Dream Interpretation from a Cognitive and Cultural Evolutionary Perspective: The Case of Oneiromancy in Traditional China

Ze Hong

Department of Human Evolutionary Biology, Harvard University

Abstract

Why did people across the world and throughout history believe that dreams can foretell what will occur in the future? In this paper, I attempt to answer this question within a cultural evolutionary framework by emphasizing the cognitive aspect of dream interpretation; namely, the fact that dreams were often viewed as significant and interpretable has to do with various psychological and social factors that influence how people obtain and process information regarding the validity of dream interpretation as a technique. Through a comprehensive analysis of a large dataset of dream occurrences in the official Chinese historical records, I argue that the ubiquity and persistence of dream interpretation have a strong empirical component (predictively accurate dream cases), which is particularly vulnerable to transmission errors and biases. The overwhelmingly successful records of dream prediction in transmitted texts, I suggest, is largely due to the fabrication and retrospective inference of past dreams, as well as the under-reporting of predictive failures. These "positive data" then reinforce individuals' confidence in the predictive power of dreams. I finally show a potential decline of the popularity of dream interpretation in traditional China and offer a few suggestive explanations drawing on the unique characteristics of oneiromancy compared to other divination techniques.

Keywords: Cultural evolution; Divination; Oneiromancy; China; Dream

1. Introduction

Dreams have fascinated humankind since antiquity; the story-like events experienced during sleep have inspired countless efforts to make sense of their meaning. Oneiromancy, the interpretation of dreams in order to foretell the future, has featured prominently in virtually

---

Correspondence should be sent to Ze Hong, Department of Human Evolutionary Biology, Harvard University, 11 Divinity Avenue, Cambridge, MA 02138, USA. E-mail: ze_hong@g.harvard.edu

all ancient civilizations as well as contemporary small-scale, traditional societies (Hughes, 2000; Kessels, 1969).

The universality of dreaming itself is not surprising. Contemporary research in neuroscience has shed light on the neurological mechanisms of dreaming (Nir & Tononi, 2010; Siclari et al., 2017) and psychologists have proposed adaptive, evolutionary explanations for its occurrence (Franklin & Zyphur, 2005; Revonsuo, 2000). Anthropologically, considerable effort has been devoted to identifying universal features in dream content (Garfield, 2009; Griffith, Miyagi, & Tago, 1958; Nielsen et al., 2003). Of course, the interpretation of dreams is almost certainly a culturally mediated practice (Lincoln, 2003). That is, how specific signs (what appears in one's dream) correspond to meaning (what the dream reveals about reality) is often heavily dependent on the cultural contexts (Kracke, 1992).

What is perhaps more noteworthy is the ubiquity of using dreams as a valid source of information. Oneiromancy has been well-documented in the ethnographic literature (Grunebaum & Caillois, 1966; Lincoln, 1935), and the cultural significance of dreaming has been thoroughly explored by anthropologists (Bourguignon, 1972; Hollan, 1989). Existing research, however, leaves an important and obvious question inadequately addressed: why do people believe in the validity of oneiromancy when modern neuroscience has shown that dreams do not necessarily have any bearings on future events (Barrett & McNamara, 2007; Nir & Tononi, 2010)? Typically, oneiromancy, like many other divinatory practices, is explained from functional perspectives, which emphasize its social, political, and religious role in a society (Annus, 2010). It is undeniable that oneiromancy certainly serves these functions; for example, a general in a battleground may fabricate auspicious dreams to boost his troops' morale (Liu, 1989) and a king may make up dreams to legitimize his political power (Fang, 2015). But the effectiveness of such deceptive techniques depends on the audience's confidence in the prophetic power of dreams. Therefore, we still need an account to explain why people believe in the validity of dreams in the first place.

Historically, the art of dream interpretation was often viewed as a form of magic, which has been subject to extensive anthropological theorizing (Frazer, 1890; Tylor, 1871). Briefly, early thinkers tend to treat magic as ineffective technology: that is, what we (modern readers) consider as "magical" activities were really instrumental efforts to achieve some desirable outcomes. As such, the "magic-ness" of these efforts stems from their ineffectiveness (Tambiah, 1990). Why would people engage in these ineffective activities? According to some early anthropological theories, this is because people in certain societies reason in a faulty fashion. Tylor (1871), for example, offers some possible factors that lead to faulty reasoning of people in traditional[1] societies, such as successful outcome by natural means (chance), vague diagnosis, and underappreciation of negative evidence. More recently, Horton (1967, 1993) has taken up this line of argument by suggesting that while traditional magic practices and western science share the same fundamental goals of explaining, predicting, and controlling worldly events, individuals in traditional societies differ from those in the West in their reasoning habits; specifically, when evaluating the effectiveness of some technology, people in traditional societies do not readily entertain alternative possibilities (e.g., the technology does not work) and do not engage in much reflective thinking.

The above view has gone out of fashion for quite some time, as later scholars in anthropology tended to focus on the symbolic function of magical, ritualistic activities (Tedlock, 2006). In the field of psychology and cognitive science, however, there has been a revival of interest in understanding these seemingly irrational beliefs and actions. Vyse (1997), for instance, offers an excellent review of the psychological and cognitive explanations of why people hold irrational beliefs and engage in ineffective actions. The psychological literature on contemporary superstition and traditional divination/magic has grown substantially in recent years; in general, psychological theories tend to attribute these irrational beliefs and actions to some type of *intuition*. In other words, factually incorrect beliefs are held as a result of intuitive reasoning (Risen, 2016; Shenhav, Rand, & Greene, 2012), and ineffective technologies are practiced because they are intuitively plausible with regard to achieving the alleged goals. In particular, cognitive psychologists and anthropologists often attribute the cultural success of certain magic/divination practices to their specific features that increases their perceived efficacy, and much progress has been made on this front. For example, Legare and Souza (2012) experimentally showed that procedural features, such as repetition and the presence of religious icons, enhanced the perceived efficacy of rituals; Nemeroff and Rozin (1990, 2000) suggest that magical principles of sympathy and contagion are intuitively attractive and speculated they may have conferred adaptive benefits in our evolutionary past (e.g., pathogen avoidance); Miton, Claidière, and Mercier (2015) contend that the popularity of bloodletting is due to the match between its form (releasing blood from the body) and folk intuitions on the nature of illness and how the body works; Singh (2017) proposes that specific aspects of shamanism, such as inhumanness, increases the plausibility of shamanistic practices, which culturally evolved as a result of a selective retention process; Barrett (2008) and Boyer (2001) have argued that concepts (and by extension, cultural practices) that are "minimally counterintuitive" are more memorable and enjoy an advantage in the transmission process.

There is no doubt that intuitive plausibility contributes to the overall explanation of the persistence of ineffective technologies, such as oneiromancy. However, evolved intuitions are unlikely to provide the full story. Previously, we have offered extensive ethnographic and historical evidence showing that people often entertain considerable uncertainty regarding their efficacy in achieving explicit goals (Hong & Henrich, 2021; Hong, submitted) and at the same time often care a lot about whether or not technological practices indeed achieve the promised outcomes (Hong, Slingerland, & Henrich, forthcoming). In other words, the empirical side of magic/divination matters as well. Though occasionally failures can be explained away rather easily (Annus, 2010), frequent failures would likely lead to a certain level of skepticism.[2] Indeed, despite the documented biases and errors in human reasoning and decision making (Henrich, 2002; Korn, Sharot, Walter, Heekeren, & Dolan, 2014; Sharot 2011), humans do probabilistically modify their beliefs, which subsequently affect actions as evidence accumulates (Ambuehl & Li, 2018; Shah, Harris, Bird, Catmur, & Hahn, 2016).

Given such probabilistic understanding of the efficacy of technological practices, it may be useful to explore factors that contribute to the estimation of technological efficacy. In addition to individual trial and error learning (more generally, reinforcement learning) (Dayan & Balleine, 2002; Dayan & Daw, 2008; Niv, 2009), humans obtain a tremendous amount

of information culturally (Richerson & Boyd, 2005). As such, psychological and social factors may create population dynamics in which overestimation of efficacy occurs. In Hong and Henrich (2021), we have formally modeled the interaction between individual cognition and social processes, where individuals update their belief regarding the efficacy of some technology in a Bayesian fashion, and through biased information transmission, individuals may end up believing the technology to be substantially more efficacious than it actually is. One key prediction of the model is that overestimation of the efficacy of some technology may be caused by a reporting bias, which I have found in other magical activities, such as rainmaking (Hong, Slingerland, & Henrich, forthcoming) and fetal sex prognostication (Hong, unpublished). In this paper, I aim to place the persistence of oneiromancy in a cultural evolutionary framework and examine the extent to which dream divination failures are under-reported as well as other psychological and social factors that may lead to the overestimation of the predictive accuracy of dreams in a cultural evolutionary process.

A large literature in psychology and cognitive science has shown that many of our beliefs, attitudes, and behaviors are transmitted culturally rather than through individual learning (Csibra & Gergely, 2009; Henrich & McElreath, 2003; Richerson & Boyd, 2005). Often, the anthropological studies on dreams implicitly presume the role of cultural transmission but rarely discuss it explicitly. In an obvious sense, the way people treat and interpret dreams is influenced by others in the community. In most small-scale societies, the meaning of dreams is passed on through word of mouth (Tedlock, 1987), and in literate societies, such as ancient Greece and ancient China, as written texts (Fu, 2017; Price, 1986). The importance of cultural transmission, however, extends beyond dream oneiromancy manuals. In addition to how to interpret dreams, people also culturally obtain actual cases of dreams accurately (or inaccurately) predicting future events, which affect their confidence in the validity of dreams as a reliable information source. This latter point is important because ample research in cognitive science and evolutionary anthropology has shown that humans possess some level of "epistemic vigilance" and do not accept transmitted information uncritically (Mercier, 2020; Sperber et al., 2010). Predictively accurate dreams thus serve as "data" to corroborate the "theory" that dreams are indeed prognosticative of future events.

The rest of the paper is organized as follows. Section 2 provides the essential background information of theories of dreams in ancient China, and Section 3 shows the results of a comprehensive quantitative analysis of dream occurrences in Chinese historical records and offers a cultural evolutionary account of the persistence of dream interpretation. Additionally, I present tentative evidence that although oneiromancy has always been considered a valid technique throughout Chinese history, the extent to which dreams were taken seriously may have declined over time. In the final section, I discuss the applicability and limitations of this account as well as the implications for divination/magic in modern societies. To preview, I argue that a theoretical commitment to the spiritual world, deliberate fabrication/retrospective inference of successful dream predictions, and the under-reporting of failed predictions collectively contribute to the persistence of oneiromancy. While the first factor can be largely attributed to evolved intuitions, the latter two factors crucially depend on our species' reliance on social learning, as our evaluation of the efficacy of some technology is often significantly affected by the testimonies, opinions, and behaviors of others in the community. The declining

importance of oneiromancy over time, on the other hand, may be attributed to the uniqueness of oneiromancy compared to other divination and magic practices, that is, dreams are by nature subjective to manipulation, cannot be readily produced to solve practical problems, and may be explained by naturalistic (psychological) causes.

