

RESEARCH

'Viral' Hunts? A Cultural Darwinian Analysis of Witch Persecutions

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The theory of Darwinian cultural evolution is gaining currency in many parts of the socio-cultural sciences, but it remains contentious. Critics claim that the theory is either fundamentally mistaken or boils down to a fancy re-description of things we knew all along. We will argue that cultural Darwinism can indeed resolve long-standing socio-cultural puzzles; this is demonstrated through a cultural Darwinian analysis of the European witch persecutions. Two central and unresolved questions concerning witch-hunts will be addressed. From the fifteenth to the seventeenth centuries, a remarkable and highly specific concept of witchcraft was taking shape in Europe. The first question is: who constructed it? With hindsight, we can see that the concept contains many elements that appear to be intelligently designed to ensure the continuation of witch persecutions, such as the witches' sabbat, the diabolical pact, nightly flight, and torture as a means of interrogation. The second question is: why did beliefs in witchcraft and witch-hunts persist and disseminate, despite the fact that, as many historians have concluded, no one appears to have substantially benefited from them? Historians have convincingly argued that witch-hunts were not inspired by some hidden agenda; persecutors genuinely believed in the threat of witchcraft to their communities. We propose that the apparent 'design' exhibited by concepts of witchcraft resulted from a Darwinian process of evolution, in which cultural variants that accidentally enhanced the reproduction of the witch-hunts were selected and accumulated. We argue that witch persecutions form a prime example of a 'viral' socio-cultural phenomenon that reproduces 'selfishly', even harming the interests of its human hosts.

Keywords: Cultural evolution; memes; cultural epidemiology; Daniel Dennett; witch-hunts; demonology

Introduction

Recent decades have witnessed the remarkable growth of a new scientific field: Darwinian cultural evolution (Lewens, 2015; Mesoudi, 2010, 2016). One of the key features of this approach is the application of *populational thinking*, imported from biology, to the cultural realm. Culture is seen as a collection of items (beliefs, practices, ideas), which form chains of transmission and are distributed across a population of human minds. Indeed, cultural items are engaged in a continuing process of competition for human minds, an ongoing 'struggle for survival'. Ironically, this framework has such wide applicability that it also includes the field of cultural evolution itself. In the competitive academic arena of publications and funding, some branches of the theory flourish while others stay marginal and have to struggle to survive. The notion of *cultural group selection*, for example, is a branch that is attracting increasing scientific attention and seems destined for a promising future. Richard Dawkins's brainchild of 'memes', on the other hand, looks like the perfect example of an evolutionary dead-end. Despite its wide acclaim in popular culture, the academic future of the idea looks increasingly bleak.

In his 1976 bestseller *The Selfish Gene*, Richard Dawkins proposed that cultural phenomena may behave like 'selfish' replicators, just like genes in the biological realm. As a result of Darwinian cultural selection, they are adapted to ensure their own propagation, rather than to serve the interests of their human hosts.

Dawkins referred to these cultural items as 'selfish memes' and argued that some may even spread at the expense of their human hosts (Dawkins, 2006b). This suggestion was enthusiastically embraced by several well-known academics such as Daniel Dennett and Susan Blackmore in the 1990s (Blackmore, 2000; Dennett, 1995), but did not gain much traction after that point. The field of cultural evolution began to flourish as never before, but many scholars have taken care to distance themselves from Dawkins's framework. Meme-theory has been criticized as either a fancy re-description of insights that were already familiar to the sociocultural sciences, or a pseudo-science that hardly deserves any academic attention (Fracchia & Lewontin, 1999; Sperber, 2001; Kuper, 2001; Bloch, 2001; Millikan, 2006; Lewens, 2015). Dennett is amongst the few remaining advocates of the idea of 'selfish memes' as a useful tool of analysis (Dennett, 2017; Schlaile, Knausberg, Mueller, & Zeman, 2018).

In this paper we will argue that the wholesale dismissal of memetics may be premature. Dawkins's proposal that cultural phenomena can be regarded as 'selfish' agents furthering their own interests is in need of closer academic attention. We will offer new support for the theory coming from a domain of science that may look like an unlikely ally: qualitative historical scholarship. The debate over memetics has attracted attention from a wide range of academic disciplines, but apart from some notable exceptions qualitative historians have remained relatively absent so far (Smail, 2008; Mokyr, 2017; Harari, 2014). In one of the few references, the philosopher Mary Midgley used qualitative history as a means to cast further doubt on memetics (Midgley, 2000). Through an analysis of the case study of the European witch-hunts, she argued that 'the meme story simply fails to give us any kind of explanation at all.' (Midgley, 2000, p. 83). As Midgley concedes, the witch persecutions may at first sight look like a perfect example of 'selfish memes' that invaded communities lacking immunity to it. But, as she goes on to argue, closer observation demonstrates that such talk misses the point. To understand the witch-hunts, we need to look into human intentions. It entails, as she calls it, the more 'awkward form of investigation' into 'the habits of the heart' (Midgley, 2000, p. 83).

Here we will take on Midgley's challenge of looking at the European witch persecutions as a 'memetic' case study. As we argue, adopting the meme's eye view when dealing with this phenomenon actually holds the promise of shedding new light on a conundrum that historians and sociologists have been wrestling with for ages. Our paper thus turns the tables on critics like Midgley: ironically, a cultural phenomenon that has been leveled as an objection against memetics actually promises to be one of its most striking illustrations.¹

Here is how the paper is organized. First, we briefly introduce what the witch-hunts were. Then we discuss how historical scholars from a wide range of theoretical backgrounds have tried to explain them and also why these attempts largely failed. The current dominant point of view in witchcraft historiography is that no general theoretical framework succeeds; a favorite amongst historians. We discuss why this is unsatisfying, and how an absence of theory leaves some striking aspects of these infamous trials unexplained. After a critical evaluation of memetic theory, we argue that memetics offers indispensable tools that can help us to bridge some of the explanatory gaps in the examination of the European witch persecutions.

What the witch-hunts were

In early modern Europe (1430–1750), tens of thousands of people were killed for the alleged crime of diabolical witchcraft (Goodare, 2016; Levack, 2016). What makes these persecutions a particularly interesting topic to study is that we now know that witches did not exist. Or at least, not in the way that people at the time thought they existed. So why did people hunt for imaginary enemies?

