



Open Library of Humanities

Teething Problems: Pierced tooth amulets and sensing pain in the Roman archaeological record

Adam N. Parker, York Museums Trust, UK, adam.parker@open.ac.uk

References in ancient literary texts refer to the use of pierced teeth as amulets used for the prevention and reduction of teething pains in infants. In this paper, I explore some of the sensory aspects of this phenomenon by centralising pain as a sensory experience. I draw on a dataset of these objects from Roman Britain in order to contextualise the types and use of these objects within the Roman world. These two facets, linking the sensory experiences of teething pain to real, material objects, allows for a discussion of the lived and embodied experience of wearing this amulet in the ancient world, through which a greater appreciation of its sensory importance is gained.



Ancient literary evidence associates animal teeth with the practice of reducing pain in teething infants. There is archaeological evidence for the use of pierced animal teeth as pendants, as well as a contextual relationship between these objects and the graves of infants. Pierced tooth pendants were amulets: protective magical objects intended to benefit their users through supernatural effects. In this paper, I aim to explore the complex relationship between this object type and its magical function as a painkiller, underpinned by a consideration of pain as a sensory experience (and so allied to the sensory turn in archaeology). To contextualise the archaeological evidence for this practice I will draw on a case study of these objects from Roman Britain (see Parker 2022).

There are several references in classical literature to pierced teeth functioning as a medicinal amulet for curing teething pains in infants. Pliny (*Natural History* 28.78) describes wolf canines as particularly efficacious for curing fear in children and as a medicine for teething and that the same could be said of horse teeth. Serenus Sammonicus (*Liber Medicinalis* 58.1029) reports a similar cure: '[Nature] afflicts us with torture when she arms us with snow-white teeth, so bind round your child's soft neck a horse's teeth [sic]'. Pierced teeth can be found in the archaeological record and a contextual link between these objects and the graves of infants has been established (Puttock 2002: 98; Dasen 2015: 193). It follows that in response to the pain endured by an infant during teething, a pierced tooth may have been used (presumed to be worn, but I will address this later) as an amulet intended to function as an analgesic or as a preventative to reduce pain and discomfort. Pain was a uniquely sensory experience in the ancient world, which straddled both the physical and emotional realms. Its subjective nature has meant that it has received comparatively little interest in the ongoing sensory turn in archaeological theory, though it has a broader academic basis in sociological (Nader et al. 2020), psychological (Gorczyca et al. 2013; Vadivelua et al. 2017), and anthropological studies (Morris 1991; Gooberman-Hill 2015) which may be allied to archaeological understandings of the past.

The study of the sensory properties and the sensory affordances of materials and objects is still a novel approach and one that does not always sit comfortably with traditional archaeological and historical methodologies (Newstead and Casimiro 2020). Acknowledging the potential that exists within sensory archaeology is important because it offers opportunities to engage in new, deeper, and more meaningful ways with ancient material culture (see Betts 2017). This is particularly true of ancient magic studies, a smaller niche within the wider discipline. A pierced tooth may be thought of as magical because this proposed function, as something 'used' by its wearer to reduce or avoid pain identifies it as an amulet.¹ Amulets warded against negative effects and

we can identify two broad types of amulets. Firstly, those that were intended to provide generic or generalised protection against a non-specific harm. These include phallic and vulvate charms and the *manus fica* ('fig sign') gesture (Parker 2020). And secondly, those intended to protect from specific harms. In this latter category we find, for example, amulets to protect from scorpion stings (Faraone 2011: 55), against uterine problems (Faraone 2011: 56), for protection in childbirth (Tomlin 2008; Dasen 2021), against stomach complaints (Faraone 2011: 50–51), and against drowning (Yébenes 2010). A pendant designed to protect an infant from pain, or curing existing pain experienced during teething, comfortably fits within this second, amorphous grouping.

To my knowledge, there is only a single, very recent, academic work which really centralises sensory studies as a tool to explore ancient magical practices: Ager's *The Scent of Ancient Magic* (2022). Ager takes the view that magic and scent were connected in the ancient world because both were intangible and could affect humans in profound ways that were, in some cases, mysterious and hard to defend against (Ager 2022: 3). Thus, an aspect of sensory experience can be used to explore ancient magic and vice-versa.² Smell was an important component of ancient ritual activity because of its affective capabilities and its links to ritual recipes and associations between different organic materials (especially plants and oils). In the ritual instructions of the *Papyri Graecae Magicae*, the most commonly used incense is myrrh, while oils of rose and lilies were frequently used perfumes, and laurel was the most common fresh plant noted (Ager 2022: 80). These are ephemeral material components which formed part of the ritual experience.

A sensory approach to the materiality of ancient magic focuses attention on not just the visual form and shape of magical objects, but their material (textures, weight etc.), sound, and smell. It is important to note that sensory experience, centralised in the real world, was liable to temporal change (including at the scale of hours, days, weeks, months, years, and further) (see Graham 2018). In the case of many amulets, they were worn as personal adornment and so there were situations when it was and was not appropriate to wear such objects. Most obviously, some adornment was removed whilst bathing or at night, and so this context alters the sensory experience of wearing a magical object.