2. The cultural background: Dream interpretation in traditional China

2.1. Theories of dream interpretations: A supernatural worldview

Like most traditional societies, beliefs in ghosts, spirits, and life after death are prevalent in premodern China. Such a supernatural worldview makes certain beliefs appear more plausible; for example, someone with the assumption that people's souls can survive their death is much more likely to believe that deceased individuals may "visit" them in a dream and potentially offer useful information compared to someone with a more materialistic worldview. Although to my knowledge no evolutionary explanation has been proposed for why specific kinds of dream interpretations may be intuitively attractive, evolutionary psychology has proposed evolved intuitions, such as life after death (Bering, McLeod, & Shackelford, 2005) and the existence of god (Boyer, 2001; Boyer & Ramble, 2001) that contribute to the plausibility of oneiromancy as a truth-revealing technique. Moreover, research in psychology and cognitive science has shown that our mind is psychologically predisposed to extract meaning from sensory data, and may occasionally detect patterns when there is not one (Ayton & Fischer, 2004). Therefore, *how* dreams should be interpreted may be up for debate, but *that* dreams can be decoded to extract and reveal meaning is usually not questioned. This is not to say that people never doubt the predictive power of specific dreams; in fact, certain kinds of dreams were thought to be uninterpretable, such as dreams due to overthinking during the day.[3]

It should be noted that while the above arguments bear resemblance to the aforementioned psychological and cognitive accounts that focus on intuition, they differ from previous accounts in two ways. First, most research that invokes intuition to explain supernatural beliefs and practices emphasizes the innateness of our intuitions (with regard to religious beliefs, humans are sometimes described as "born believers" [Rottman, 2013]); these intuitions presumably are "hard-wired" in our genes as a result of millions of years of evolution. In my account, although the "supernatural worldview" certainly has (presumably genetically evolved) intuitive support, it also has a significant cultural component. The early anthropologist, Margaret Mead (1932), for example, showed that among the Manus in Papua New Guinea, it was often the adults rather than the children who were more prone to magical thinking and supernatural beliefs. Some recent work in psychology also shows that there is no detectable correlation between intuitive thinking and supernatural beliefs (Farias et al., 2017), and people in certain religious societies may even be described as "moving toward magical thinking" as a result of cultural transmission (Harris, 2012). The takeaway here is that while debate on the exact role of intuition in supernatural beliefs remains, the role of cultural input should be better appreciated by psychologists and cognitive scientists.

A second difference between the "supernatural worldview" and evolved intuition is that the plausibility of specific beliefs (e.g., dead people may transmit information in dreams) is a downstream consequence of some higher level theoretical commitment (e.g., some form of life beyond death). As such, once the high-level theoretical commitment is gone or radically altered, the downstream practices that rely on the original theoretical justification lose their plausibility immediately. In a different paper, we have argued that rainmaking practices in traditional China suffer exactly from this fate (Hong, Slingerland, & Henrich, forthcoming).

2.2. *Dream as signs versus dream as messages*

In contemporary Western societies, dreams are often grouped into different categories based on their cognitive functions or the underlying brain activities (Blagrove, 1992; Revonsuo, 2000; Yu, 2016). In contrast, the Chinese, like some other ancient civilizations (Kessels, 1969),have long classified dreams by how they should be interpreted (Hughes, 2000; Liu, 1989). For example, "straight dreams" (直梦) refer to dreams that are prophetic of reality in a straightforward way, for example, dreaming of X's death and X dying in reality. "Opposite dreams" (反梦), on the other hand, refer to dreams that are in some sense "opposite" to reality.[4] Since this paper focuses on why people believe in the validity of oneiromancy, I propose to classify dreams by their epistemological status. Specifically, dreams as signs that usually need to be interpreted (often with professional expertise) and dreams as messages transmitted by other humans or human-like agents. This distinction is useful because it highlights how the perceived plausibility of the two kinds of dreams may be affected by one's larger theoretical commitment.[5] The famous Eastern Han skeptical thinker, Wang Chong (27–97 CE), for example, denies the possibility of message dreams but would entertain the possibility of certain sign dreams (He, 2011). It is also worth noting that there are instances where message dreams, nonetheless, require great interpretive effort; for example, when the information sender offers a riddle with hidden meaning.

2.3. *The cultural transmission of oneiromancy instructions and cases*

Because of the indispensability of interpretation in sign dreams, there is often an interest and demand for instructions on how to correctly interpret of the content of dreams. In ancient China, there was a rich tradition in collecting and compiling dreams and their associated meanings (Fu, 2017; Liu, 1989), and some of the most popular compilations, such as *The Duke of Zhou's Explanations of Dreams*, can still be purchased in bookstores today (Yun, 2013). As mentioned, the other aspect of cultural transmission of oneiromancy, the transmission of actual oneiromancy cases and the associated predictive outcomes (whether the prediction was successful or not), is also important; intuitively, one would not take dreams very seriously if all she hears about oneiromancy are failed predictions. In China, oneiromancy cases were recorded in historical records, philosophical writings, and a wide range of literary forms (fiction, drama, poetry, etc.) (Liu, 1989). During later dynasties, compilations of oneiromancy cases in the form of encyclopedias became popular with improved printing technology and the expansion of book publishing and distribution

(Vance, 2012). These encyclopedias often contained both dream prognostic instructions and actual cases; in an extensive analysis of an oneiromancy encyclopedia, *Forest of Dreams* compiled in 1636 CE, for example, Vance (2012) shows that it contained not only instructions on how to interpret dreams but also many case descriptions of predictive dreams.

3. Analysis of historical data in a cultural evolutionary framework

3.1. General description of dream collection and the dataset

Although many anthropological and psychological studies on dreams have utilized quantitative approaches, most of them lack a historical dimension. In this section, I take advantage of the rich textual record of Chinese dynastic histories to systematically examine the content and context of dream occurrences and how they are interpreted. Specifically, I compiled all dream occurrences by searching the keyword "dream/to dream" (梦) in the *Twenty-Four Histories* and *Draft History of Qing*, as well as two well-known pre-Qin historical texts, *Zhuo Zhuan* and *Guo Yu* on ctext.org, a digital database of Chinese textual records. The *Twenty-Four Histories* are the official historical books that record important historical figures and events from mythic times (∼ 2600 BCE) to the end of Ming dynasty (1644 CE). The *Draft History of Qing* follows the same format as *Twenty-Four Histories* and is the draft of the official history of the Qing dynasty,[6] and *Zhuo Zhuan* and *Guo Yu* are chronical narrative histories covering a period from 722 to 468 BCE. The latter two books are usually attributed to Zuo Qiuming, a historian of Lu during the Spring and Autumn era (770–476 BCE), though debates remain regarding their authorship (Plaks & Nylan, 2016). Collectively, these records provide a comprehensive coverage of Chinese history, and given their orthodox status, we can have a good sense of the mainstream depiction of dreams in terms of how they were interpreted and the general attitude toward oneiromancy. My choice of using the official historical records for textual analysis is deliberate: although there are perhaps more mentions of dreams and oneiromancy in nonhistorical writings, it is unclear the extent to which oneiromancy cases in these literary forms were viewed by the general public as real, recorded stories or artistic creations. Dynastic histories, on the other hand, are supposed to consist of only factual information.[7] Of course, as modern historiography points out, the subjective biases in history writing are more or less inevitable (Lustick, 1996; Tucker, 2009; Yu, 1988), yet we can at least be certain that what is recorded in these officially approved historical documents was deemed realistic and plausible at the time of their writing.

In total, I collected 793 dream occurrences and recorded information regarding the type of dreams, the dreamer, the interpreter, the interpretation of the dream, and the predictive accuracy of the dream interpretation whenever possible (see Supplementary Material for details). To ensure reliability of the coding scheme, two independent coders were invited to code a randomly selected sample (133 out of a total of 793 dreams) based on written instructions (see Supplementary Material for details). I then performed an inter-rater reliability test with *kappam.light* method of the *irr* package in *R* and achieved moderate to substantial reliability (0.548, 0.622, and 0.674 for dream type, interpretation, and outcome accuracy, respectively)
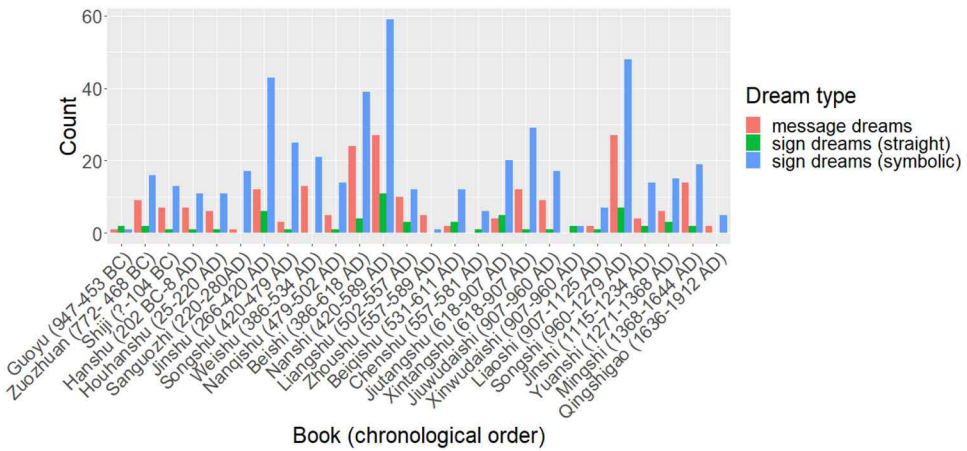
Fig 1. The breakdown of dream types across Chinese history. The x-axis represents the individual dynastic records ordered chronologically by the time periods that they cover, and the y-axis represents the raw counts of dream occurrences in each text.

(Landis & Koch, 1977), suggesting that there is moderate agreement among independent raters regarding the classification of dreams.

We see cultural transmission in action: among the 793 dreams, a significant proportion (15%) are either individuals in later times referencing dreams/dream interpretations of earlier people or historians recording oneiromancy cases that already appeared in earlier texts. Fig. 1 shows the breakdown of the types of dreams across Chinese history. There is a consistent pattern that the majority of sign dreams are symbolic and thus require interpretation. No obvious temporal trend is observed in the relative frequency of these different types of dreams, and the ratio between message dreams and sign dream in most historical periods is roughly 1:2.