In order to answer this question, we first need to acknowledge that Mary Midgley was right in one important respect. If we aim to understand the witch-hunts, we first need to undertake 'this awkward form of investigation' into 'the habits of the heart'. The early modern witch trials were driven forward by imaginations that can look irrational and bizarre to an audience today. The interpretation and the explanation of these events thus requires a deeper understanding of the complex symbolic world that the involved actors were living in. As we shall see in the next section, the failure of various explanatory attempts in witchcraft historiography was at least partly due to an insufficient understanding of what contemporaries believed. We therefore start with a short immersion in some aspects of the early modern mind-set that made the witch-hunts possible. As the emotion of fear played a key role in the trials, a suitable way to introduce this thought world is by looking at some of the greatest anxieties of the age (Kounine & Ostling, 2016).

¹ Peter Richerson and Robert Boyd briefly refer to witch trials as a case study of a maladaptive cultural phenomenon that spreads in a population despite its fitness-lowering effects (2006: 167–69).

In the public mind, the time period from the fifteenth to the seventeenth century is often associated with the Renaissance, voyages of discovery, the scientific revolution, the Reformation and its alleged individualism, but historical experts have recognised for some time that early modern Europe had more sinister sides (Delumeau, 1978; Kounine & Ostling, 2016). It was also an age of fierce intolerance, religious wars, and profound anxieties. Christian communities often perceived themselves as embattled fortresses, which were in need of defence against dangers and enemies looming all around, and the apocalypse seemed imminent.

The ultimate source of evil in this paranoid world was the Devil (Delumeau, 1978; Levack, 2016). With the support of legions of demons he formed an inexhaustible source of hatred against God and humanity. The Devil should not be understood as a threat to divine powers though, because God was omnipotent. Quite the contrary; God used the Devil as a device to test and punish sinful humankind. But precisely because of the divine origins of his powers, the threat that Satan posed to humanity was all the more real. Human sin was perceived to be ubiquitous, and this provided the Devil with continuing opportunities to exert his evil ways. Satan also sensed the imminent apocalypse, which made his attempts even more pressing.

The historian Stuart Clark described this era as an 'age of cognitive extremism' (Clark, 1997: 39). Opponents were not just opponents, they were active agents of the Devil. The Middle Ages had already witnessed harsh persecutions of religious communities deemed to be deviant, such as the Jews, Hussites and Waldensians (Oberste, 2012). During the fifteenth century and sixteenth-century Reformation, this zeal only seems to have intensified. Enemy religious groups were habitually stereotyped as dark diabolical forces that posed a direct threat to the stability and salvation of righteous Christian communities. Stories abounded about heretical nocturnal meetings with frenzied promiscuous dancing, and Jewish sabbats with cannibalistic rituals. Already before the age of the witch-hunts Europe had developed the mental and institutional machinery to be willing to wipe out such alleged threats.

Another force that was thoroughly distrusted within this male-dominated world was female power. To be sure, women could be venerated, as the cult of Holy Mary testifies. But the sublime virtuousness of Mary sharply contrasted with conditions for many actual women, who were often perceived as weak in mind and character with an overall tendency towards irrationality, petulance, credulity, and sexual transgressions. They posed a potentially uncontrollable force that could easily disrupt the fabric of society, and thus provided the Devil's perfect tool (Delumeau, 1978; Wiesner-Hanks, 2008).

Early modern European communities were confronted with a further range of real and purported dangers. During this particular time period, Europe increasingly experienced the grim effects of the Little Ice Age, and the period from 1550-1660 was characterized by particularly harsh socio-economic strains (Behringer, 1999; Kamen, 1976). In such circumstances, people were often barely getting by, so failed harvests or the loss of livestock could pose an insuperable loss and was dreaded as such. In order to face these challenges, people depended on robust social bonds within their local communities. During times of scarcity, such social cohesion could provide much-needed solidarity. But there was also a darker side to all this, as enmities and suspicions were often building up within communities. When confronted with perceived transgressors, people could lash out harshly against them. Amongst the potentially most incendiary suspicions that could stick to a person was the reputation for evil magic. Early modern Europeans maintained a premodern belief in the possibility of sorcery, and the abuse of such powers was a matter of continuing concern (Briggs, 1996b; Hutton, 2018).

However, petrifying as these real or alleged dangers may have been, they did not yet create witch-hunts. What created the possibility of witch-hunting was that these fears, which had often existed independently from each other, very gradually came together into a cluster of beliefs that was even more frightening, and that has been labelled by witchcraft historians as 'the cumulative concept of witchcraft' (Dillinger, 2018; Levack, 2016). It was a new amalgam of ideas that first appeared in rudimentary form in the fifteenth century in the western Alps, and spread throughout Europe. Scholars disagree on what the cumulative concept precisely entails, but the following notions are amongst the most crucial ones.

It contained the idea that the Devil made a pact with people, women in particular, through sexual intercourse (Roper, 2006). Satan often appeared in women's lives as a handsome young man with beautiful clothes, and then seduced them to have sex with him. It was possible for women to recognize that something was not right, because the Devil could never achieve a perfect disguise. For instance, he may have had the hoof of a goat, or he felt cold, or lacked a shadow. But due to their insatiable sexual appetite and overall

weakness in character, women often did not pay careful attention and so got easily entrapped. This sexual act then turned them into servants of Satan; they became witches. What made these people particularly dangerous was that Satan endowed them with magical powers: the ability to cause disease, kill livestock, or destroy harvests through all sorts of magical means (Levack, 2016).

A further crucial element of the cumulative concept was the notion that witches were supposed to consort with other witches during so-called 'sabbats' (Clark, 1997; Levack, 2016). At these nocturnal events, witches met each other and received their instructions from Satan. The sabbats were horrific gatherings of Devil worship, where witches and demons held sexual orgies, performed cannibalistic rituals, and desecrated the symbols of Christianity. Satan also enabled his witches to attend sabbats at remote places through the magical ability of nightly flight. Goats, pitchforks, or broomsticks could be turned into vehicles for aerial journeys. Witchcraft thus formed a collective endeavour of people who consorted with each other over long distances.

The danger that witchcraft posed to ordinary Christians was urgent but, at the same time, difficult to combat. The magical acts and sabbats all happened in secret and the identity of witches remained concealed. Witchcraft therefore became known as a *crimen exceptum*; an extraordinary crime requiring extraordinary means of investigation. Most important, this implied that normal restrictions on the use of torture during criminal proceedings could be dispensed with. Various forms of physical torment were recommended to make alleged witches confess to their evil deeds and to make them name accomplices. Unsurprisingly, the likelihood of suspects pleading guilty significantly increased.