Conceptualising Pain

Pain, or nociception, is a sensory experience. More than that it is a psychobiological experience because it can affect mind and emotional states as well as having physiological effects. Within the broader 'sensory turn' in archaeology (see Betts 2017) approaches to pain can be particularly allied with emotional archaeologies (see Tarlow 2012).

As pain as a concept is complicated, a definition of it will be helpful to situate my use of it. A definition widely used in modern scholarship, and so here adopted, is by the International Association for the Study of Pain (IASP) (2022): '[Pain is] an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage'. The definition has six caveats:

1. Pain is always a personal experience that is influenced to varying degrees by biological, psychological, and social factors.
2. Pain and nociception (the sensory stimulus associated with pain signals) are different phenomena. Pain cannot be inferred solely from activity in sensory neurons.
3. Through their life experiences, individuals learn the concept of pain.
4. A person's report of an experience as pain should be respected.
5. Although pain usually serves an adaptive role, it may have adverse effects on function and social and psychological well-being.
6. Verbal description is only one of several behaviours to express pain; inability to communicate does not negate the possibility that a human or a nonhuman animal experiences pain.

A significant issue in the study of pain is that its experience and description is subjective. Other than its palaeopathological nature it is very difficult to understand archaeologically or historically (Chapman and Gearey 2019)—indeed the subjectivity of pain may be further compounded by historical distance. Approaching the idea of pain in ancient history requires, at least in part, an essentialist understanding of the shared-experience of pain amongst humanity past and present. The IASP (2022) definition of pain includes the caveat that 'pain is always a personal experience', and so the study of pain, even in the twenty-first century inherently involves an essentialist approach.

The conceptualisation of pain becomes frustratingly limited when it is reliant upon expressive language to explain how the pain *feels* (Scarry 1985: 3–11; Toates 2007: 17). In Melzack's (1975) McGill Pain Questionnaire, he identified, through a series of trials, a broad range of the expressive language used by pain-suffering (anglophone) patients and used these to create a series of categories by which pain could be measured. In a subsequent study, Melzack and Wall (1988: 42) reported that groups of patients suffering similar forms of tissue damage used similar words (e.g. that the group suffering menstrual pain regularly reported that it was 'cramping' or 'aching' and those suffering toothache reported it as 'throbbing', 'sharp', or 'boring'). Avoiding a

discussion on the pain perceptions of modern populations, suffice it to say that the use of expressive language in these studies highlights the interconnectedness of differing pain experiences. These, and similar words, might be also termed ‘pain affordances’ as they are useful words to describe these subjective sensory experiences. Melzack and Wall (1988) highlight that pain can change across different parts of the human body and different types of tissues. Thus, muscle pains, skin/flesh pains, or bone pains could each represent different sensory experiences. And so, using my terminology, pain affordances may be spatially restricted within a human body. And this is to say nothing of the affordances of cognitive or emotive pains which, we can imagine, may not be so restricted by the experience of nociception on specific tissues.

So, pain is subjective and is (and was) an intensely insular experience. Language can articulate *some* of that experience, but only in people able to sufficiently communicate this. A focus on infant teething, to which I will now move, is additionally problematic because the infant is likely to be without the necessary language skills to explain the pain. Their experience of pain is without words but that does not mean that it is hidden or silent.

The pain experience of an infant is also intimately linked to the adult carers upon which it is dependent. So, the physiological pain encountered by the infant is connected not only to their own cognitive and emotional pains, but also to those of the carer. A distressed infant is unable to reconcile the basis of their pain with its world experience and so the onus is passed to the adult carer. What I am aiming to introduce here is an understanding that pain may be a subjective experience but that in the case of the relationship between an infant and its carer that this pain could be shared in complex and meaningful ways. Furthermore, we should recognise that the experience of pain can affect the other senses and, in doing so, it could affect wider lived experience.

Teething and the Life Course

Teething has been described as the first major step in early childhood (Dasen 2015: 191) and is an indicator of the start of a change from immediate dependency of an adult to increasing levels of independence (in terms of food sources). It is a step further along the life course, but a change that comes with pain and suffering. Teething pain is natural and, if it occurs, unavoidable—there is therefore a difference between physiological pain associated with the life course and pain which results from accident or violence.³ The final caveat of the IASP definition is also relevant for teething pain: ‘... [the] inability to communicate [pain] does not negate the possibility that a human [...] experiences pain’. A teething infant is unlikely to be able to verbally communicate

pain, but other communication strategies exist—especially, in this context, the ability for an adult carer to perceive the emotional distress of an infant and attribute it to the teething process.