Fig. 2 shows the breakdown of the types of dream interpretations across all sources. These dream interpretations cover a wide range of topics, many of which are difficult to classify. Overall, we observe that a large proportion of dream interpretations were related to pregnancy, followed by disaster, death, career, and politics. Many of the dreams are nonpredictive; they are mostly dreams of deceased friends or relatives paying visits, offering "thank-you" messages when the dreamer had done something nice to their living family members or refurbished their grave. Consistent with previous anthropological studies of dreams (Bourguignon, 1972; Wallace, 1959), my dataset shows that dreams can have therapeutic significance; one may dream of some deity offering to cure either one's own illness or the illness of her close relatives or friends. A final noteworthy type of dream is the type in which the dreamer gains some ability either through a symbolic dream, where a person or a deity gives the dreamer an object with magic power (e.g., a five-colored pen 五色笔) or a message dream, where one is explicitly taught or trained by some spiritual agent. The exact criteria for categorizing dreams can be found in the Supplementary Material.
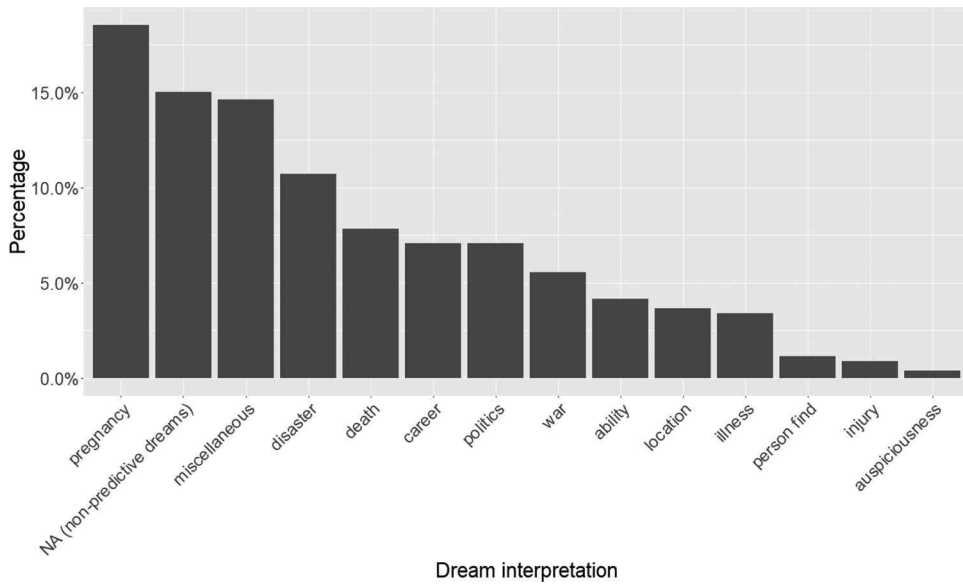
Fig 2. The breakdown of different types of dream interpretations, ordered by their relative frequency.

3.2. Fabrication and retrospective inference of prophetic dreams: A look at pregnancy dreams

With this dataset, I now address the question regarding the persistence of oneiromancy by focusing on its empirical component. My basic argument is that predictively accurate dreams strengthen people's confidence in the validity of dreams, and the large number of successful oneiromancy cases that were recorded and transmitted were not an accurate representation of the statistical reality of prophetic dreams. Fig. 3 shows the relative proportion of dreams in terms of their predictive accuracy over historical time, and what is immediately obvious is that most dream occurrences are prophetic and have an associated confirmatory outcome. That is, whenever dreams are mentioned in these official historical records, the readers can expect that they are predictive of some later outcome, which is usually verified. How come oneiromancy as practiced in ancient China appear to have such a high rate of success? First, I address the possibility that many of these dreams and their associated predictions may be deliberately fabricated by focusing on the largest category of dream interpretations (Fig. 2), pregnancy dreams.

Typically, the mother (occasionally the father) of some famous individual would dream of strange things or events which is said to have "induced" (感) the pregnancy. Because official dynastic histories are essentially biographies of famous individuals, pregnancy dreams were often mentioned, partly to demonstrate the extraordinariness of these individuals. In the case of emperors, dragons and suns were usually dreamt by their mothers, and it is probably not a coincidence that both dragons and suns symbolize imperial power. In fact, it is very likely that either historians or people who first reported these stories retrospectively fabricated
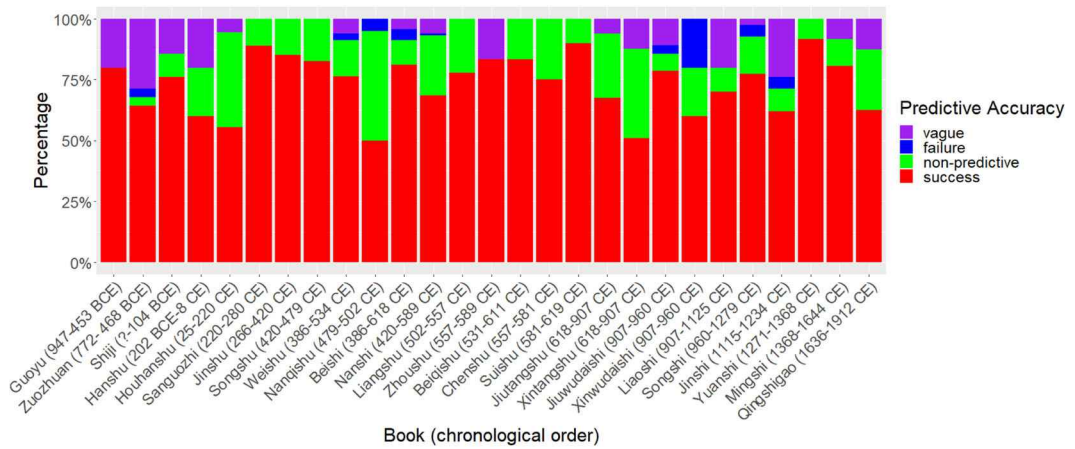
Fig 3. Relative proportion of dreams of different accuracy types as recorded in official dynastic records by chronological order.

pregnancy dreams of emperors' mothers to justify the emperors' political power of their own dynasty[8] (Fang, 2015). To what extent were these stories believed? Historical texts do not offer straightforward answers, but we can, nonetheless, get some indirect clues. The famous skeptic during the Eastern Han dynasty, Wang Chong (27–97 CE) made the following comment on the story about how the mother of the first Han emperor dreamed of a dragon which presumably induced the pregnancy:

> From the chronical of Gaozu (the later founding emperor of the Han dynasty) we learn that dame Liu (mother of Gaozu) was reposing on the banks of a large lake. In her dream she met with a spirit. At the time there was a tempest with thunder and lightning and a great darkness. Taigong (Gaozu's father) went near, and perceived a dragon above her. She became enceinte and was delivered of Gaozu. These instances of the supernatural action of spirits are not only narrated, but also written down, and all the savants of the day swear by them. (*Lun Heng*, Chapter 26, Forke (1907)'s translation)

Thus, the story goes that Gaozu's mother met with a spirit (and presumably had sexual intercourse with it) whose earthly manifestation was a dragon. According to Wang Chong, all the savants believed the veracity of the story, and he felt compelled to make a case against it. Of course, we do not know for sure whether the savants at the time genuinely believed in it or were merely pretending for political reasons. I suggest that some, perhaps many of them were genuine believers; even Wang Chong himself who argued against this kind of supernatural pregnancy believed that when great men are born, there will be signs occurring either in reality or dreams; he just does not believe that nonhuman species, such as dragons, can have sexual intercourse with humans.[9] This belief in supernatural pregnancy is perhaps not all that shocking considering that 73% of contemporary Americans believe in Jesus' virgin birth according to Pew Research Center.[10] In a way, the Chinese were more justified in believ-

Table 1
Percentage of dreams that could be used for justifying political power in different time periods

Time period	Total number of dream occurrences	Number of political justification dreams	% of political justification dreams
pre S-N (before 420 CE)	171	27	15.8
S-N (420–589 CE)	323	33	10.2
post S-N (after 589 CE)	309	29	9.4

Note: S-N stands for Southern-Northern Dynasties.

ing the plausibility of spiritual impregnation of emperors' mothers as there were more data supporting it!

Intentional fabrication of dreams for political reasons is likely a prevalent phenomenon in these dynastic histories. Besides pregnancy dreams, we occasionally observe individuals themselves using dreams to justify their own political power. For example, the founding father of the Eastern Han Dynasty, Guangwu emperor, said the following to one of his generals as Guangwu is achieving tremendous military success yet has not officially declared himself the emperor:

> "Last night I dreamed of myself riding a red dragon flying into the sky; when I woke up, my heart beat real fast." Feng Yi (the general) said: "This is your soul induced/moved by the Heavenly Mandate (天命). The unrest in your heart is due to your habitual prudence." Then he started to discuss with other generals on officially proposing Guangwu to be the emperor. (*Hou Hanshu, chapter 17*)

We do not know for sure whether Guangwu indeed dreamed of himself riding a dragon, but even if he made it up (and he had good incentive to do so), few would question its validity especially given that he indeed became an emperor later on. As long as dreams are perceived to be a permissible information channel, historians and laypeople alike at the time had very little incentive to challenge the dream claim. To get a better sense of the number of such "political justification" dreams, I computed the percentage of such dreams[11] out of the total number of dreams in different historical periods (Table 1).

From Table 1, we can clearly see that in all three historical periods (the reason for using Southern-Northern Dynasties as the dividing period will be made clear in Section 3.4), there is a nontrivial proportion of recorded dreams of such type. The percentage of dreams that could be used to justify political power is slightly higher in the pre Southern-Northern Dynasties period and remains roughly constant in the later two periods.

In addition to intentional fabrication, some dreams may be "false memories"; that is, individuals may falsely remember and report dreams that they never experienced if these dreams were expected in the community. Recent psychological research on dreams has suggested that the encoding of memories of dreams may share the same neurocognitive basis as autobiographical memory and thus be subject to false memory (Beaulieu-Prévost & Zadra, 2015). Psychologists have long known that subjective dream reports are often unreliable

(Schwitzgebel, 2011), and both theoretical accounts and empirical studies (Beaulieu-Prévost & Zadra, 2015) have suggested that false memories may occur quite often in dreams (Rosen, 2013). In particular, Rosen (2013) points out there is often significant memory loss in dream recall, which may lead to a "fill in the blanks" process.

While the dreamer may fabricate or falsely remember their dreams, the observer can also *infer* dreams retrospectively. Historians in ancient China often have an "if there is an outcome, then there must be a sign" mentality (Zheng, 2014) when recording events that were supposed be predicted by divination. Similarly, Vance (2012) in her extensive treatment of dream interpretation of the Ming dynasty argues that written and transmitted dreams often reveal not what the dreamers actually dreamed of but what the recorder believed about the dreams. In my dataset, a substantial proportion of the dreams (11%) were described in a retrospective and explanatory manner, marked by the phrase "in the beginning" (*chu*). This way of writing gives the impression that the authors were trying to find signs that had already foretold the fate of individuals in order to create a coherent narrative.

Therefore, it is likely that the retelling and recording of dreams involved an imaginative and inferential process. Li (1999) points out that in early Chinese historical writing, authors may present cases where multiple individuals shared the same dream to prove its objective veracity. In my dataset, 1.3% of total dreams were reported to have multiple dreamers, and in the most extreme case, hundreds of people were said to have dreamed of the same thing.[12] Although this is not statistically impossible, we can safely conclude (unless we seriously entertain the possibility of ghosts and spirits sending dream messages to multiple individuals simultaneously) that there was either some serious fabrication or false inference.