There was significant temporal and regional variation in what exactly people believed about witchcraft (Blécourt, 2013). Even so, in consonance with several current witchcraft experts, we maintain that the term can still be helpful (Dillinger, 2018; Goodare, 2016; Levack, 2016). Ideas about witchcraft very often did cluster together during a particular time period and retained a certain degree of coherence and stability. When combined, they often had very similar effects. It was an amalgam of ideas that developed a striking capacity to trigger panics about witchcraft that spiralled out of control.

In places where people had internalized the concept, they could interpret various forms of unusual misfortune as acts of witchcraft. A failed harvest owing to a hailstorm or the sudden death of livestock were likely candidates for suspicion. A reputation for maleficent magic within local communities then provided potential suspects. If the local authorities decided to start legal proceedings, investigation through the use of torture could easily lead to confession. The belief in the sabbat created chains of accusation when people were forced to name ever new accomplices. These chains could form networks over long distances from community to community, as a consequence of the belief in nightly flight. It was particularly in late sixteenth and early seventeenth-century Germany that such series of events reached an ominous peak, sometimes leading to hundreds of people being burnt at the stake.

Some historians in the past proposed that there might indeed have been real dissident networks, such as lingering pagan cults or webs of social rebels that were stereotyped as witches by contemporary elites (Michelet, 1952; Murray, 2008). However, historians today have concluded that the alleged evidence for such networks was contaminated by leading questions and the use of torture (Levack, 2016). Doubtless there were people who tried to use harmful magic against others, but the cumulative notion of a network of Satan-worshippers were nothing but 'an illusory whole' (Bever, 2008: 414). This brings us back to our question: Why did people persecute imaginary enemies? As we will see in the next section, this has turned out to be a theoretical puzzle that is remarkably difficult to resolve.

The explanations

'Too well designed', wrote cultural anthropologist Marvin Harris about European witch persecution (Harris, 1989: 236). To Harris, it looked purposeful, demonstrating that there must have been practical uses other than the stated goals of the persecutors. The witch-hunt system was a means to a hidden end. Harris was not the only one to think along these lines. Modern scholars from a wide range of theoretical perspectives have been searching for the secret aims, the concealed beneficiaries. Among nineteenth-century liberal historians, for instance, it was common to explain the witch-hunts as a top-down campaign of clerics (Hansen, 1900; Soldan & Heppel, 1880). A comparable view can be found in the twentieth-century work of the English historian Hugh Trevor-Roper. He argued that witch-hunting was a tool of the late Medieval church that was 'perfected in the course of a local struggle' in the western Alps, and was then applied internationally

(Trevor-Roper, 1969: 115). From this point of view, the intensification of witch-hunting in the 1560s also made sense, as it was closely related to the escalation of the religious wars. In the ongoing struggles between Catholics and Protestants, the hunt for witches provided a helpful instrument to discredit and combat religious opponents.

Marvin Harris, who was influenced by Marxism, also looked for a top-down campaign (Harris, 1989). In his view, the witch-hunt system represented a material power struggle between the ruling classes and the oppressed. Poor people were unsatisfied with their lot and potentially rebellious, so the rich created the enemy scapegoat of the witch. The aggression of the people could then be targeted at the witches instead of the ruling classes, and thereby the rich reaffirmed their position of power. 'That was its secret', explained Harris (1989: 240).

A poststructuralist orientation can be found in the work of the French historian Robert Muchembled, using Michel Foucault's theories of power structure. In his view, the persecutions were part of a cultural power struggle between traditional peasant society and the upcoming world of the modern city. Older women held a central and respected position in traditional peasant culture; and the idea of the witch was created by city elites as a reversal of this image. It was a way of telling peasants that the women they had always respected were untrustworthy. By killing these women, the city elites destroyed something crucial in the peasant world, thereby making it easier to rule over them. The repression of witchcraft, according to Muchembled, was a visible part of 'a more or less conscious' campaign of disciplining traditional rural society: 'It constituted a form of pedagogy' (Muchembled, 1987: 23–4, 69). Similarly, the gender dimension of the witch persecutions, and the strong over-representation of women among the victims, has been highlighted by feminist historians (Barstow, 1994; Ehrenreich & English, 1974; Honegger, 1979). Anne Barstow presented the witch-hunts as a powerful symbolic tool that was used by men to mark the subordinate position of woman. Male interrogators, judges, inquisitors and executioners used the trials as a means to publicly demonstrate the lustfulness and danger of women; thereby underlining the need to keep them confined. As a result of the persecutions, the role of women in European public and working life became all the more contained. 'As a didactic device, the ritual execution of witches succeeded superbly' (Barstow, 1994: 156).

Alternatively, historians who drew inspiration from functional anthropology proposed a more abstract beneficiary. Cultural anthropologists had encountered similar phenomena among non-western peoples, and in the mid-twentieth century some of them argued that witch-hunting should be understood as a form of scapegoating that put to rest tensions within the community (see for instance: Kluckhohn, 1944; Marwick, 1965). Through the attack of a common enemy, tensions were released, moral boundaries were marked, and the community strengthened as a result; society 'benefited' from witch-hunts. Several scholars attempted to apply such insights to European witch-hunting (Ben-Yehuda, 1980; Macfarlane, 1970; Thomas, 1971). As the early modern time period experienced stresses such as social disintegration, rising capitalism and the breakdown of traditional forms of protection against magic, the persecution of witches could offer psychological and social relief. In an analysis of the English trials, Keith Thomas contended that they offered a means of empowerment in the face of danger. Alan Macfarlane described them 'a means of effecting deep social change' (Macfarlane, 1970, p. 197).

In contrast to such socially oriented perspectives, other scholars looked for mundane, individualistic aims. A common suspicion, already expressed by contemporaries, was that the trials were created for the purpose of financial gain (Spee von Langenfeld, 1992). What the persecutors were after was the money of the convicted (Currie, 1968). Mechanisms for profit were 'built into the structure of the trials' It was 'a large and complex business', which created the 'livelihoods of a sizable number of people' (Currie, 1968: 21–2). Similarly, it has been argued that witch-hunting offered an opportunity to indulge in sadistic impulses, or to regulate birth control (Heinsohn & Steiger, 1985; Trethowan, 1963).

In short, historians and social scientists have looked for the hidden beneficiaries of witch-hunts in different directions. However, what these explanations all share is that many experts have rejected them over the past decades (Behringer, 2008; Briggs, 1996b; Dillinger, 2018; Goodare, 2016; Levack, 2016; Scarre, 1987; Thurston, 2007). Various hypotheses highlighted relevant aspects of the trials, such as the overrepresentation of women, interactions between popular and elite cultures, or the social dimensions of village accusations. But as an overall explanatory model they are now generally abandoned, as all these hypotheses suffer from two serious problems.