Teething was, potentially, a very sensory experience; an upset, screaming, red-faced, dribbling infant could be a worrying prospect for an adult carer and the opportunity to attempt to resolve such problems no doubt would be pursued. It can also be associated with disrupted infant sleep and other bodily functions which may compound the issues of pain with exhaustion, hunger, and dehydration. Again, being essentialist about humans as a species: Teething is a variable process, some babies are born with their first teeth, otherwise the process may begin at four to twelve-months of age and it may be entirely painless or partly/thoroughly painful (NHS 2022). The early imperial writer Soranus (*Gynecology* 2.49) mentions the occurrence of teething at about the seventh month and suggests that massage of the gums may help, also that the use of a piece of animal fat from which the infant may suck the moisture is a good idea. Teething is and was a process, and the continued eruption of new teeth over a course of months or years means that teething should be conceptualised as intermittent phases of pain. Pain affordances were, thus, not a constant experience but changeable and variable over the unique lived experience of each child.

Teething is closely associated with weaning, though the two processes are not necessarily concurrent. Soranus (*Gyn.* 2.47) suggests that breastfeeding continues, with supplements of solid food, up to the age of 18 to 24-months. He further suggests the use of specialist equipment (*tettina* or ceramic feeding bottles) for this process (Sor. *Gyn.* 2.46); whilst they may not be exclusively associated with infants, the type is associated with them in funerary contexts in Roman Britain at London (Powell et al. 2014: 94) and York (RCHME 1962: 67–110, i), for example.⁴ An isotopic study of infant feeding practices in Roman London supports the idea that breastfeeding occurred at the very early stages in the life of the infants sampled and also that it continued to form part of the diet during a very gradual weaning process lasting, in some cases, up to the age of three years (Powell et al. 2014: 101). Bioarchaeological evidence suggests that the use of cereals as a weaning food, used in the Roman Empire, may itself be associated with negative health effects like anaemia (Redfern and Gowland 2012: 126–127) and thus the type of ailment that may require supernatural or medicinal intervention in the form of an amulet. Problems with malnourishment at the time of weaning may have compounded existing problems if the mother or wet-nurse was herself malnourished, or animal milk had instead been used as a supplement (Redfern and Gowland 2012: 126–127). Powell et al. (2014: 101–102) suggest that breastfeeding mothers may have consumed a specialist diet during this time, also predominantly of cereals. The use

of a smooth porridge-like puree for the purposes of weaning in the Roman period is consistent with modern guidelines for what an infant is physically capable of eating during the ‘transitional feeding stage’ at six to nine-months of age (Arvedson 2006: Table 3); this change in consumption habits may also be linked to physical developments including the infant sitting upright with limited physical support and hand to mouth motor skill development (Arvedson 2006). The dual process of weaning and teething may, in fact, result in pain for both the infant and the mother if she remained breastfeeding during this time.

The existence of pain in infants in the ancient world suffering from teething is, archaeologically, nearly impossible to prove. Recent studies have moved towards highlighting the sensory and emotive experiences of pain and suffering based on bioarchaeological remains (see Kjellström 2010 and Chapman and Gearey 2019 as examples). Of course, skeletal remains of infants can be used to identify which stage of teething they had reached, but this does not equate to an understanding of their pain.

Pierced Teeth Pendants and Protection from Pain

Teething pain is caused by a hard bone pushing through soft tissue and so the function of a bodily-worn tooth may be evidence of the ancient sympathetic magic notion of *similia similibus curantur*—‘like cures like’. The teeth most commonly pierced for suspension were incisors and canines (Parker 2022: 92; **Figure 1**). These are the ‘biting’ teeth of mammals and can be conceptually associated with pain because these teeth can mechanically cause pain to other animals. The pierced tooth was no longer associated with its host’s jaw and the removal of this may have been painful for the animal (unless it was already deceased, in which case the pain may have been peri-mortem). So, a pain-inducing tooth was removed from one animal and pierced to give to a human infant, conceptually binding the two together. This might indicate that the suffering of one was intended to alleviate the suffering of the other.

If we accept outright that pierced teeth pendants were potentially used for the treatment of problems with teething, this can raise a whole series of questions. Were they worn on the body or used elsewhere? Were they used in the weeks or months before teething pain was presumed to begin? From



Figure 1: A Pierced Tooth Pendant from Grave 406, Butt Road Cemetery, Colchester (COLEM: 1986.66.693. Colchester Castle Museum, reproduced with permission).

birth? Only once the teeth start showing? Only once pain began? Was a new tooth required for each new child or could they be recycled? If the latter, might such teeth have been curated and used for multiple children, multiple families, and even multiple generations? Did the family have to acquire the teeth from the animal itself or should we presume a trade in these animal parts? Was there a mundane function as well as, or instead of, a magical one?