3.3. Under-reporting of failed dream predictions/wrong dream interpretations

In addition to the fabrication/retrospective inference of oneiromancy cases, under-reporting of failed predictions very likely existed to a substantial extent. The Song historian and philosopher Lü Zuqian (1137–1181 CE) made the following statement when commenting on the Confucian text *Zuo Zhuan* (∼500 BCE) regarding the accuracy of divination predictions:

> Some people ask: "Zuo's record of crackmaking and milfoil divination cases were so amazing and spectacular; given such predictive accuracy, why are there so few [records] of them?" The answer: "from the Lord Yin till Lord Ai was a total of two hundred and twenty-two years. Kings, lords, dukes, the literati and the commoner perhaps made tens of thousands of divinations, and only tens of the efficacious cases were recorded in Zuo's book. These tens of the cases were collected in Zuo's book and therefore feel like a lot; if they were dispersed into the two hundred and twenty-two years it would feel extremely rare. If divination cases were of deceptive nature or had failed predictions, they would not have transmitted during their time and not be recorded in the book. I do not know how many tens of thousands of them were missed. If we had all of them [recorded], they would not be so rare. (*Donglai Zuoshi Boyi*[13])

The early Qing scholar Xiong Bolong (1616–1669 CE) commented on using dream signs to predict the sex of the fetus more specifically[14]:

> It is not the case that all pregnant women have the same type of dreams, and it is not the case that if [she] dreams of certain signs she must give birth to son or daughter. There are also instances where one dreams of a bear[15] yet gives birth to a daughter, and instances where one dreams of a snake and gives birth to a son. The poets [diviners] tell the cases where their predictions are fulfilled and not talk about the cases where their predictions failed. (*Wuhe Ji*[16])

Passages like this show that even in premodern times, some people were aware that failed predictions may have been missed or intentionally ignored in transmitted texts. There are a few reasons why people might preferentially report dreams whose predictions turn out to be accurate: first, a large literature on confirmation bias has shown that humans have a tendency to search for, interpret, and recall information that supports one's prior beliefs (Johnson, 2017; Nickerson, 1998); second, research on norm psychology suggests that one of the most fundamental human psychological disposition is to observe, internalize, and follow rules (Chudek & Henrich, 2011). Thus, if the community norm is to use dreams for predictive purposes, then people may have an incentive to avoid revealing predictive failures. Lastly, my own fieldwork in southwest China among the Yi shows that many people are unwilling to reveal the divination or healing ritual failures of local shamans because these shamans are often friends and neighbors of the clients and there is the concern that spreading "accidental" failures may taint their reputation (Hong, submitted).

Therefore, if the prevailing belief is that dreams indeed contain hidden information that could be decoded and interpreted, dreams with failed predictions are not as likely to be recorded and transmitted as predictively accurate dreams. This may create a population-level process, where these predictively accurate dreams were taken as data for the validity of oneiromancy by naïve individuals (see Anonymized for a formal analysis of this process, and De Barra (2017), De Barra, Eriksson, and Strimling (2014), and Ioannidis (2017) for additional analysis in the medical literature). In most dynasties, predictively accurate dreams constitute over 50% of total recorded dream occurrences, and this percentage is even higher if we discount nonpredictive dreams. Deliberate fabrication and retrospective inference alone are unlikely to account for such a high proportion of predictively accurate dreams; after all, these dynastic records were written by serious historians and the fabrication of facts was generally discouraged in Chinese historical writing.

With the above analysis in mind, let us take a closer look at Fig. 3. Notice that there is a nontrivial number of dreams (5–20%) with vague predictive outcomes in most dynastic records. These dreams were mostly cases where the dream content was clearly described but does not have a definitive confirmation or disconfirmation of the dream's significance or prophetic power. It is likely that many of these dreams were in fact predictive failures, as otherwise historians would have recorded the verifications given that dreams were generally viewed as a legitimate information source. Will a naïve reader realize that these dreams with unclear predictive outcomes may in fact be predictive failures? We do not know for sure,

but I suggest that it is very likely that people with a strong background belief in the validity of oneiromancy will take these dream signs as meaningful and prognosticative, and that the predicted outcomes of these dreams in fact occurred but happened to be omitted for idiosyncratic reasons. Further historical and anthropological work may shed light on this interesting possibility.

As we have argued elsewhere, under-reporting of failed predictions may be a prevalent feature of divination in ancient societies (Anonymized, forthcoming). By selectively omitting failed predictions, these transmitted texts give a false impression that dream interpretations are overwhelmingly accurate, which, along with fabrication and ad hoc inference of predictive dreams, serves as a powerful mechanism to empirically sustain the validity of oneiromancy.

3.4. *The declining significance of oneiromancy over time: Evidence from its frequency of occurrence*

So far, I have discussed factors that contribute to people's confidence in oneiromancy, with the premise being that oneiromancy was viewed as a legitimate prediction technique throughout Chinese history. Indeed, Fig. 3 shows that the success rate of dream interpretation does not change much over time, and there is not a definitive trend in the number of dream occurrences over time based on Fig. 2. However, later texts were often lengthier than earlier ones. Could there be a temporal pattern in the relative frequency of dream occurrences? To investigate this, I obtained the number of total characters in each of the Twenty Four Histories from the Corpus of Chinese Dynastic Histories[17] (Zinin & Xu, 2020), and calculated the relative frequency of dream occurrence (number of dreams divided by the number of total characters) in each dynastic record. Fig. 4 shows the relationship between the middle year of each dynastic record's coverage and the relative frequency of dream occurrence, with 95% confidence intervals calculated assuming the number of dreams recorded in a particular history follows a Poisson distribution. Although there is not a definitive linear temporal trend, we nonetheless observe some interesting patterns. Most notably, there is a sudden spike at around 500 CE. The dynastic history *nanshi* (南史, *The History of the Southern Dynasties*), for example, has a frequency of 0.15 per thousand characters along with the temporally nearby dynastic histories, such as *nanqishu (南齐书, The History of Nanqi)*, *beishi (北史, The History of the Northern Dynasties)*, *liangshu (梁书, The History of Liang),* and *beiqishu (北齐书, The History of Beiqi)*. What is special about this particular time period? Traditionally, the period between 420 and 589 CE is referred to as the Southern and Northern dynasties (Zhi'An & Henderson, 2014) and is a particularly turbulent time of civil war and political chaos. Yet, the same period also witnessed great cultural and religious transformations, most notably the rapid spread of Buddhism. According to some authors, the bitter wartime suffering turned many laypeople and elites alike toward religion and placed their hopes into the promised afterlife often in the form of Karma and reincarnation (Duan & Zhang, 2020). Though the real cause of the spread of Buddhism is most likely complex and multifaceted, there is no doubt that Buddhist values and beliefs were vastly popular during this time period, yet such popularity gradually waned in later dynasties (Ch'en & Ch'en, 1972; Sato, 1955; Whalen, 2013). I suggest that the heightened religious interest during the Southern and Northern Dynasties contributed to
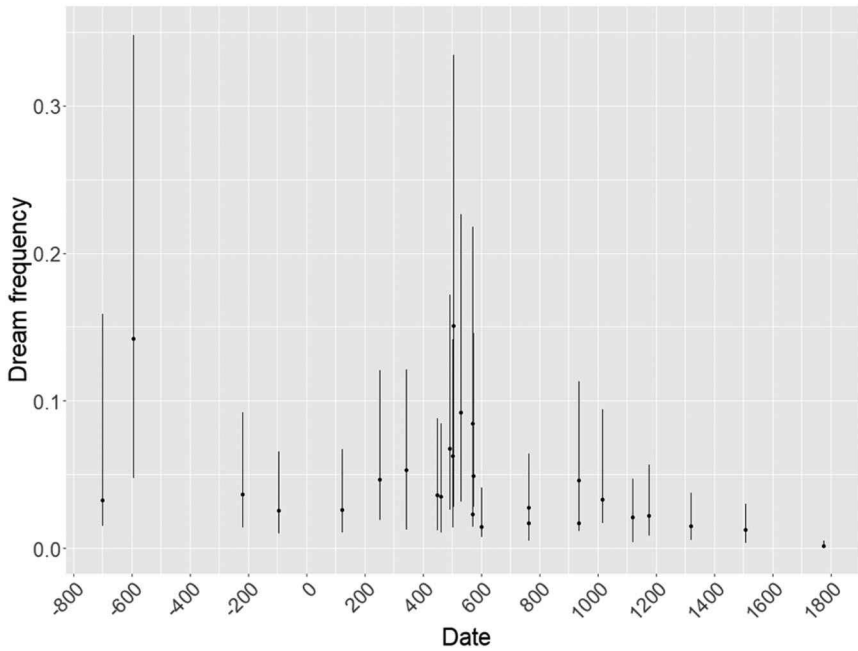
Fig 4. Dream frequency (occurrence per thousand characters) versus year. Each data point represents the middle year of the historical period that each historical record covers. Error bars represent 95% confidence interval assuming a Poisson distribution.

people's belief in oneiromancy as this religion greatly increases the theoretical plausibility of dreams being predictive devices. My dataset supports this possibility: in this short time period, we observe 12 dreams with explicit mentions of either the Budda (佛) or other Buddhist deities out of a total of 20 Buddhism themed dreams throughout the entire dynastic histories.

After the Southern and Northern dynasties, however, the frequency of dream occurrence visibly declines (see Fig. 5 for a comparison of the dream frequency in the three time periods), with a downward trend particularly noticeable in later dynasties. This means that although oneiromancy cases were still described as accurate whenever they were mentioned, the total number of mentions seems to have decreased over time. The *Draft History of Qing*, for example, covers nearly 300 years of history (1636–1912 CE) and has the greatest number of characters (4,514,000), but only mentions dreams eight times. Of course, because the *Draft History of Qing* was written between 1914 and 1928 when the radical social and cultural transformation was taking place, it is possible that its authors were influenced by the scientific thinking from the West and thus their omission of oneiromancy cases does not reflect attitudes toward oneiromancy during the Qing dynasty. To obtain additional evidence, I turn to nonsupernatural fictions in the Ming and Qing dynasties for their depiction of dreams and dream interpretations. Obviously, we need to bear in mind the aforementioned caveat that dream stories in these literal works may be artistic creations and may be thought of as unrealistic even by
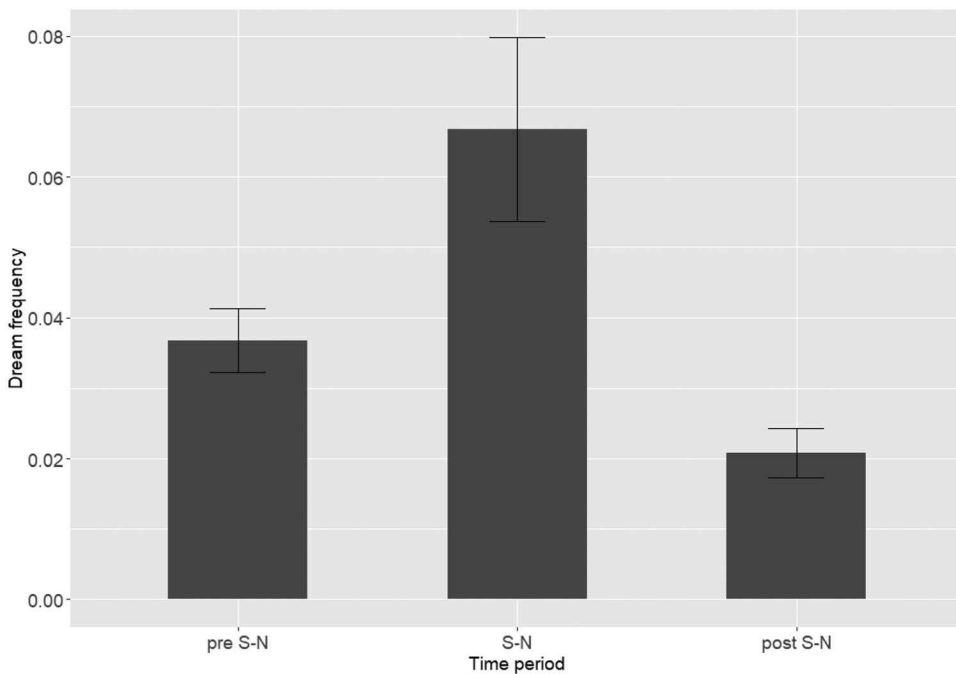
Fig 5. Dream frequency during different time periods. S-N represents Southern-Northern Dynasties (420–589 CE). The unit of analysis here is the frequency of each dynastic period (represented by individual dynastic records). Error bar represents 95% confidence intervals. Sample size $N = 7$, 9, and 11, respectively.

their contemporaneous readers. In the following analysis, I thus excluded fictions with explicit supernatural themes and only focused on historical and realistic fictions in the Ming-Qing era (1368–1912 CE).