The first is that historical sources have failed to reveal a hidden agenda. As current witchcraft experts emphasize, belief in witchcraft was not an aberration, or a conviction suddenly created for specific purposes but, rather, a common element of the early modern worldview (Clark, 1997). Geoffrey Scarre comments: 'The prosecution of witches was a rational activity given the complex set of ideas and circumstances obtaining in the sixteenth and seventeenth century' (Scarre, 1987: 34). In historical documents we encounter people telling each other how dangerous witchcraft could be, and how to stop it. It seems that they were genuinely afraid. What they do not talk about is subjugating women, oppressing the poor, let alone relaxing the social system. So it is hard to grasp how the witch-hunters could have developed such a shrewd hidden functional purpose, if they did not discuss this with each other. The scholars who developed the hidden-agenda thesis are equally vague on this point.

One could, of course, argue that people concealed their true intentions, or that they were only subconsciously driven by these motives. But if this were the case, the hidden agenda should have become apparent in the course of the persecutions. However, this was not borne out either (Behringer, 2008; Briggs, 1996b; Dillinger, 2018; Goodare, 2016; Levack, 2016). If there was a systematic agenda, or a systematic function, we should expect the persecutions to display certain regular patterns, targeting certain classes of individuals rather than others. But this is not what historians have encountered, or at least not enough for these hypotheses to be confirmed. Persecutions were highly erratic. They could suddenly erupt, take lots of victims, then disappear for a long while, and then suddenly erupt elsewhere. This, again, looks more like genuine fear than a shrewd and systematic campaign stemming from underlying motives or functions.

It was also a quite haphazard matter who took the initiative and who became the victim. There was an overrepresentation of women among the victims and misogyny was an essential part of the picture. But still, it was regularly also women who took the initiative to accuse, and on average around a quarter of the victims were men. That is quite substantial and does not fit with the school of thought that believes oppressing women was the ultimate aim. Often, it was also elites versus elites, city dwellers versus city dwellers, or Catholics versus Catholics. The division of culprits and victims that these theories would lead us to expect are not at all obvious. Neither are hidden financial motives a likely explanation, as we know that the possessions of the executed witches rarely fell into the hands of the persecutors. Witch-hunting was a very time-consuming and expensive activity – just think of the costs of the trials. People with strictly personal motives would probably have found more efficient ways of getting what they wanted. As historians note, we can assuredly find individual cases where hidden personal motives played a role. Animosity between families, or between individuals, stimulated accusations and trials in specific instances, as could other factors like greed or jealousy (Rummel, 2003; Rummel & Voltmer, 2008; Walz, 1993). But such factors do not come even close to explaining the overall nature and scale of witch trials.

What about the functional effects for society? This explanatory model has also been widely abandoned because witch-hunts did not so much release tensions as create and foster them. The dynamics of a real witch panic could be difficult to control, and grossly exacerbated social strains. The effects could be devastating, resulting in communities that were weakened rather than strengthened (Dillinger, 1999; Levack, 2016; Midelfort, 1972).

Where does the failure of all these explanatory models leave us? Many experts state that we should take the historical actors a lot more seriously in what they actually thought and said. Witch-hunting was not a means to an end, but, rather, an end in itself (Briggs, 1996b; Dillinger, 2018; Goodare, 2016). Wolfgang Behringer, a German expert familiar with the historical sources, describes the persecution of witches as an effort that was time-consuming and unpleasant. 'The astonishing misery of the trials burdened most of the commissioners psychologically, which makes the assumption that they were carried out from lower motives (enrichment etc.) seem absurd.' (1997: 320). Julian Goodare writes: 'a witchcraft accusation was not 'really' about something else; it was really about witchcraft.' (2016: 385).

The inadequacy of the explanatory models led many witchcraft-experts to the conclusion that we should abandon all larger explanatory attempts (Behringer, 1997; Briggs, 1996b; Dillinger, 2018; Sharpe, 2001). It is an argument that has been made in many historiographic debates: grand theories may sound appealing but if we look more closely at historical processes it turns out that these frameworks do not work, or work only to a very limited extent. History is too messy and too complex, and there are always too many exceptions for a general rule to work. According to the witchcraft historian Robin Briggs, we should look for 'a more finely grained picture' and a 'greater diversity at local level' (1996a: 51).

However, we believe that this is unsatisfying. The failure of these older approaches should not be treated as a theoretical dead-end but, rather, as a new beginning. Perhaps historians have not yet asked all the right

questions. What makes the current situation particularly unsatisfying is that empirical findings about witch persecutions have unearthed two intriguing theoretical puzzles that have been overlooked so far and that are accordingly in need of an answer.

The first problem is that, even if there was no hidden agenda behind the witch persecutions, Harris's observation about its apparent 'design' still stands. Many ingredients of the cumulative concept of witchcraft, such as the belief in a diabolical pact, the sabbat, nightly flight and torture as a means of interrogation, seem to be particularly suited to ensure the continuation of the persecutions with an ever-increasing circle of suspects. It is understandable that earlier scholars assumed that the witch-hunts system must have contained 'built in structures', which were 'designed' and 'perfected' to serve particular goals. But if the witch trials were not produced by a shrewd hidden agenda or 'intelligent design', how did the concepts of witchcraft, and the attendant practices for persecuting witches, become so robust, resilient and conducive to dissemination within their historical context?

A second intriguing question remains unanswered. If historians are right that witch-hunts did not have substantial beneficiaries, and that communities as a whole were ravaged by them, how is it possible that they survived for such a long time? Why was it so difficult to keep an outbreak of witch panic under control, once it was set in motion? It seems strange that communities would tolerate such deleterious practices, if there was no tangible benefit that could offset the cost of human life. This is very odd and begs for an explanation. In other words, what we observe are forms of socio-cultural 'design', apparently without designers, which did not substantially benefit any interested party, and which were often damaging to the community as a whole. Could there be a theory to help us out?

Meme-theory

'Cui bono?' is a question that the philosopher and meme-adept Daniel Dennett does not get tired of asking. Who benefits? It is a stock Latin phrase used by lawyers, but according to Dennett the question is also useful in our scientific examination of the biological and socio-cultural worlds. When we are confronted with traits that look functional, it is crucial to ask who or what they are functional *for*. But, as Dennett (2007) warns us, the ultimate beneficiaries of design can be elusive. So we should cast our nets out widely. The reason Dennett so enthusiastically embraced Dawkins's brainchild of meme-theory is that it offers a whole new way of answering this question. It can open up new explanatory vistas.