The fact that the teething process may be entirely painless (NHS 2022) could establish links between a pendant and its efficacy in stopping pain. It may have been accompanied by other ritual actions—spoken prayers or other material amulets as well as non-magical interventions (like Soranus' (*Gyn.* 2.49) suggestion of using animal fat for chewing). There may be a particular importance to the sensory experience of these ritual actions, especially of smell because of its symbolic link to moments of social transitions (Ager 2022: 22; in this case from a state of pain to a state of reduced pain). Given the intimate yet brief period of use for such an amulet, there may be a likelihood that that they were re-used within a family for multiple children or passed amongst other parents of young infants; the shared memories and shared interpersonal experiences within such an object may also be of relevance to its efficacy (see Graham 2011: 25). In such circumstances, the retention of the tooth pendant may not be surprising.

It is worth speculating that the tooth may, in fact, have been worn by the carer during this period—if on a necklace and worn at the chest it could be encompassed between carer and child during the process of feeding.

A Full (Data)set of Teeth

A dataset of magical objects from Roman Britain (Parker 2022) recorded the occurrence and context of pierced teeth from Roman Britain as potential evidence of this magical practice. This data is presented here as a case study of the incidence of pierced teeth in a Roman province; 86 pierced and/or mounted teeth were recorded (**Table 1**). Canine (dog/wolf) incisors or canines pierced with a circular perforation were the most common pierced tooth in Roman Britain according to Greep (1983: 288, Type D1), but this picture has now changed and pierced pig/boar tusks were the most commonly recorded type (pig/boar, $n = 41$; dog/wolf, $n = 25$).⁵ Greep (1983: 288–290) noted three other types of pierced teeth or tusks from Roman Britain: *bos* (cow) incisors ($n = 7$), bear incisors ($n = 5$), and boar's tusks. To this list, we can now add individual examples of badger, horse, and fox.

| Animal | Total |
|--------------|-----------|
| Pig/boar | 41 |
| Dog/wolf | 25 |
| Cow | 7 |
| Bear | 5 |
| Unknown | 5 |
| Fox | 1 |
| Badger | 1 |
| Horse | 1 |
| Total | 86 |

Table 1: Pierced teeth pendants from Roman Britain organised by animal (after Parker 2022).⁶

Importantly there are five pierced teeth deriving from graves in Roman Britain: two at Lankhills, Hampshire (Crummy 2010: 50), and one each from St Albans, Chichester, and Colchester (Crummy 1983: 1803; 2010: 46–47; Philpott 1991: 134; 162). St Albans was from a cremation and the others were inhumation burials. Dateable skeletal evidence only comes from the Lankhills graves where each was associated with a six to nine-month-old infant buried in a wooden coffin. There is no literary evidence to link the use of pierced tooth pendants to an amuletic function from Roman Britain specifically (and a general paucity of documentary evidence explaining the function of amulets)⁷ leading to a reliance on funerary evidence to link pierced teeth to the protection from teething. The funerary evidence for pierced teeth in Roman Britain is slight and we must look to the wider Empire for corroboration on a link to infants. In this, the evidence is more generous, and particular highlights include a beaver tooth in an infant grave (one to three-year-old) from Gallia Narbonensis (Bel 2012: 202, fig. 13), a bear tooth in a second century AD child's grave at Como (Cattaneo et al. 2015), and pierced teeth in an amulet set associated with infants from the Ponte Galeria in Rome (Cianfriglia and De Cristofaro 2013).

It is unclear whether the pierced teeth from different animal species, if used as amulets, were intended to perform different functions. Pig/boar as animals were not particularly associated with protective or healing practices in the ancient world. The idea of boar hunting as important (and tangentially related to ritual and religion practices) can probably be traced to the Classical notion of the mythical boar hunt (e.g.

Hercules and the Erymanthian Boar; The Hunt for the Calydonian Boar).⁸ Boars were prized hunting trophies and boar imagery was associated with ideas of strength and violence in Roman Britain if the emblem of the 20th Legion (Mattingly 2006: 210) is anything to go by.⁹ Images of boar and bear hunts were used by several Roman Emperors to represent their *virtuus* (Tuck 2005: 237–238) by connecting the Emperor to both a traditional sport as well as important myths. There is thus an association of violence and masculinity to boar hunting. As a counterpoint, the large litter size of pregnant pigs and the visual trope of a single sow feeding multiple piglets at once is a closer link to the idea of infant feeding.¹⁰

The teeth of wolves and dogs were noted by Pliny (*HN* 28.78) as amulets for toothache. Bones found in the excrement of wolves (and thus biologically not wolf but associated with them) also were noted as a cure for toothache and colitis (*Natural History* 28.59). Dogs were particularly associated with Asclepius and considered to be possessed of healing qualities (Jackson 1988: 142). The use of pig/boar teeth for the prevention of teething pain cannot be wholly excluded, but the ancient literary evidence does not point in this direction. In the context of the northern provinces, where this case study is concerned, there is extensive archaeological evidence that links canine skeletal remains to ritual practices in Roman Britain (Fulford 2001; Irvin and Lundock 2020: 190), and so this may reasonably extend to skeletal parts divorced from the original body.