Table 2 shows the summary statistics of dream occurrences in the five most famous non-supernatural classic fictions[18] written between the 14th and 18th century (Plaks, 2015). We can see that the frequencies of dream occurrence in these fictions are comparable with those in official historical records (though they fall on the low end of the spectrum), but in later fictions, the percentage of accurate dreams showed a marked decline. Another interesting observation is that in later fictions, dreams were often offered psychological explanations; that is, dreams were not attributed to external reality but subjective feelings, emotions, and desires. In *Unofficial History of the Scholars* (written in the 18th century), for example, we see the following description of dreams:

> Ever since you went with the guest, my body has felt uneasy for over a year! One night I dreamed of you falling into water, and I found myself wake up crying; another night I dreamed that you hurt your leg; another night I dreamed that you had a large tumor on your face... I told your father about these dreams, and your father said I miss you

Table 2
Summary statistics of five nonsupernatural fictions from the 14th to 18th century

Book	Century	Number of dream occurrences	Dream per thousand characters	% Inaccurate dreams	% Vague dreams	% Accurate dreams	% Nonpredictive dreams	% Psychological explanation and skepticism
Outlaws of the Marsh	14th	24	0.025	0	4.2	95.8	0	0
Romance of the Three Kingdoms	14th	21	0.035	14.3	23.8	57.1	4.8	9.5
The Golden Lotus	16th–17th	15	0.015	0	33.3	60	6.67	26.7
Unofficial History of the Scholars	18th	7	0.020	0	28.6	57.2	14.3	28.6
Dream of the Red Chamber	18th	17	0.022	0	35.3	35.3	29.4	17.6

Note that % psychological explanation and skepticism is a separate category from the four types of dream accuracy categories. Most of the psychological explanation and skepticism cases have vague predictive outcomes.

so much that I'm losing my mind (想痴了). (*Unofficial History of the Scholars, chapter 16*)

Here is a story of a woman dreaming of her lover and was told that the reason she had such a dream was because she missed him too much. This type of psychological explanation occurs similarly in *Dream of the Red Chamber* (written in the 18th century):

Sister Feng said: "…last night I had a dream which is kind of funny. I dreamed of a person who looks nice, yet I do not know his name; he told me that he was sent by a royal madam (娘娘) to ask for a hundred pieces of silk. I asked which madam, he said she's not our madam. I therefore did not want to give him [the silk], and he came to grab it by force. I woke up as he was grabbing it." The person from Wang Er family smiled and said: "this is because you manage and organize housework with too much concentration during the day, thinking about the imperial palace." (*Dream of the Red Chamber, Chapter 72*)

Again, we see a dream being attributed to overthinking during the day. Additionally, in these later fictions, we also see occasional skepticism toward the use of dreams for foretelling future events:

Jia Yun said: "…yesterday there was a person saying that a nun in her temple had a dream in which Miao Yu was killed." The crowd laughed: "dream talk does not count!" (*Dream of the Red Chamber, Chapter 72*)

Although it was never revealed in the story whether Miao Yu was indeed killed, it is clear that the significance of the dream was dismissed quite casually. In Table 1, although there are only five data points, we do observe a temporal increase in psychological explanations of dreams and skepticism toward dream interpretation.

Together, the decreased frequency of dream occurrence in dynastic records and increased psychological explanations/skepticism of dreams in fictions suggest that the predictive value of dreams was perhaps not taken as seriously in later times. Of course, this does not mean that oneiromancy was definitively rejected in any way; as long as spirits and ghosts are believed to exist, dreams always serve as a plausible channel for the transmission of messages and signs. Indeed, literary researchers maintain that works on dreams (prognostication manuals, dream encyclopedias, treatise on dreams, and fiction) were valued as legitimate sources of human knowledge during the Ming and well into the Qing dynasty (Zeitlin, 1993). What I want to emphasize here is a comparative difference: although oneiromancy has always existed throughout Chinese history, its relative importance has diminished in later dynasties. The Ming scholar Zhang Fengyi (1527–1613 CE), for example, made the following comment about the early oneiromancy instruction manual *The Duke of Zhou's Explanations of Dreams*:

> Verily, there was no better mantic art than dream [interpretation]. During the Wei-Jin period (220-589 CE), each generation still had its famous specialists. In Song-Yuan times (961-1368 CE), however, people had lost so much interest in it that some crafty ones in the book market appropriated the name "Duke of Zhou" (Ong (1981)'s translation).

There are two interesting points here. First, Zhang Fengyi himself obviously takes oneiromancy seriously as he laments the loss of public interest in dream interpretation. Second, he suggests a temporal decline of the popularity of oneiromancy by providing a rough timeline. Zhang's claim echoes well with the quantitative analysis in Fig. 3; most of the texts with the highest dream frequency are from 300 to 600 CE, and there is a marked decline in dream frequency after 1000 CE.

Another worth-noting point is the decline of official court oneiromancy during Chinese history. The interpretation of dreams was viewed as a very important divination technique during the Zhou dynasty (1046–256 BCE), and oneiromancers often have official government appointments (Yang, 1993). According to official dynastic record of the Han dynasty,[19] "different divination techniques do not yield the same result, and oneiromancy is the main method [should take precedence over other methods]. That's why the Zhou dynasty had an official position of oneiromancer." Liu (1989) in his extensive analysis of the history of Chinese oneiromancy points out that official oneiromancy entirely disappeared in transmitted texts after the Five Dynasties (907–960 CE). The Song scholar Hong Mai (1123–1202 CE) commented on the disappearance of official oneiromancy:

> [Official oneiromancy] still existed sparingly in Wei-Jin times; people (the literati) today don't pay much attention to it anymore. Although [dream interpretation has become] a lowly street art (市井妄术) and was practiced by a few, none of them called themselves

an oneiromancer (无以占梦者自居). This technique has indeed disappeared. (*Rong Zhai Sui Bi*)

Of course, Hong Mai is exaggerating a little bit here as the technique itself never disappeared. Nonetheless, the relegation of oneiromancy to a "lowly street art" deserves attention. Contemporary Chinese researchers have attributed the decline of oneiromancy to its inflexibility; that is, because the sign-outcome association in some early oneiromancy manuals tends to be straightforward and unsophisticated, it leaves little room for oneiromancers to explain away failed predictions and was, therefore, outcompeted by other divination techniques (Fang, 2015; Yang, 2002). This explanation is inadequate because although it is true that some oneiromancy manuals are overly simplistic (i.e., if dreaming of X, then Y, where Y is a very specific outcome), there is no reason why oneiromancers cannot be flexible in offering their predictions (i.e., dreaming of X means general auspiciousness or disaster) as other divination techniques (Liu & Cao, 2003). I suggest that the decline of oneiromancy is primarily due to three reasons. First, what appears in one's dream is, for the most part, an involuntary phenomenon.[20] Therefore, it cannot be readily used to solve practical problems in the same way that other divinatory techniques can be used whenever necessary, such as to identify the spirit that causes illness, the whereabouts of some lost item, or the best location of one's grave. This means that it is probably not as frequently used as other divination techniques, and thus less likely to be observed and copied. Since observing others performing some technology (Anonymized, forthcoming) often contributes to one's subjective belief in the efficacy of the technology, the infrequent use of oneiromancy means its efficacy is not believed as much as other divination and magic practices that are more frequently performed and observed.

Second, dreams are by their nature a private phenomenon, that is, what appears in one's dream is only directly accessible by the dreamer. As such, dream interpretation by a third party necessarily relies on the subjective report of the dreamer. This creates a possibility for the dreamer to fabricate his dream content to provide strategic misinformation to the interpreter or the audience. Boyer (2020) suggests that the cultural success of many divination techniques may be attributed to their "ostensive detachment"; that is, the signs or messages of successful divinations are usually produced in a process which is perceived to not be influenced by the intentions and interests of the interpreter (the diviner). In oneiromancy, the suspiciousness comes from the provider of the sign, the dreamer herself. The deceptive use of dreams was even recorded in orthodox histories:

Wang Shichong wanted to take the chance to start a war against him (Li Mi, a general during the Tang dynasty), but is afraid of a lack of confidence from his soldiers. Therefore, he utilized omens from ghosts and spirits by saying that he has dreamt of the Duke of Zhou. He then built a temple for the Duke of Zhou by the Luo River, and let the shamans announce that the Duke of Zhou had ordered a war against Li Mi, and if war is not fought then all soldiers will die of disease. Wang's soldiers were mostly from Chu

楚 with the tradition of believing in the strange and the supernatural, and all [soldiers] requested to fight. (*Jiu Tangshu, chapter 54*)

This instance happened in the year 618 CE and echoes the previous point that manipulation of dreams depends on the belief of the audience. The more obvious takeaway here, however, is it shows how easily dreams can be used for deceptive purposes, especially this type of message dream where one is free to make up whatever message he wants to influence others. In this aspect, dream interpretation suffers a disadvantage compared to other divination techniques that appear more "objective." Here, we see that fabrication may have the opposite effects on efficacy estimation; on the one hand, fabricated successes may trick naïve individuals into believing that oneiromancy is more effective than it actually is; on the other hand, the possibility of fabrication may raise suspicion and thus lowers the efficacy estimate.

Lastly, the perceived predictive power of dreams could be diminished due to having a rather straightforward explanation caused by present anxieties, desires, and emotions. Such explanations already existed in early Han philosophical writings; the Confucian scholar Wang Fu (102–167 CE) commented that sometimes "what one thinks during the day, one dreams at night."[21] Similarly, as we see in later fictions, dreams were often explained as a product of psychological states, which diminishes their significance in presaging future events. Yet, it is important to note that the decline of oneiromancy does not mean its disappearance; like other divinatory and magic practices, oneiromancy survived well into the Qing dynasty, and was only truly rejected[22] with the introduction of western science based on theoretical grounds.