Richard Dawkins's idea of the 'selfish meme' is a cultural application of his biological concept of the 'selfish gene'. Well into the 1960s, evolutionary biologists tended to assume that the beneficiary of Darwinian adaptations in living nature was the individual organism, the group, or perhaps the species as a whole. These, after all, were the most obvious and visible candidates to profit from adaptive 'design'. But the *Cui bono*-question should be carefully addressed, not just answered by default, and it is here that Dawkins, building on the theoretical work of colleagues such as William Hamilton and Robert Trivers, made his crucial contribution. He proposed the gene as the ultimate beneficiary (Dawkins, 2006b). In most cases, as selfish gene theorists admit, the reproductive 'interests' of organisms and genes align. The theory leads to new and interesting insights especially when it is applied to cases where the reproductive interests of genes and organisms do *not* coincide (Sterelny & Kitcher, 1988; Williams, 1966). Famous examples are alarm calls of animals that endanger their own individual survival, or bees stinging themselves to death when the queen bee is besieged. Taking into account the relations of relatedness, this behaviour made perfect sense from the perspective of their genes, as it does enhance *their* reproductive success. Genes can be said to 'manipulate' the behaviour of their vehicles to make them do things that serve the reproductive 'selfish' interests of the genes themselves.

Similar manipulative 'selfish' behaviour can be found in the relationship between viruses and organisms (Dimmock, Easton and Leppard, 2012). Most of the time, the reproductive interests of the hosts and the visitor coincide as well; most viruses are neutral or perhaps even beneficial (Dennett, 2017). They do not 'want' the organisms to die, because that would seal their own fate. It is only when the interests diverge that viruses can manipulate their organisms' behaviour in highly ingenious ways that are not functional or even deleterious to the organism. Here, one famous example includes the rabies virus manipulating the nervous system of dogs to make them more aggressive and hence more likely to bite others. The latter is actually very dangerous for dogs as it can easily result in their death, but it is good for the rabies virus, because this is how it gets transmitted (Gluska et al., 2014; Richard & Fouchier, 2015).

At the same time there are criticisms of selfish gene theory within biology, of which two now deserve closer consideration before we move on to its cultural application. The first strand of critique states that

selection does not only take place at the level of genes, but also at other levels. Some biologists therefore prefer to speak of *hierarchical selection* or *multilevel selection*, that also includes the selection of individuals, groups, or species (Gould, 2002; Wilson & Sober, 1994). Particularly, group selection has recently triggered intense debates (Liao, Rong & Queller, 2015; Nowak, Tarnita & Wilson, 2010). However, the gene-centred view still has continued support, and even if group selection will turn out to be an effective force, we doubt whether it fundamentally undermines selfish gene theory (Abbot et al., 2011; Haig, 2012; Kennedy, Higginson, Radford, & Sumner, 2018). A crucial difference between genes and groups still remains; namely, that genes are transmitted while groups are not. What effective group selection would imply is that genes can be transmitted that make organisms behave in group-functional ways. But, as we already discussed in regard to the individual organism, the 'selfish' interests of genes do not necessarily conflict with the interests of higher levels of organization.

The second strand of critique is perhaps more challenging, as it states that heredity can take place at various levels. The new field of epigenetics indicates that complex developmental changes within organisms can be transmitted to the next generation without any changes to the genetic code (Burggren, 2016; Jablonka & Lamb, 2014). According to the evolutionary biologists Eva Jablonka and Marian Lamb, this implies that we should reconsider our terminology. Instead of the selection of single atomistic genes, we should speak of the selection of developmental 'networks', or 'heritably varying traits' (Jablonka & Lamb, 2014: 77; 379). The debate over the adaptiveness of hereditary epigenetic effects is still undecided, but if this turns out to be true, it would certainly make some of the terminology of selfish gene theory obsolete. Whether it would undermine the key logic of selfish gene theory is again questionable, because this logic does not necessarily depend on genes. If hereditary materials also include developmental networks, we could also expect them to be very good at reproducing themselves, making them metaphorically 'selfish' (Roach & Ormerod, 2008).

Interestingly, Richard Dawkins himself already emphasised that the logic of selfish gene theory does not rely on the specific mechanisms of genes and proteins. In his defences of a 'generalized Darwinism', he maintains that the mechanism is substrate neutral. Any hereditary substance that undergoes the process of non-random selection of undirected variation results in adaptive phenomena that ensure their own self-reproduction. It is precisely this observation that sparked his theory of the 'selfish meme', and that provided two key ideas about the workings of socio-cultural processes, to which we will now turn (Dawkins, 1993, 2006a, 2006b). First, Dawkins stated that Darwinian selection processes of cultural variants, which he coined 'memes', can result in forms of socio-cultural 'design without designer'. Second, these memetic designs may be well-built to serve no other interest than their own self-reproduction.

The first idea was already articulated before Dawkins and is not unique to memetics (Campbell, 1965; Henrich, 2016; Wilson, 2002). Through the work of authors such as Donald Campbell, Joseph Henrich, and D.S. Wilson, it has become a central part of the burgeoning field of Darwinian cultural evolution. The argument comes down to the idea that human intentional design is important in the formation of cultural adaptations, but cannot explain all of it. Substantial parts of socio-cultural functionality are a likely outcome of a process of cumulative preservation of *accidentally* adaptive variants. As Henrich writes about the cultural evolutionary process: '(it) is – in some crucial sense – smarter than we are. Over generations, often outside of conscious awareness, individual choices, learned preferences, lucky mistakes, and occasional insights aggregate to produce cultural adaptations' (Henrich, 2016: 34). In other words, there is 'design without designer' in the socio-cultural realm.

Mainstream cultural evolutionary theorists and meme-adepts diverge when it comes to Dawkins's second idea. In contrast to 'selfish memes', cultural evolutionists such as Wilson and Henrich developed the idea of *cultural group selection* (Henrich, 2016; Wilson, 2002). This theory assumes that symbolically marked groups vary in their reproductive success. Cultural variants that make particular groups successful thrive because their groups thrive, or because other groups adopt those variants. Concrete examples include phenomena such as food taboos, hunting rituals or religious ceremonies that enhance the abilities of groups to stick together and face environmental challenges. In answering the *Cui bono*-question, this perspective thus tends to look for functionality for cultural groups as a whole.