What is not apparent in this list of animal species is whether the two most commonly encountered pierced animal teeth came from domestic pigs and dogs or wild boars and wolves, or combinations thereof. This difference is important; if the products derive from domesticated animals they are, to a point, more readily available to those who wished to use them, whereas the capture and killing of a wild animal was a different thing entirely. The ability of the average inhabitant of Roman Britain to reliably distinguish between genuine dog and wolf teeth once decontextualised from the animal can be questioned. And so, dog teeth might have masqueraded as wolf teeth. We cannot know whether this affected the perceived efficacy of the amulet but it does speak to a tension within the use of magic in the ancient world—that both specific (and often exotic) components were required to correctly perform many rituals, but also that there was space for individual creativity within these same rituals. We can probably assume that the cow and horse teeth derived from domestic livestock and badger and fox from wild animals. Bears were used in Roman entertainments and teeth could thus be acquired from wild animals in the wild or after being caught/bred and transported to an urban setting (though I note that this difference may be immaterial as far as the use of pierced teeth as amulets is concerned).

Elsewhere in the Empire there is evidence for pierced teeth of fox, lion, and beaver. I note that I recorded no examples of pierced human teeth from Roman Britain; it may seem particularly appropriate for the idea of *similia similibus curantur* to explicitly use human teeth but evidently this was not the case. Perhaps this lack of human remains in a potentially magical practice was linked to the ancient disapproval of such practices though there is a small amount of evidence for wearing human teeth in the ancient world. Aelius Promotus recommended that women in labour wore a tooth of a first-born child to accelerate the process (quoted in Faraone 2018: 65) and a single tooth was found encased in a copper alloy *bullā* from Hierapolis (Phrygia) (Dasen 2015: 195). Both may thus be linked to the supernatural protection of infants.

Whether a non-human animal was living or dead when a tooth was removed is an important distinction. All animals could lose teeth, particularly as a result of violence. Direct extraction might be difficult if the animal was unrestrained, but the complexities of acquiring a tooth in such a violent and visceral manner might, theoretically, increase the magical potency of the object. As well as directly linking it to a real, living creature (a channel for the human pain to travel towards?) it also alludes to what Malinowski (1948) described as the ‘co-efficient of weirdness’—put simply, that exotic, unusual, arcane things may be regarded as being more magical. As well as the violent extraction as a sympathetic link, we should also consider the sorts of animal teeth naturally lost during its life course—dogs and horses, for example, shed teeth over a lifetime and so may be conceptually linked to the idea of tooth-loss in humans.

Different animal teeth could be linked to real creatures in the natural world. They may have been animals that were familiar, that were pets, the source of family income, something on the dinner table, something seen but never touched, something seen in other places or only at certain times of the year, something heard of but never seen in the real world, an animal linked to a cult or a temple, or a family member, or friend, or employer. Individual experiences must have influenced understandings of these animals and so it is unavoidable that they were not heavily imbued with symbolic links in one form or another. Teeth naturally have bilateral symmetry in mammalian jaws and yet there is no clear evidence of both teeth of a pair (or all teeth of a certain kind from a single animal) used together as an amulet. Individual specimens survive in the archaeological record. There is a strong link between *dextra* (right) being auspicious and *sinister* (left) being inauspicious or unlucky in the Roman world and this choice could be meaningful given the options of using either tooth as an amulet.

Wearing an Amulet

Embodiment refers to the ‘body as a vehicle of social agency. It encompassed all those actions performed by the body, on the body and through the body’ (Gilleard and Higgs 2013: ix) or, more succinctly as Smith (2017: 1) defined it: ‘Embodiment—having, being in, or being associated with a body—is a feature of the existence of many entities’. From these approaches, I argue that ‘embodied space’ in the ancient world was the immediate physical locale of a human body, how it moved, the things it touched, and the things it was able to sense. So worn clothing was part of embodied space, as was jewellery, and so too was a cup being drunk from, a seat which was sat upon, hearing the sound produced by a bell, the smell of plants, and so on. So too, the sensation of pain and its affordances was an embodied experience.

The strong connection between the teeth of carnivores and otherwise large or strong domestic and wild animals is perhaps evidence of the sympathetic ritual elements of Roman magic, with the collection of naturally occurring, biological elements creating a link between the ritual practitioner and the original animal (Wilburn 2012: 26; 84f). In this sense, teeth were relatively passive as magical ingredients—they did not have to be ingested, extensively worked, burnt, boiled, or otherwise manipulated to function. Their innate qualities could be transferred to their user simply by wearing them and becoming embodied again. Their incorporation into a necklace or some other method of attachment hints that the innate efficacy of such pendants was dependent upon close proximity to the human body (Dasen 2015).