What about other divination techniques? If oneiromancy's decline in popularity was indeed due to its uniqueness, we would expect less of a decline in popularity of other divinatory techniques, especially the ones whose signs are public and can be readily utilized to solve practical problems. I thus examined two common divinatory techniques, siting (geomancy) and date selection. Siting, now known as Fengshui, is the technique for picking a location for various purposes, such as burial or home construction (Kory, 2016). Date selection refers to the calculation of auspicious dates for holding important events, such as religious ceremonies, marriage, and opening a business (Li, 2007). Fig. 6 shows the frequency of occurrence of these two types of divinatory techniques over time. Here, intuitive visual inspection does not reveal a definitive trend, and formal statistical tests show that there is no significant correlation between the frequency of these techniques and time (Pearson's correlation test, $p = .136$ and .439 for siting and date selection, respectively). Unlike oneiromancy, the frequency of siting and date selection remained substantial in later dynasties and both techniques played important roles in people's everyday life. Even in the late Qing dynasty, siting concerns were invoked to prevent the construction of railways by foreign powers (as the "earth vein" would be disrupted) (Brown, 2017). Therefore, the decline in popularity of oneiromancy is more likely due to its idiosyncratic characteristics rather than some overall shift in the zeitgeist with regard to divination and magic in Chinese society.
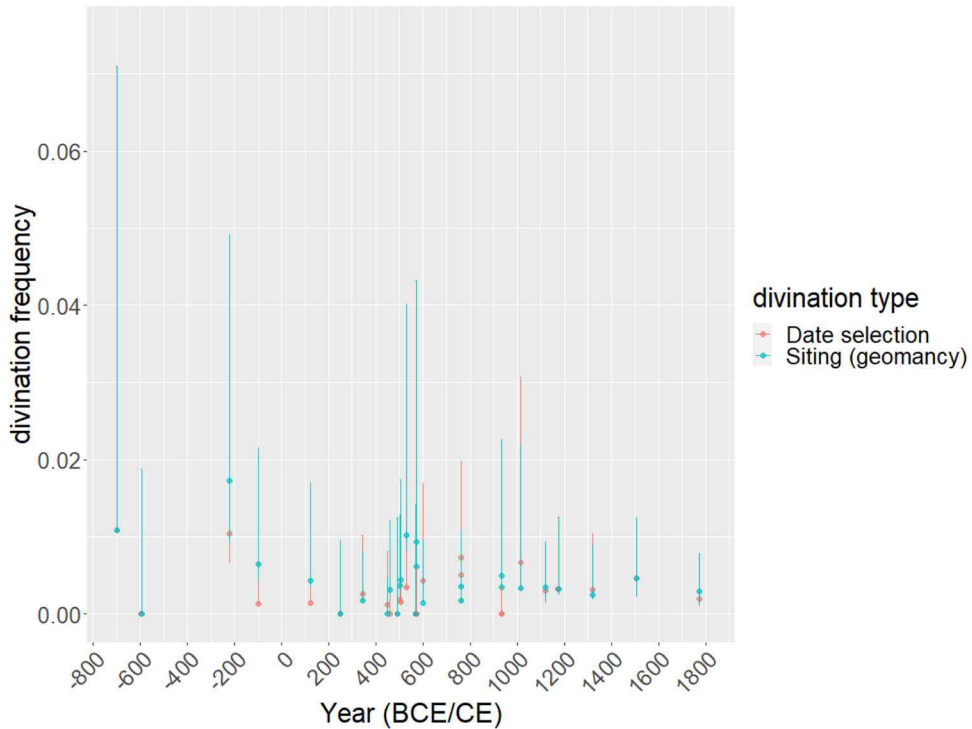
Fig 6. The frequency (occurrence per thousand characters) of siting and date selection versus time. Each data point represents the middle year of the historical period that each historical record covers. Keyword searches were performed on "卜宅/卜居/卜葬/卜地/卜筑" for siting and "卜吉/卜日" for date selection. Error bars represent 95% confidence intervals for a Poisson distribution.

4. Discussion

4.1. *Why oneiromancy? The puzzle from a cognitive perspective*

Given that much anthropological research has focused on the functional aspect of dream interpretation, it is necessary to reassert the cognitive aspect of oneiromancy and ask why humans everywhere believed what one experiences during sleep has genuine meaning and is often prognosticative of future events, when many dream predictions assuredly must have turned out to be wrong. In this paper, I suggest that people in premodern societies have both theoretical (a supernatural worldview) and empirical reasons (successful oneiromancy cases) to believe in the validity of oneiromancy. Through a comprehensive analysis of the Chinese dynastic history, I show that the impressive success of recorded dream predictions may largely be a result of deliberate fabrication, retrospective inference, and under-reporting of predictive failures. These recorded predictively successful dreams then get transmitted over generations and serve as raw input data for naïve individuals and increased their confidence in the predictive power of oneiromancy. Such psychological and social factors may also apply to

other divination/magic practices: for example, some astrological omens recorded in Han Shu are almost certainly fabrications for political purposes (Eberhard, 1957), and many rainmaking failures were ignored in Chinese dynastic records (Hong, Slingerland, & Henrich, forthcoming). In fact, this belief-reinforcing process may be a general feature of many instrumental practices and may result in a feedback loop (Anonymized, forthcoming). Consequently, some rather ineffective practices can, nonetheless, be perceived as highly effective and persist in the population.

In terms of theoretical plausibility, oneiromancy enjoys the same level of support from a supernatural worldview as many other divination and magic practices. What is perhaps unique about oneiromancy is that it does have an alternative explanation. After all, it is not all that difficult to realize the association between one's waking thoughts and dream contents, and from historical sources, we do see this type of psychological explanation appearing in later Chinese dynasties. Oneiromancy suffers from two additional issues: its usage is quite limited because it cannot be voluntarily produced, and the private nature of its sign makes it susceptible to skepticism and suspicion more than other divinatory practices where the sign is more public. These factors potentially contributed to its declining popularity in China. The possibility of fabrication in oneiromancy is particularly interesting because its effect is double-edged: on the one hand, fabrication increases the number of predictively accurate oneiromancy cases, which are recorded and transmitted; on the other hand, the fact that it can be easily fabricated triggers epistemic vigilance and generates suspicion. Which effect dominates may be determined by the cultural context (e.g., whether falsely reporting dream incurs supernatural punishment, etc.).

We thus see that it may be challenging to come up with a unified theory of divination or magic in general, as each kind of divination/magic practice has its own idiosyncratic characteristics that affect the extent to which they are believed and used. Research on "why divination/magic" is thus largely an effort to identify one or several factors that increase the perceived efficacy of some (large) set of divinatory/magic practices. We need to keep in mind, however, that in reality the subjectively perceived efficacy of any instrumental action is certainly a function of many factors. Given the complexity of human cognition and behavior, it may be more useful to assess the relative importance of factors that collectively contribute to the cultural success of certain practices.

4.2. The inadequacy of individual intuition in explaining oneiromancy

Of course, it is rather banal to make the uninformative claim that "everything matters." In what follows, I shall offer a few suggestive arguments for why dream interpretation, along with many other ancient forms of divination and magic, has some characteristics that make explanations primarily invoking intuitions inadequate. First, while there certainly exist intuitive elements in the overarching worldview that provide theoretical support of oneiromancy, the specific dream interpretation techniques often require great interpretive effort and expertise, and are not intuitive in any obvious sense. For example, glyphomancy, a type of fortune telling by dissecting and analyzing a Chinese character, was frequently used in deciphering the meaning of dreams (Vance, 2012). The basic idea is that what appears in dreams

is extracted and represented by their corresponding written characters, and these characters are either dissected or assembled into other characters whose meanings are then interpreted. In a rather extreme case, a court official during the Jin dynasty (266–420 CE) is said to have correctly deduced a murderer's name by analyzing the signs of a suspect's dream using glyphomancy.[23] For most illiterate people at the time (which was the vast majority of the population), glyphomancy probably did not make much intuitive sense.

Second, interpreting the meaning of dreams using specific techniques was often a very deliberative process. The good dream diviner, according to the famous dream encyclopedia *Guidelines for Dreams and Dream Interpretation* (梦占逸旨) written in the 16th century, needs to carefully examine the context of dream occurrence, such as the timing of the dream (what season it occurs in), the *yin-yang* situation of the location of the dreamer when the dream occurred, and in particular the psycho-physiological state of the dreamer; for example, dreams are not interpretable if the dreamer has excessive impure thoughts (妄虑) during the day, or if the dreamer wakes up in the middle of a dream. Indeed, in ancient China, the level of oneiromancy theorizing was so great that it is reminiscent of doctors theorizing the nature of illness and the appropriate treatments. In this sense, people resorting to specific interpretation techniques to decipher hidden messages from their dreams is rather different from people avoiding walking under ladders, which has been attributed to the failures of deliberate reasoning to correct or override intuitive reasoning in a dual-processing account (Risen, 2016)

Finally, an exclusive focus on intuition at the individual level ignores the fact that there often exists significant division of cognitive labor in technological practices that require expertise. Surely, the extent to which experts and lay people find some practice intuitively plausible would be very different. As in the case of glyphomancy, while the literati may find it an attractive way of deciphering dreams, lay people most likely find it much less intuitive, and their confidence in its validity is probably a combination of the aforementioned psycho-social factors (fabrication, retrospective inference, and under-reporting of negative evidence) and their trust in oneiromancers, who, like astrologers, geomancers and healers, are the possessors and practitioners of specialized skills. Such differential possession of knowledge means that these professionals often serve as epistemic authorities with regard to solving specific problems (Majdik & Keith, 2011; Pierson, 1994), and to better understand the beliefs and practices of ordinary individuals we need to focus instead on the production and dissemination of knowledge.

4.3. The decline of oneiromancy: Then and now

Many human practices are inherited and passed on over generations. Not all practices are equally successful, and in a cultural evolutionary process, the frequency of some practices in the population may change via a number of mechanisms (Boyd & Richerson, 1985; Henrich & McElreath, 2003). For example, context biases, such as prestige bias (Henrich & Gil-White, 2001) and payoff bias (Kendal, Giraldeau, & Laland, 2009), often lead to the selective retention of adaptive cultural variants. While in simplistic cultural evolutionary models, the probability of a certain cultural variant being transmitted largely depends

on it being "possessed" (or, in the case of behavioral variants, "practiced") by individuals, in reality, the belief in the plausibility of some technology may last regardless of its actual usage frequency in the population. That is, the use of some technology may be rare in a population due to fear of deception, charlatans, or other factors, yet the beliefs that it can achieve its putative purpose when *properly performed* may, nonetheless, remain in the population.

In this final section, I wish to point out that the decline of oneiromancy in later Chinese dynasties exemplifies this type of situation and as such was qualitatively different from the marginalization of divination and magic in contemporary modern societies. As previously alluded to, the declining popularity of oneiromancy in premodern China was not due to a rejection of the underlying theory, but rather because in everyday situations, it was not perceived as a reliable information source as some other divinatory techniques for the aforementioned reasons. Therefore, despite its relegation to a "lowly street art," the extraction of meaning from dreams remains theoretically plausible. This is why in later dynasties, we often observe scholarly efforts to rediscover the lost art of oneiromancy.

The situation in modern societies is very different. Most notably, modern science and technology have generated a materialistic/mechanistic worldview in which ghosts and spirits have no place. This worldview is largely imposed on the population through mass education and state media that creates a radically different understanding of the nature of dreams. Therefore, if a person in late Qing dynasty was asked why he (who most likely believed in astrology, geomancy, and a number of other divination techniques) does not believe in oneiromancy, he would probably have answered "the art has been lost and those on the streets are just quacks" (Liu & Cao, 2003), whereas if a modern person is asked the same question, he would probably offer a materialistic explanation of the dreams and why it has no causal association with future events. In fact, the significance of dreams has diminished to such a degree that most contemporary Americans rarely remember their dreams (Kracke, 1992).

A final note on the particularities of modernity: modern societies have epistemic institutions, such as universities and research agencies, where the use of data to inform theory is regulated. Fabrication of data is straightforwardly discouraged; theories and hypotheses are carefully tested in controlled experimental settings, and important discoveries are replicated to rule out the possibility of statistic artifacts. Under-reporting of predictive failures (known as publication bias in the scientific literature) was perhaps not adequately dealt with as much in the social and medical sciences, but recent progress in preregistration (Haven & Van Grootel, 2019; Nosek et al., 2018, 2019) and the encouragement of publishing negative results (Mehta, 2019; Trivers, 2010) have been proposed to address the issue. Of course, this is not to say that superstitions, such as horoscopes and fortune telling, completely ceased to exist in our societies. They are, however, definitively out of the mainstream as a credible information source and people who believe in them are often frowned upon. I think it would be a mistake to deny the drastic difference between the traditional and the modern: as long as our epistemic institutions survive, thrive, and are trusted by the public, we have good reasons to believe that the technologies we utilize today are genuinely effective, and that we generally live in a much more epistemically secure society.