This perspective has delivered powerful insights but, if applied very broadly, it can also lead us astray (Dennett, 2007). Why, after all, should Darwinian 'designs without designers' necessarily serve group-functional purposes? As Dennett reminded us, when looking for the beneficiaries we should cast our nets widely. Perhaps some adaptations might serve other functions, such as the maintenance of positions of power within groups, or the direct interests of individual people; or, and this was Dawkins's key contribution, their own self-reproduction. As Dawkins wrote: 'What we have not previously considered, is that a cultural trait may have evolved in the way that it has, simply because it is *advantageous to itself*' (Dawkins, 2006b: 200).

From this perspective, cultural group selection can be seen as a limiting case of the meme-centred view: memes have developed various strategies to further their own propagation and one of them works through enhancing the group solidarity of their hosts.

Like selfish gene theory, this idea makes logical sense, because cultural variants or 'memes' that tend to further their own survival and reproduction will be successful at precisely that: reproduction. Dawkins and Dennett like to draw an analogy with viruses and other microorganisms that also spread through us, but sometimes against our interests (Dawkins, 1993; Dennett, 2007, 2017). Human bodies are chockfull of bacteria and viruses, and as we already noted, most are neutral or beneficial – we could not live without them. However, some evolved into deleterious parasites. Meme-theorists propose that we should look at our culture in a similar way. Culture also spreads through us, and is beneficial in most cases – our survival also depends upon our culture – but some forms of culture may 'behave' like deleterious parasites, spreading at the expense of their human hosts (Boudry & Hofhuis, 2018).

Again, it is important to understand the power of metaphors here. Using this sort of language does not in any way mean that cultural phenomena can think or act selfishly in any literal sense. For present purposes, culture may be said to consist of information that is located within our brains or in cultural artefacts (Boudry, 2018; Dennett, 2011); it has no mind or will at all. But by treating it *as if* it has its own reproductive purposes, we offer ourselves a heuristic tool that can help us to gain understanding of cultural evolution, especially in cases where traditional frameworks break down. The claims of Dawkins and Dennett also lead to empirical questions. Does the historical record offer examples of socio-cultural forms of 'design without designer'? And can we find examples of cultural phenomena that spread in almost parasitic ways at the expense of their human hosts? Dawkins and Dennett have referred to possible case studies such as current conspiracy theories, ear worms, and certain aspects of religion. These examples look promising. We now need case studies that are more precise and historically specific. It is in this regard that we return to the European witch persecutions.

A memetic approach

During the years around 1590 the city and environs of Trier experienced witch persecutions that stunned central Europe (Behringer, 1995; Dillinger, 1999; Franz, 1995; Rummel, 1995; Voltmer, 1999, 2003; Zenz, 1977). From the 1560s onwards, central Europe had witnessed a significant increase in witch trials, but what happened in and around Trier surpassed everything that had happened before. At the time, the effects of the Little Ice Age were increasingly palpable and, after a period of long and exceptionally bad weather, rumours about witchcraft began to spread. First, there were trials in the near countryside, but at some point names from people in Trier were mentioned. When a young boy made some remarkable confessions about his visits to the witches' sabbat and the people he saw there, it stimulated further investigations. The accounts of the child fitted into local stories about flying witches who met each other in the middle of the night at remote places in the region. What particularly frightened people was that the witches were supposed to be preparing new magical attacks on the population. A true sense of panic took hold of the city and the region, and the normal standards of proof were significantly lowered during the subsequent investigations.

In preceding trials, inquisitors had usually been satisfied with suspects naming up to 20 accomplices. But during the investigations through torture in this region the numbers were much higher. One suspect mentioned 60 alleged collaborators. It helped to trigger spectacular chains of accusation that broke through earlier limitations on the scale and magnitude of witch-hunts. Very soon almost nobody was safe anymore, not even the elites or the people who had presided over trials themselves. Amongst the victims was the president of the university, Dietrich Flade, who, earlier on, had himself supervised witch trials. Eventually, he was amongst hundreds of victims who were burned at the stake.

The region does not seem to have done itself a great favour with these trials. Perhaps some people benefited financially from confiscations, but the overall results seem to have been disastrous (Dillinger, 1999). Horrendous fear gripped these communities, social bonds unravelled, numerous lives were destroyed and the reputation of the city was severely damaged. Trier became known as a contemporary Sodom; a place full of sinners where the Devil lingered to exert his evil ways. Protestants also happily seized the opportunity to discredit this overly Catholic city (Dillinger, 1999). By giving in to popular demands for persecution, the authorities also endangered precarious balances between jurisdictions, and even imperilled their own positions. A few decades later, the city records would already look back in anguish at what had happened, and understood that things had gotten out of hand (Zenz, 1964, pp. VII, 13–14). Trier would still experience some smaller trials, but would never let it go as terribly out of hand again.

However, the effects elsewhere were often very different. These persecutions turned out to be extremely influential (Behringer, 1995; Dillinger, 1999). Trier was a staunchly Catholic city with an important university and the events had been sensational. The extraordinary character of these persecutions was reported through news sheets, chronicles, treatises, sermons and demonological works throughout Germany and other parts of Europe. Peter Binsfeld, a bishop from Trier who had been involved in the trials, wrote a new book on how to persecute witches that became a well-known reference (Binsfeld, 2004). The exceptional scale of the persecutions had been the result of some particular regional beliefs and circumstances, but these exceptions now turned into a transregional standard. As a result, many people adopted the idea that society was even more thoroughly infested with witches than was previously thought. Concepts of witchcraft now more prominently came to include notions about large sabbats, a focus on children as potential litigants, and low standards of proof during investigations. Such ideas, later on, triggered similar large-scale trials in cities such as Ellwangen, Bamberg, Eichstätt, and Würzburg. The persecutions of the Trier region would become the first of the so-called 'super-hunts' (Monter, 2002: 22).

Darwinian evolution is a matter of the differential survival of variants. So what if we imagine a scenario in which people in Trier and its environs held some different ideas about witchcraft? Suppose, for instance, that they would have believed that sabbats are small gatherings, that witches do not possess the power of flight to visit remote places, that testimonies from children should not be taken seriously, or that the use of torture requires high standards of proof. In all likelihood, in that case, the trials would not have become as large and would not have received as much attention. Consequently, the underlying ideas would not have spread as effectively. Such a constellation of beliefs is not merely hypothetical – it can be found in countless other places at the time. Very often, accusations of witchcraft did not result in legal proceedings and, if they did, the trials often remained limited to only a few victims (Levack, 2016). For instance, earlier in the sixteenth century, the Netherlands had been a relative hotbed of persecutions but the trials remained much smaller. A detailed study of the province of Holland demonstrates that the idea of the sabbat was relatively marginal, and, if present at all, rather looked like a modest dance nearby with just a few witches assembled. Hence, persecutions were unlikely to exceed a few executions within a restricted area (Waardt, 1991).