The ancient names of amulets (*periamma/periapton* and *ligaturae*) refer to the act of tying them onto things—created and tied by human hands onto inanimate objects or living bodies. Wearing an amulet on a body was a conscious act that linked the *materia magica* of the amulet directly to the target of its effect and this is present in the dataset from Roman Britain (see Parker 2022): amulet cases held hidden texts or substances close to the chest; *bullae* could contain hidden objects; some magical gemstones had hidden texts on their undersides, pressed against the finger that wore them; snake bracelets encircled wrists. In the same way that a phallic carving built into a wall was designed to protect the wall (its foundations, bricks, mortar, and those who used it), many amulets worn on bodies were designed to protect those bodies, as physical spaces, from supernatural harm. Bodies were thus a space where magic happened—they both crafted and used its material components, though we may draw a distinction between adults undertaking ritual acts and infants being more or less passive participants in them. The process of wearing an amulet could have been accompanied by other adult gestural or speech acts such as spoken prayers or a ritualised ‘putting-on’ of the amulet, and so too other ritualised sensory acts such as the burning of incense to produce a

magical scent. Wearing a pierced tooth amulet was likely to have intersected with the wearing of other amulets at certain times.

Most of the teeth were pierced (un-pierced teeth were not recorded as part of my data gathering process). The canines and incisors were mostly pierced through the enamel, sometimes through the root. Pig teeth were always pierced through the widest end. It would be quite easy to do this with a metal tipped tool, an awl or something similar, and a little patience. It could be done by hand, indeed in the hand. Acts of tying and mounting of teeth, as well as the piercing itself, was a process, and it could have been a mundane or ritualised experience. In either case, the creation of a pierced tooth could have produced some different sensory affordances to wearing one, such as: the presence of soft tissues and fluids (blood and saliva)¹¹ on a violently extracted tooth, holding a tooth in one hand whilst piercing it with a tool in the other, the rotating piercing motion creating friction and a burning smell, and sensations associated with binding and cutting leather, twine, or metal wire to suspend it.

Occasionally, non-pierced teeth were mounted for suspension: many pig tusks are suspended in copper alloy frames (Parker 2022: 97), a bear tooth from Augusta Raurica (Augst, Switzerland) was wrapped in gold leaf around the root of the tooth and a small, gold suspension ring was threaded through piercing (Riha 1990: 74, no.702, Taf.30), and the single badger tooth from Roman Britain was set in a silver mount with a suspension loop. I presume that a mounted tooth may also have functioned in an analogous way to a pierced tooth amulet; the materiality of the mounting materials could have added amuletic efficacy to the objects. The metals, or other mounting materials, added additional sensory components to the pierced tooth, mixing materials, colours, and textures. A statement by Pliny the Elder (*HN* 33.25) hints at a Roman understanding that gold had more value than its mundane, economic one: 'gold is efficacious as a remedy in many ways, being applied to wounded persons and to infants, to render any malpractices of sorcery comparatively innocuous that may be directed against them'. The colour of gold was also linked to solar deities in the ancient world because of its allusion to the colour of the sun, and so too silver to the moon through its visual and mythological connections (Faraone 2018: 80). Solar and lunar allusions link the mounting materials to seasonality, and thus the life course.

What this summary highlights, is that the sensory affordances of pierced teeth were variable across the corpus, though there are commonalities. For example, all teeth are white/yellow/brown in colour, though this might change across what animal tooth is present and the age of the animal it came from. Teeth are, uniformly, hard objects, although the density can be variable (dense at the tip and across the enamel, and eventually hollow at the end of the root). Tooth enamel is often smooth and shiny.

When worn on a human body, presumably as a pendant (Greep 1983: 238), a suspended tooth was a lightweight adornment. It could hang on the neck or chest, warming to the heat of the body, and could have easily been hidden beneath clothing if this was desirable. A tooth pendant could be held in the hand, in the palm or between fingers and engaged with mechanically. The position of such a pendant was variable on where it was pierced—a piercing through the root would allow the enamel and biting part of the tooth to point downwards¹² and the same is true of a mounted tooth with a suspension loop, but not necessarily of one pierced through the enamel (in which case it points upwards). A pierced rather than mounted tooth may rotate on its suspension medium, giving tactile feedback to the hand rotating it. The location of the piercing and the subsequent method of attachment to a human body undoubtedly altered the sensory experience of a tooth pendant. In all cases suggested here, a suspended tooth was not directly in contact with the site of pain—the jaw—and was some distance from it. The presence of an amulet designed to heal a specific body part being worn in a different place on the body was not unusual as many magical gemstones intended to heal conditions including stomach aches, cramping, nausea, colic, and sciatica and were worn on finger rings away from the affected body parts. The importance was placed on its physical connection to the body in need of help.