Notes

1 The word "primitive" was often used to denote these societies in early anthropological writings.

2 Although as I emphatically point out in Anonymized (unpublished) and will later discuss in the paper, such skepticism rarely leads to a complete rejection of the validity of some technological practice.

3 See *Meng Zhan Yi Zhi*, by Chen Shiyuan (1516–1597).

4 Obviously, "opposition to reality" is a vague term and there are lot of ways dreams can be said to be "opposite."

5 This way of classifying dreams resembles Plato's distinction between "technical" and "possession" divination, where "technical divination" refers to the interpretation of signs that appear in dreams, whereas "possession divination" refers to messages from the gods conveyed by humans in some altered conscious state (Flower, 2008).

6 The *Draft History of Qing* was written during the Beiyang government period (1912–1928 AD) but was not completed due to a lack of funding.

7 The classical Chinese conception of history has been that it is a *record* of events, free of interpretations (Dubs, 1946).

8 In addition to writing histories of the previous dynasty, official court historians were also responsible for recording individuals and events of their own dynasty, which often served as raw materials for historians of later dynasties (Qu, 2020; Xu, 2012).

9 Later in the text, Wang Chong seems to have entertained the possibility that different kinds/species may have intercourse with each other, but he insists that their offspring are unprincipled and mischievous as opposed to virtuous and king-like.

10 Pew Research Center. (2013). Celebrating Christmas and the Holidays, Then and Now. Accessed on 01/20/2021 from https://www.pewforum.org/2013/12/18/celebrating-christmas-and-the-holidays-then-and-now/

11 Dreams that depict the extra-ordinariness of kings, queens, and emperors, excluding repeated dreams.

12 *Nan Shi*, chapter 63.

13 东莱左史博议.

14 Interestingly, Xiong Bolong does think that what appears in the mother's dream *statistically* predicts the fetus's sex by offering a justification of using the yin-yang theory.

15 The association between dreaming of a bear and giving birth to son (as well as dreaming of a snake and giving birth to daughter) originally comes from *Classic of Poetry, Xiaoya*.

16 无何集.

17 *Zuo Zhuan*, *Guoyu*, and *Draft History of Qing* from the published versions by Zhonghua Book Company (中华书局).

18 *Journey to the West* is excluded from this analysis due to the supernatural nature of its stories.

19 *Han Shu*, Yiwenzhi (Treatise on Literature).

20 Though Ong (1981) mentions dream incubation (efforts to produce specific types of dreams for problem solving) in China, it never became a mainstream practice and never appeared in official dynastic records.

21 *Qian fu lun*, *Meng lie* (潜夫论·梦列).

22 Of course, the use of dreams for prognosticative purpose still exists in China, especially in rural areas. But, as we have argued in Hong and Henrich (2021), there is a qualitative difference between rejection based on theoretical grounds due to a culturally imposed mechanistic worldview and the mere declining popularity of one type of divination relative to others.

23 This story is recorded in the official dynastic history of Jin 晋书 (266–420 CE), chapter 114.

Acknowledgments

References

Ambuehl, S., & Li, S. (2018). Belief updating and the demand for information. *Games and Economic Behavior*, *109*, 21–39. https://doi.org/10.1016/j.geb.2017.11.009

Annus, A. (2010). Divination and interpretation of signs in the ancient world. In *Oriental Institute Seminars*.

Ayton, P., & Fischer, I. (2004). The hot hand fallacy and the gambler's fallacy: Two faces of subjective randomness? *Memory and Cognition*, *32*, 1369–1378. https://doi.org/10.3758/BF03206327

Barrett, D., & McNamara, P. (2007). *The new science of dreaming* (Vol. 3). Westport, CT: Praeger Publishers.

Barrett, J. L. (2008). Coding and quantifying counterintuitiveness in religious concepts: Theoretical and methodological reflections. *Method and Theory in the Study of Religion*. *20*(4), 308–338. https://doi.org/10.1163/157006808x371806

Beaulieu-Prévost, D., & Zadra, A. (2015). When people remember dreams they never experienced: A study of the malleability of dream recall over time. *Dreaming*, *25*, 18–31. https://doi.org/10.1037/a0038788

Bering, J. M., McLeod, K., & Shackelford, T. K. (2005). Reasoning about dead agents reveals possible adaptive trends. *Human Nature*, *16*, 360–381. https://doi.org/10.1007/s12110-005-1015-2

Blagrove, M. (1992). Dreams as the reflection of our waking concerns and abilities: A critique of the problem-solving paradigm in dream research. *Dreaming*, *2*, 205–220. https://doi.org/10.1037/h0094361

Bourguignon, E. (1972). Dreams and altered states of consciousness in anthropological research. In F. L. Hsu (Ed.), *Psychological anthropology*. (403–434). Schenkman.

Boyd, R., & Richerson, P. J. (1985). *Culture and the evolutionary process*. University of Chicago Press.

Boyer, P. (2001). *Religion explained: The evolutionary origins of religious thought*. Basic Books.

Boyer, P. (2020). Why divination? Evolved psychology and strategic interaction in the production of truth. *Current Anthropology*, *61*, 100–123. https://doi.org/10.1086/706879

Boyer, P., & Ramble, C. (2001). Cognitive templates for religious concepts: Cross-cultural evidence for recall of counter-intuitive representations. *Cognitive Science*, *25*, 536–564. https://doi.org/10.1016/S0364-0213(01)00045-3

Brown, T. (2017). *The veins of the earth: Law, geomancy, and the transformation of property in modern China*. Columbia University.

Ch'en, K. K. S., & Ch'en, K. K. S. (1972). *Buddhism in China: A historical survey* (Vol. 1). Princeton University Press.

Chudek, M., & Henrich, J. (2011). Culture-gene coevolution, norm-psychology and the emergence of human prosociality. *Trends in Cognitive Sciences*, *15*, 218–226. https://doi.org/10.1016/j.tics.2011.03.003

Csibra, G., & Gergely, G. (2009). Natural pedagogy. *Trends in Cognitive Sciences*, *13*, 148–153. https://doi.org/10.1016/j.tics.2009.01.005

Dayan, P., & Balleine, B. W. (2002). Reward, motivation, and reinforcement learning. *Neuron*, *36*, 285–298. https://doi.org/10.1016/S0896-6273(02)00963-7

Dayan, P., & Daw, N. D. (2008). Decision theory, reinforcement learning, and the brain. *Cognitive, Affective and Behavioral Neuroscience*, *8*, 429–453. https://doi.org/10.3758/CABN.8.4.429

de Barra, M. (2017). Reporting bias inflates the reputation of medical treatments: A comparison of outcomes in clinical trials and online product reviews. *Social Science and Medicine*, *177*, 248–255. https://doi.org/10.1016/j.socscimed.2017.01.033

De Barra, M., Eriksson, K., & Strimling, P. (2014). How feedback biases give ineffective medical treatments a good reputation. *Journal of Medical Internet Research*, *16*, e193. https://doi.org/10.2196/jmir.3214

Duan, Y., & Zhang, T. (2020). 北朝佛教兴起原因及社会影响. *河西学院学报*, *36*(1), 98–102.

Dubs, H. H. (1946). The reliability of Chinese histories. *Journal of Asian Studies*, *6*, 23–43. https://doi.org/10.2307/2049671

Eberhard, W. (1957). *The political function of astronomy and astronomers in HanChina*. University of Chicago Press.

Fang, A. (2015). *唐代小说中的占梦文化研究*. 新疆师范大学.

Farias, M., Van Mulukom, V., Kahane, G., Kreplin, U., Joyce, A., Soares, P., … Möttönen, R. (2017). Supernatural belief is not modulated by intuitive thinking style or cognitive inhibition. *Scientific Reports*, *7*, 15100. https://doi.org/10.1038/s41598-017-14090-9

Flower, M. A. (2008). *The seer in ancient Greece*.

Forke, A. (1907). *Lun-Heng: Philosophical essays of Wang Ch'ung*. Paragon Book Gallery.

Franklin, M. S., & Zyphur, M. J. (2005). The role of dreams in the evolution of the human mind. *Evolutionary Psychology*, *3*, 59–78. https://doi.org/10.1177/147470490500300106

Frazer, J. G. (1890). *The golden bough: A study in comparative religion, Volume 2*. Macmillan.

Fu, Y. (2017). *中国古代占梦书梳理与考辨*. 兰州大学.

Garfield, P. (2009). *The universal dream key*. Harper Collins.

Griffith, R. M., Miyagi, O., & Tago, A. (1958). The universality of typical dreams: Japanese vs. Americans. *American Anthropologist*, *60*, 1173–1179. https://doi.org/10.1525/aa.1958.60.6.02a00110

Grunebaum, G. E., & Caillois, R. (1966). *The dream and human societies*. University of California Press.

Harris, P. L. (2012). *Trusting what you're told*.

Haven, T. L., & Van Grootel, D. L. (2019). Preregistering qualitative research. *Accountability in Research*, *26*, 229–244. https://doi.org/10.1080/08989621.2019.1580147

He, Y. (2011). *占梦文化*. Beijing Book Co. Inc.

Henrich, J. (2002). Decision-making, cultural transmission and adaptation in economic anthropology. In J. Ensminger (Ed.), *Theory in economic anthropology* (pp. 251–295). Walnut Creek, CA: AltaMira Press.

Henrich, J., & Gil-White, F. J. (2001). The evolution of prestige: Freely conferred deference as a mechanism for enhancing the benefits of cultural transmission. *Evolution and Human Behavior*, *22*, 165–196. https://doi.org/10.1016/S1090-5138(00)00071-4

Henrich, J., & McElreath, R. (2003). The evolution of cultural evolution. *Evolutionary Anthropology*, *12*, 123–135. https://doi.org/10.1002/evan.10110

Hollan, D. (1989). The personal use of dream beliefs in the Toraja highlands. *Ethos*, *17*(2), 166–186.

Hong, Z., & Henrich, J. (2021). The cultural evolution of epistemic practices. *Human Nature*, *32*, 622–651.

Horton, R. (1967). African traditional thought and western science. *Africa*, *37*, 50–71. https://doi.org/10.2307/1158253

Horton, R. (1993). *Patterns of thought in Africa and the west*. Cambridge University Press.

