M., Mai, F., Nickerson, J.V., 2019. The roles bots play in wikipedia. Proceedings of the ACM on Human-Computer Interaction 3, 1–20.

### Colophon

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#> R6 2.4.1 2019-11-12 [1]  
#> Rcpp 1.0.4.6 2020-04-09 [1]  
#> readr \* 1.3.1 2018-12-21 [1]  
#> readxl 1.3.1 2019-03-13 [1]  
#> remotes 2.1.1 2020-02-15 [1]  
#> reprex 0.3.0 2019-05-16 [1]  
#> rgeos 0.5-2 2019-10-03 [1]  
#> rlang 0.4.6 2020-05-02 [1]  
#> rmarkdown 2.1 2020-01-20 [1]  
#> rnaturalearth \* 0.1.0 2017-03-21 [1]  
#> rnaturalearthdata \* 0.1.0 2017-02-21 [1]  
#> rprojroot 1.3-2 2018-01-03 [1]  
#> rstudioapi 0.11 2020-02-07 [1]  
#> rvest 0.3.5 2019-11-08 [1]  
#> scales 1.1.1 2020-05-11 [1]  
#> sessioninfo 1.1.1 2018-11-05 [1]  
#> sf 0.9-3 2020-05-04 [1]  
#> sp 1.4-1 2020-02-28 [1]  
#> stringi 1.4.6 2020-02-17 [1]  
#> stringr \* 1.4.0 2019-02-10 [1]  
#> testthat 2.3.2 2020-03-02 [1]  
#> tibble \* 3.0.1 2020-04-20 [1]  
#> tidyr \* 1.0.3 2020-05-07 [1]  
#> tidyselect 1.1.0 2020-05-11 [1]  
#> tidyverse \* 1.3.0 2019-11-21 [1]  
#> units 0.6-6 2020-03-16 [1]  
#> usethis 1.6.1 2020-04-29 [1]  
#> vctrs 0.3.0 2020-05-11 [1]  
#> viridisLite 0.3.0 2018-02-01 [1]  
#> withr 2.2.0 2020-04-20 [1]  
#> xfun 0.14 2020-05-20 [1]  
#> xml2 1.3.2 2020-04-23 [1]  
#> yaml 2.2.1 2020-02-01 [1]  
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#>   
#> [1] /Library/Frameworks/R.framework/Versions/4.0/Resources/library

The current Git commit details are:

#> Local: master /Users/bmarwick/Desktop/worldheritagewikipedia  
#> Remote: master @ origin (https://github.com/benmarwick/worldheritagewikipedia.git)  
#> Head: [a8a8618] 2020-05-24: more writing abotu WHL