However, amongst the variety of ideas about witchcraft that spawned a limited number of accusations and legal procedures, there were some that triggered larger and more spectacular trials. As a result of these larger persecutions, those were often the ideas that received most attention and spread most effectively. Particularly in southern and western Germany from the 1560s to the 1630s, such a cumulative mechanism seems to have occurred. For instance, a persecution in Wiesensteig in 1562 was influential because it was reported that dozens of witches had come together at the sabbat, thus triggering the execution of 62 people, a remarkable number at the time, which stimulated large persecutions elsewhere (Waite, 2012). A hunt that began in Ellwangen in 1610 also caught much attention because of the exceptional bureaucratic efficiency with which hundreds of people were killed. It provided a model for even larger trials in Franconia (Dillinger, Fritz, & Mährle, 1998). Through such interactions between beliefs about witchcraft and the course of the trials, the concepts of witchcraft gradually became ever better adapted at triggering large persecutions, and thus 'broadcasting' themselves.

Several historians of witchcraft have already reflected to some degree on such interactions. Julian Goodare describes the relationship between witch trials and demonological treatises as 'mutually reinforcing' (Goodare, 2016: 85). Brian Levack is particularly perceptive here. He proposes a cumulative scenario where an inquisitor uses information from manuals to formulate questions during trials, while, at the same time, he 'might use some of the specific charges against the accused, or his own imagination to give a new twist to the standard charges.' Subsequently, such new twists then slip into new manuals and treatises and influence new investigations at other places (Levack, 2016: 49). Other historians have also demonstrated how concepts of witchcraft became ever more malleable to fit into any form of conflict, and how they developed remarkable abilities to 'mobilize people's deepest fears' (Briggs, 1996b: 265; Dillinger, 1999: 442; Goodare, 2016: 305). Such remarks are intriguing, but at the same time they remain fragmentary and disconnected from any broader theoretical framework. However, when we look at them from an evolutionary point of view, they can suddenly take on a whole new meaning. These observations become essential ingredients for a Darwinian model that helps us to answer the question that we raised above: how did concepts of witchcraft become so well adapted over time as to trigger witch-hunts within its particular historical context? The evolutionary scenario that we propose is as follows: ideas that *accidentally* triggered larger persecutions were cumulatively preserved precisely because of that effect, in repeated rounds of variation and selection. A continuing supply of highly diverse beliefs from popular folklore and learned demonology, such as flying

women, nightly gatherings, harmful magic, or uncontrollable female sexuality, provided the raw materials for a process of Darwinian selection, resulting in forms of cultural 'design without a designer'.

This is not to say that there were no intentional designers involved who deliberately tried to enhance the spread of the trials. A perfect example is the Dominican friar Heinrich Kramer, who, in 1487, published his infamous *Hammer of Witches* (Mackay & Institoris, 2017). A significant part of Kramer's career had been devoted to witch-hunting, and he wrote his extensive book to convince others to follow in his footsteps (Broedel, 2003). However, it is highly questionable whether such efforts provide us with a sufficient explanation for the adaptedness of the cumulative concepts of witchcraft. Interestingly, Kramer's book was also relatively ineffective, as it was followed by a long lull in witch persecutions. The content of the *Hammer of Witches* also makes this understandable. The belief about witchcraft that was probably most conducive to the spread of the trials was the witches' sabbat. But in Kramer's book this inflammatory notion is mentioned only in passing, even though it already existed in various forms at the time. So why did Kramer hardly mention an idea that may have served his purposes most effectively? This has been somewhat of a mystery to witchcraft experts (Briggs, 1996b; Broedel, 2003; Goodare, 2016). It has, for instance, been proposed that the rigid scholastic format of the book disallowed elaborations upon the sabbat, or that contemporary notions of the sabbat also included male visitors, which was unpalatable to the thoroughly misogynistic Kramer. However, we could also consider a more straightforward explanation here. Perhaps Kramer hardly mentioned the sabbats because he simply did not understand what historians today understand; namely, that it was exceedingly helpful for the reproduction of witch trials. It was only later in the 16th century, as a result of the aforementioned cumulative interactions, that the notion of the sabbat became more prominent.

Intentional design on the one hand and Darwinian 'design without designer' on the other hand can provide us with complementary models of explanation for the evolution of cultural adaptations. What makes the witch persecutions particularly captivating here is that they seem to offer a case study where the balance tips in favour of the Darwinian scenario. Intelligent design is insufficient to explain the adaptive features of witchcraft beliefs and attendant practices. In addition, European witch-hunting also offers a stimulating case study for addressing the *Cui bono*-question in cultural evolution.

In regard to non-western forms of witch persecutions, some evolutionary theorists recently tried to apply models of *cultural group selection* (Joseph Bulbulia et al., 2013). However, this model looks particularly ill-suited for the European version. The alleged group-selectionist mechanism could have worked if cultural groups, as a result of their efforts at hunting and killing witches, had better reproductive chances than other cultural groups. But this scenario is unlikely because the trials, and particularly the large ones, did not often occur at the same place twice (Goodare, 2016; Roper, 2006). In the words of Wolfgang Behringer: 'As a general rule we can conclude that the burning of witches was an exception – everywhere'. As he explains: 'Normally people are not interested in burning their neighbours, and governments do not wish to wipe out their tax-payers' (Behringer, 2008: 148–9). As we have seen, witch panics were often disastrous for communities. Apart from the toll of human life, witch-hunts exacerbated social tensions rather than relieving them; and it is hard to imagine that they brought about the social cohesion and collaboration necessary for outcompeting other communities. Finally, the rise and fall of the witch panics was simply too quick for cultural evolution to take place on the level of whole groups.

A model of evolutionary 'random drift' provides us with another possible explanation of the witch-hunts, as not all cultural phenomena result from processes of selection and adaptation. Various studies have shown how cultural variants may spread because of chance factors alone, possibly resulting in the reproduction of harmful variants (Bentley, Lipo, Herzog, & Hahn, 2007; Bentley, Ormerod, & Batty, 2011; Salganik, Dodds, & Watts, 2006; Shennan & Wilkinson, 2001). While cultural drift may have played a role in the spread of certain cultural variants as opposed to others, we believe it is an unlikely model for the evolution of the underlying cumulative concepts of witchcraft. As we noted, the latter is simply too well adapted for cultural survival within its particular historical environment that we can rule out mere chance as an explanation.