Hughes, J. D. (2000). Dream interpretation in ancient civilizations. *Dreaming*, *10*, 7–18. https://doi.org/10.1023/A:1009447606158

Ioannidis, J. P. A. (2017). Does evidence-based hearsay determine the use of medical treatments? *Social Science and Medicine*, *177*, 256–258. https://doi.org/10.1016/j.socscimed.2017.02.004

Johnson, D. K. (2017). Confirmation bias. In *Bad arguments: 50 common fallacies and how to avoid them*. https://doi.org/10.1002/9781119165811.ch73

Kendal, J., Giraldeau, L. A., & Laland, K. (2009). The evolution of social learning rules: Payoff-biased and frequency-dependent biased transmission. *Journal of Theoretical Biology*, *260*, 210–219. https://doi.org/10.1016/j.jtbi.2009.05.029

Kessels, A. H. M. (1969). Ancient systems of dream-classification. *Mnemosyne*, *22*, 389. https://doi.org/10.1163/156852569x00058

Korn, C. W., Sharot, T., Walter, H., Heekeren, H. R., & Dolan, R. J. (2014). Depression is related to an absence of optimistically biased belief updating about future life events. *Psychological Medicine*, *44*, 579–592. https://doi.org/10.1017/S0033291713001074

Kory, S. N. (2016). Five classics of Fengshui: Chinese spiritual geography in historical and environmental perspective. *Monumenta Serica*, *64*, 201–203. https://doi.org/10.1080/02549948.2016.1170346

Kracke, W. (1992). Cultural aspects of dreaming. Encyclopedia of Dreams. Internationale Institute for Dream Research.

Landis, J. R., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics*, *33*, 159–174. https://doi.org/10.2307/2529310

Legare, C. H., & Souza, A. L. (2012). Evaluating ritual efficacy: Evidence from the supernatural. *Cognition*, *124*, 1–15. https://doi.org/10.1016/j.cognition.2012.03.004

Li, L. (2007). Superstition or modernity? *M/C Journal*. *10*, https://doi.org/10.5204/mcj.2604

Li, W. (1999). Dreams of interpretation in early Chinese historical and philosophical writings. In Dream cultures: Explorations in the comparative history of dreaming (pp. 17–42).

Lincoln, J. S. (1935). *The dream in primitive cultures*. London: Cresset Press, Ltd.

Lincoln, J. S. (2003). *The dream in native American and other primitive cultures*. Courier Corporation.

Liu, W. (1989). 梦的迷信与梦的探索. 中国社会科学出版社.

Liu, W., & Cao, T. (2003). 梦与中国文化. 人民出版社.

Lustick, I. S. (1996). History, historiography, and political science: Multiple historical records and the problem of selection bias. *American Political Science Review*, *90*, 605–618. https://doi.org/10.2307/2082612

Majdik, Z. P., & Keith, W. M. (2011). Expertise as argument: Authority, democracy, and problem-solving. *Argumentation*, *25*. 371–384. https://doi.org/10.1007/s10503-011-9221-z

Mead, M. (1932). An investigation of the thought of primitive children, with special reference to animism. *Journal of the Royal Anthropological Institute of Great Britain and Ireland*, *62*, 173–190. https://doi.org/10.2307/2843884

Mehta, D. (2019). Highlight negative results to improve science. *Nature*. https://doi.org/10.1038/d41586-019-02960-3

Mercier, H. (2020). *Not born yesterday: The science of who we trust and what we believe*. Princeton University Press.

Miton, H., Claidière, N., & Mercier, H. (2015). Universal cognitive mechanisms explain the cultural success of bloodletting. *Evolution and Human Behavior*, *36*, 303–312. https://doi.org/10.1016/j.evolhumbehav.2015.01.003

Nemeroff, C., & Rozin, P. (2000). The makings of the magical mind: The nature and function of sympathetic magical thinking. In K. S. Rosengren, C. N. Johnson, P. L. Harris, C. N. Johnson, & P. L. Harris (Eds.), *Imagining the impossible* (pp. 1–34). Cambridge University Press.

Nemeroff, P., & Rozin, C. (1990). The laws of sympathetic magic: A psychological analysis of similarity and contagion. In J. W. Stigler, R. A. Shweder, & G. H. Herdt (Eds.), *Cultural psychology: Essays on comparative human development* (pp. 205–232). Cambridge University Press.

Nickerson, R. S. (1998). Confirmation bias: A ubiquitous phenomenon in many guises. *Review of General Psychology*, *2*, 175–220. https://doi.org/10.1037/1089-2680.2.2.175

Nielsen, T. A., Zadra, A. L., Simard, V., Saucier, S., Stenstrom, P., Smith, C., & Kuiken, D. (2003). The typical dreams of Canadian University students. *Dreaming*, *13*, 211–235. https://doi.org/10.1023/B:DREM.0000003144.40929.0b

Nir, Y., & Tononi, G. (2010). Dreaming and the brain: From phenomenology to neurophysiology. *Trends in Cognitive Sciences*, *14*, 88. https://doi.org/10.1016/j.tics.2009.12.001

Niv, Y. (2009). Reinforcement learning in the brain. *Journal of Mathematical Psychology*, *53*, 139–154. https://doi.org/10.1016/j.jmp.2008.12.005

Nosek, B. A., Beck, E. D., Campbell, L., Flake, J. K., Hardwicke, T. E., Mellor, D. T., … Vazire, S. (2019). Preregistration is hard, and worthwhile. *Trends in Cognitive Sciences*, *23*, 815–818. https://doi.org/10.1016/j.tics.2019.07.009

Nosek, B. A., Ebersole, C. R., DeHaven, A. C., & Mellor, D. T. (2018). The preregistration revolution. *Proceedings of the National Academy of Sciences of the United States of America*, *115*, 2600–2606. https://doi.org/10.1073/pnas.1708274114

Ong, R. K. (1981). *The interpretation of dreams in ancient China*. University of British Columbia.

Pierson, R. (1994). The epistemic authority of expertise. *Proceedings of the Biennial Meeting of the Philosophy of Science Association*, *1*, 398–405. https://doi.org/10.1086/psaprocbienmeetp.1994.1.193044

Plaks, A. H. (2015). *The four masterworks of the ming novel: Ssu ta ch'i-shu*. Princeton University Press.

Plaks, A., & Nylan, M. (2016). *Zuo tradition/Zuozhuan: Commentary on the" Spring and Autumn Annals"*. University of Washington Press.

Price, S. R. F. (1986). The future of dreams: From freud to artemidorus. *Past and Present*, *113*, 3–37. https://doi.org/10.1093/past/113.1.3

Qu, L. (2020). 中国史学之连续性发展的特点及其深远的历史意义. 河北学刊, *40*(4), 1–9.

Revonsuo, A. (2000). The reinterpretation of dreams: An evolutionary hypothesis of the function of dreaming. *Behavioral and Brain Sciences*, *23*, 877–901. https://doi.org/10.1017/S0140525x00004015

Richerson, P. J., & Boyd, R. (2005). *Not by genes alone: How culture transformed human evolution*. University of Chicago Press.

Risen, J. L. (2016). Believing what we do not believe: Acquiescence to superstitious beliefs and other powerful intuitions. *Psychological Review*, *123*, 182–207. https://doi.org/10.1037/rev0000017

Rosen, M. G. (2013). What I make up when I wake up: Anti-experience views and narrative fabrication of dreams. *Frontiers in Psychology*. *4*, 514. https://doi.org/10.3389/fpsyg.2013.00514

Rottman, J. (2013). Born believers: The science of children's religious belief. *Religion, Brain & Behavior*. *3*(3), 254–256. https://doi.org/10.1080/2153599x.2012.739741

Sato, T. (1955). Buddhism and Zen in the northern and southern dynasties. *Journal of Indian and Buddhist Studies (Indogaku Bukkyogaku Kenkyu)*. *3*(2), 526–527. https://doi.org/10.4259/ibk.3.526

Schwitzgebel, E. (2011). *Perplexities of consciousness*. MIT Press.

Shah, P., Harris, A. J. L., Bird, G., Catmur, C., & Hahn, U. (2016). A pessimistic view of optimistic belief updating. *Cognitive Psychology*, *90*, 71–127. https://doi.org/10.1016/j.cogpsych.2016.05.004

Sharot, T. (2011). The optimism bias. *Current Biology*, *21*, R941–R945. https://doi.org/10.1016/j.cub.2011.10.030

Shenhav, A., Rand, D. G., & Greene, J. D. (2012). Divine intuition: Cognitive style influences belief in God. *Journal of Experimental Psychology: General*, *141*, 423–428. https://doi.org/10.1037/a0025391

Siclari, F., Baird, B., Perogamvros, L., Bernardi, G., LaRocque, J. J., Riedner, B., … Tononi, G. (2017). The neural correlates of dreaming. *Nature Neuroscience*, *20*, 872–878. https://doi.org/10.1038/nn.4545

Singh, M. (2017). The cultural evolution of shamanism. *Behavioral and Brain Sciences*, *41*, e66. https://doi.org/10.1017/s0140525x17001893

Sperber, D., Clément, F., Heintz, C., Mascaro, O., Mercier, H., Origgi, G., & Wilson, D. (2010). Epistemic vigilance. *Mind and Language*, *25*, 359–393. https://doi.org/10.1111/j.1468-0017.2010.01394.x

Tambiah, S. J. (1990). *Magic, science, religion, and the scope of rationality*. Cambridge University Press.

Tedlock, B. (1987). *Dreaming: Anthropological and psychological interpretations*. CUP Archive.

Tedlock, B. (2006). Toward a theory of divinatory practice. *Anthropology of Consciousness*, *17*(2), 62–77. https://doi.org/10.1525/ac.2006.17.2.62

Trivers, R. (2010). Deceit and self-deception. In *Mind the gap: Tracing the origins of human universals*.

Tucker, A. (2009). *A companion to the philosophy of history and historiography*.

Tylor, E. B. (1871). *Primitive culture: Researches into the development of mythology, philosophy, religion, art, and custom*.

Vance, B. E. (2012). Textualizing dreams in a Late Ming dream encyclopedia [PhD Dissertation]. Princeton University.

Vyse, S. (1997). Believing in magic. In *The psychology of superstition*. Oxford University Press.

Wallace, A. F. C. (1959). The institutionalization of cathartic and control strategies in Iroquois religious psychotherapy. Marvin Opler, *Culture and Mental Health*, 63–96. New York: The Macmillan Company.

Whalen, L. (2013). Buddhism in China: A historical survey. In Antonio Cua, *Encyclopedia of Chinese philosophy* (pp. 29–46). Routledge.

Xu, H. (2012). 唐朝史官制度研究. 河北师范大学.

Yang, J. (1993). 周代占梦术的发展及其政治功能. 福建论坛: 人文社会科学版, *3*, 17–23.

Yang, X. (2002). 宋代占卜与宋代社会. 四川师范大学学报 (社会科学版), *3*, 94–99.

Yu, A. C. (1988). History, fiction and the reading of Chinese narrative. *Chinese Literature: Essays, Articles, Reviews (CLEAR)*, *10*, 1–19. https://doi.org/10.2307/495139

Yu, C. K. C. (2016). Classification of typical dream themes and implications for dream interpretation. *Neuropsychoanalysis*, *18*, 133–146. https://doi.org/10.1080/15294145.2016.1236701

Yun, P. (2013). 何苦迷信周公解梦. 科学与无神论, *3*, 61–64.

Zeitlin, J. T. (1993). *Historian of the strange: Pu Songling and the Chinese classical tale*. Stanford University Press.

Zheng, W. (2014). 两晋时期占卜研究. 吉林大学.

Zhi'An, L., & Henderson, K. (2014). Northern and Southern dynasties and the course of history since middle antiquity. *Journal of Chinese Humanities*. *1*(1), 88–119. https://doi.org/10.1163/23521341-01010006

Zinin, S., & Xu, Y. (2020). Corpus of Chinese dynastic histories: Gender analysis over two millennia. LREC 2020 - 12th International Conference on Language Resources and Evaluation, Conference Proceedings.

Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Table S1. Description of the dataset
Table S2. Descriptions of the type of dream interpretations