Whether an infant would ever wear a pendant necklace is open for discussion. Infants begin to place their hands and nearby objects into their mouths during this ‘transitional feeding stage’ (Arvedson 2006) so a small tooth nearby could present a choking hazard. Conversely, it could also present something for them to chew on and may have functioned as a teething tool, linking a soothing and beneficial sensory experience to the negative pain affordances of teething. Newborns may have been swaddled (preventing hand-to-mouth motions); there is both literary and visual evidence to suggest this may have occurred for about the first 40–60 days (Sor. Gyn. 2.14; Croom 2000: 117–118), but this is most likely to have occurred before the child had teeth. A swaddled infant was less likely to manipulate a pierced tooth and engage with it in a tactile way, though this does not mean that the amulet was not still embodied. Amulet chains were moulded in ceramic on the exterior of ceramic votives from Paestum in the final three centuries BC (Ammerman 2007: 142f, figs. 7.12–14, 7.16–17) in which the infants were shown to be swaddled beneath the amulets. So, a swaddled infant may still have worn amulet(s) and experienced some of their sensory properties but have been otherwise unable to engage with them. Unswaddled, we thus might consider alternative methods of suspension than the necklace: tied onto an arm or leg, onto a crib, or even sewn onto clothing. After all, an otherwise unworked tooth with a single lateral perforation could be suspended on a body in many different ways. It is worth

highlighting that teething is a prolonged process and this amulet could, therefore, be appropriate for a six-month-old with basic grasping functions as well as a 18-month-old capable of moving and interacting with a pierced tooth in many different ways.

The wearing of the tooth as a suspended pendant was, perhaps, more likely to have been done by adults; in which case, the sensory experience of it for the infant and adult was affected. The necessity of bodily contact in the efficacy of such objects (e.g. Dasen 2015) may be particularly relevant to the physical contact between carer and child during feeding at a difficult time for the child. Indeed, if a wet nurse was being employed the experience may be quite different in terms of bond development and the upbringing of the child, though if the wet nurses' services are being sought because of the death of a mother during childbirth, her illness, weakness or lactation problems (Sparreboom 2014: 146), her role was very important for the early months of that child's life. Wet nurses may continue to look after a child after it has been weaned and frequently became respected members of a household (Allason-Jones 2005: 28). In this hypothetical situation, the pierced tooth did not need to be worn by the child or a parent, but another member of a household.

It doesn't even have to be anything to do with feeding—bodily contact could simply be a soothing device. In both cases, if the child is wearing a pierced tooth amulet somewhere about their body, its efficacy could be enhanced or activated by bodily contact. If, rather, the thing was designed to be chewed on, then its use in the mouth by the infant was clearly very important and this opens a whole different set of sensory affordances between pierced teeth and their feel in the mouth. This situation is likely to represent the clearest opportunity for analgesia from nociceptive tissue pain in teething. Conceptually, teeth were made to be inside a mouth and so it may follow that the amuletic function of a pierced tooth was activated by it being put into one. The materiality of the amulet was important if it was designed to be chewed. At its most basic, it needed to be a material suitable for the task and the smooth, hard texture of enamel may have been suitable for this. Some teeth had a metal mount or suspension loop and the metallic elements could have produced different taste or texture sensations, probably in juxtaposition to the tooth. The experience of how the amulet felt in the mouth was likely to change depending on how many teeth the infant had cut already; new sharp incisors in use whilst the nearby teeth were cutting might be able to bite into, mark, and eventually break a pierced tooth. A pendant worn by an adult may be physically accessible by an infant for this purpose, given close proximity, or even embraced between them. It is worth highlighting that it is not just the child who may be distressed by teething pains because the same is true of their adult carers. A carer who continued to breastfeed may have suffered from additional bites from new infant teeth.

One further possibility exists: that pierced teeth were appropriate amulets to be worn by adults with no connections to infants. Toothache and problematic teeth were undoubtedly an issue in the ancient world and magical means could have aimed to resolve this health problem as well as the more direct means of extraction (Becker 2014).

Regardless of who wore the amulet, the temporal and changeable nature of teething pains suggest that the relationship between pierced teeth and specific pain affordances was fluid. The intensity of the pain experienced, and the affordances of that experience (aching, stabbing, piercing etc.) was not a constant thing during a defined period of teething (perhaps because the tissue damage had stopped, the pain responses had changed, or the pain was not attended to and so not immediately discomforting). The eruption of different types of teeth through the gums could also have different pain affordances and so created a variable sensory experience.

There are few clear examples of where pierced teeth were used alongside other amulets, but I must draw attention to the *crepundia* assemblage in the Colchester Butt Road grave 278. *Crepundia* were amulet-chains, particularly associated with the graves of infants and children. Martin-Kilcher (2000: 64) associated them with prematurely deceased unmarried individuals, especially girls, and defined the five main groups of objects within the sets: noise-producing objects, meaningful shapes, those with 'exterior qualities', remarkable objects and curiosities, and materials valued for their special purposes. The other objects in this grave were a copper alloy phallus, an amber pendant, a Hadrianic coin (an *as*) in a silver frame, a copper alloy bell, and two pierced coins (Crummy 1983: 50–51; Parker 2022: 210). It was found in an iron pan with a mass of copper alloy chain links (probably from their suspension together). The objects in this amulet set could be argued, individually, to have been used to protect the physical well-being of the child who wore them from both health concerns and supernatural dangers. The presence of a pierced tooth in this set was thus meaningful and links the power of the object to its temporal importance in the life course protection of a child. *Crepundia* are intensely sensory objects—colourful, with intriguing shapes which are moveable and noisy. Perhaps this assembly of meaningful shapes was also intended to entertain and so distract a distressed infant from their pain?