It is here that the 'meme's eye view' may offer its true value. Dawkins and Dennett proposed that some cultural phenomena can reproduce at the expense of the human hosts in almost virus-like ways. Strikingly, historians have already compared witch-hunts and viruses quite regularly. Dairmaid MacCulloch writes that witch-hunting is 'as episodic and developmental as the gradual spread of a slowly incubating disease' (MacCulloch, 2004: 563). Robin Briggs called the large persecutions 'parasitic', and Behringer wrote: 'The implementation of witchcraft persecutions spread contagiously, but any politically coordinated effort with that direct intent was conspicuously lacking' (Behringer, 1996: 84; Briggs, 1996b: 402). These similarities are remarkable, as there were sudden outbreaks of witch-hunting, forms of contagion from one population to

the next, and many casualties as a result. But historians have used the comparison of witch-hunts to viruses only as a figure of speech, not as a promising avenue for explaining the 'design' of the witch-hunts. In other words, what they have overlooked is its genuine explanatory potential.

Why did the ideas that gave rise to the massive persecutions in the Trier region spread so well? Not because the communities involved benefited from them – quite the contrary. But if we look at it from the reproductive interests of the witch beliefs and hunts themselves, the trials in and around Trier suddenly look like prodigious 'mutations'. By taking the 'meme's eye view', certain aspects of the witch-hunt system begin to make a lot more sense. As the cumulative notions of diabolical witchcraft began to take shape in people's minds, they began to act in specific ways that were conducive to the spread of their beliefs: relying on media reports (i.e. manuals) from elsewhere; hunting down innocent fellow human beings, torturing suspects, persecuting people over long distances, spreading warnings about the invidious dangers of witchcraft, and sometimes risking their own lives as the next potential victim in the chain of accusations. To a wide range of theoretical frameworks, all of this remains highly puzzling, but it looks precisely like the kind of 'selfish' cultural phenomenon that Dawkins had envisaged.

We should be mindful of the power of metaphors. Witchcraft beliefs and trials should not literally be understood as possessing selfish interests, and human beings should not be seen as mindless automata blindly carrying out the will of fiendish little agents. Culture consists of materially implemented information within our brains, or in artefacts such as books or trial records, none of which have any true agency. Neither do biological viruses, which are just simple fragments of DNA or RNA drifting about in an organic soup, but this does not stop biologists from describing the strategies and ploys developed by viruses to bypass our immune systems, hijack our reproductive machinery and fulfil their genetic functions. Indeed, such intentional language is indispensable if we are to understand the phenomenon of parasitism. Just like in the case of genes and biological viruses, it is helpful, as heuristic tool, to look at witchcraft beliefs and trials *as if* they had agency and selfish interests. It increases our understanding of what actually happened.

This paper is about why witch persecution became so big, not about why it eventually died out over the course of the seventeenth and eighteenth centuries. However, even its disappearance shows some strikingly virus-like patterns, familiar to epidemiologists. Over the course of evolutionary history, pathogens have a recurring tendency to 'overplay their hand' and in doing so to doom themselves. More specifically, some viruses and bacterial infections such as syphilis had historic phases during which they were much more brutal and lethal than they are today (Crawford, 2007). From a reproductive perspective, brutality can be a good strategy for a while, but in the long run it can harm the interests of the pathogens. When carriers become so sick that they cannot spread their viruses any longer, so that the pathogens die along with their host, the aggressiveness gradually backfires, and the dissemination of the pathogen is halted. Also, the more lethal the pathogen, the higher the selective pressure on the immune system of the host population to evolve effective countermeasures. Diseases thus tend to evolve back into less lethal forms. But evolution does not have any foresight, so such outbreaks of aggressive strains may be expected to re-occur from time to time. In some cases, viruses wipe out a whole population of hosts, and they perish along with them.

This loosely resembles what happened to the witch-hunts. After the extreme severity of the early seventeenth-century persecutions, the cumulative witchcraft concept seems to have become the victim of its own success. The enormity of the super-hunts triggered increasing resistance, and critiques of the legal procedures of the trials became more pervasive and well thought out. It seems as if communities had been 'inoculated' against witch-hunts after one single devastating outbreak. From the 1630s onwards, witch persecutions then tended to evolve into relatively milder forms again (Briggs, 1996b; Dillinger, 2018; Goodare, 2016). Later on, in eighteenth-century Enlightenment Europe, the environment became even more hostile to the anti-diabolical witch trials, and eventually they suffered a fate that they share with almost all species of the living world: the witch persecutions went extinct.

Conclusion

The idea of selfish memes has often been dismissed as a fanciful or vacuous metaphor, and the idea of 'mind viruses' as a tendentious gloss on cultural ideas without any theoretical import. A qualitative historical analysis of the European witch persecutions can help to demonstrate its real explanatory power. Historians and social scientists in the past have been impressed by the semblance of 'intelligent' design in the cumulative concepts of witchcraft and the resulting persecutions. This inspired the idea that there were intelligent designers behind the scenes who used the witch-hunts to fulfil their hidden aims. However, thorough empirical research on the course of the trials, as well as detailed qualitative interpretations of people's

actions, have demonstrated that witch persecutions were not the result of coordinated intelligent strategies with underlying goals. This finding reinforced the conviction among many historians of witchcraft that grander explanatory frameworks do not work.

Selfish meme theory provides us with the opportunity to re-open the debate. The semblance of intelligent design that impressed historians and social scientists was perhaps not illusory after all. But the *cui bono* question had not been properly addressed or, more precisely, some possible answers had not been considered. Witchcraft beliefs and trials were very 'well-designed', though not to serve the interest of any human agent or group of agents. They were accidentally 'designed' by evolutionary mechanisms to further *their own* reproduction and propagation. The similarities between biological viruses and outbreaks of witch panics are not just superficial or curious coincidences without any theoretical significance. On the contrary, the analogy arises from the fact that both phenomena underwent Darwinian selection processes.

The moral of our story is clear. Whenever we are struck by the functional complexity or design of some cultural phenomena, we should ask who or what may be the ultimate beneficiary. In evolutionary processes involving human agents, it is tempting to prejudge the *cui bono* question and to assume that – of course – human agents are the beneficiaries. After all, they are the ones who do the believing and the hunting. But this default assumption is misguided. Historians have been looking for human beneficiaries of the witch-hunts all over the place, but did not find them in substantial numbers. Perhaps this was because they had been looking in the wrong place. One potential beneficiary of the remarkable design has been overlooked all the time: the witch beliefs and persecutions themselves.

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The authors have no competing interests to declare.

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