Conclusions

What all these raised questions are intended to do here is to try and better understand a practice that may be, at its very core, designed to reduce or prevent one of the most fundamental human experiences—pain. It is an experience that we all share now, as they did in ancient societies. We can all understand the concept of pain, and all take a

great deal of time trying to reduce it or avoid it through learned behaviours or medicinal applications. I have introduced the type of animal used for Roman tooth pendants, how they may be worn, who could be wearing them, in what situations it was appropriate to do so, and their links to life course development, all of which I see as important factors in trying to understand how these small, simple things could improve the psychological, emotional, or physical well-being of an adult or child nearly 2,000 years ago.

Notes

- ¹ Faraone (2018: 5) defined as amulet as: 'Any object—plant, animal, or mineral; natural or humanmade, image or text—that the Greeks placed on their bodies, domestic animals, homes, ships, vineyards, or cities in the hope of protecting themselves, of curing some illness, or of gaining some benefit'.
- ² In Ager's (2022: 4) words: 'The flexible connections between odours and the supernatural suggest that the familiar phenomenon of scent [is] a model through which people could imagine the more mysterious idea of magic'.
- ³ For example, of the kind which Chapman and Gearey (2019) discussed in their approach to 'archaeologies of pain'.
- ⁴ An ongoing research project led by Kayt Hawkins (UCL) is undertaking residue analyses of this vessel type in the UK, though at the time of writing, the project has not yet reported back results for public dissemination. Probably the most famous Romano-British context for one of these objects is in the Colchester 'Child's Grave': a mid to late first-century AD funerary assemblage containing a series of pipe-clay figurines, ceramics, glass vessels, an iron and bone funerary couch, and coins (see Eckardt 1999).
- ⁵ Note that this list only accounts for pierced pig/boar teeth from Roman sites in Britain. Wholly unstratified examples, even those optimistically recorded as Roman in date (e.g. PAS: YORYM-357456), were not included in this dataset because of their potential association with later periods of use.
- ⁶ The contextual data associated with pierced teeth pendants is less clear than it could have been for Roman Britain, owing to many examples poorly recorded from antiquarian and mid-twentieth century excavations. As a class of objects, they are clearly understudied, which may contribute to the poor contextual data presented here.
- ⁷ Though, notably, the inscribed gold or lead sheets known as *lamellae* do provide this sort of evidence (Parker 2022).
- ⁸ See Leeming 2005, entries: 'Erymanthian boar' and 'Meleager'.
- ⁹ As an example, an Antefix stamped LEGXX depicting a boar and a *vexillum* bearing a *phalera* from Holt, Wrexham is in the collection of the National Museum of Wales (NMW: 25.1/133).
- ¹⁰ Varro (*De Re Rustica* 2.4.14) also notes the suggestion that sows could have two litters a year, spending four months pregnant and two months suckling piglets. He was talking about ancient breeds of pig and there were two dominant breeds of pig in Roman Italy, a smaller breed suitable for forest habitats, and most frequently used for pork, and a larger breed suited for sties (MacKinnon 2001).
- ¹¹ On bodily fluids in antiquity see Bradley et al. 2021.
- ¹² I noticed this on the display of two Roman pierced tooth pendants, strung with modern strings, in the Verulamium Museum in April 2018. An incisor and a canine both hung in this way.

Acknowledgements

I wish to thank Tom Derrick and Giacomo Savani for inviting me to contribute to this special issue of *TRAJ*, for commenting and improving on earlier drafts, and for organising the *Experiencing Britannia* conference panel at the Classical Association Conference in 2017 (at which I presented on a different topic) and the *Sensory Experience* workshop in 2018 (which I attended). This paper was seeded in a much earlier version, given at the MagiCog conference on Cognitive Approaches to Ancient Magic, held at the Institute of Classical Studies in 2019 and I extend my thanks to the organisers of that conference: Esther Eidinow, Irene Salvo, and Tanja Scheer. Thanks to Glynn Davis and Colchester Museums Trust for permissions to reproduce Figure 1. This paper draws on some of the research from my recent PhD studies with the Open University and I am grateful to the OU for supporting my research with a fees and maintenance award; I am sincerely thankful for my excellent triumvirate of supervisors Helen King, Emma-Jayne Graham, and Ursula Rothe for their support. Final grateful thanks to the reviewers for their comments and improvements. I also acknowledge the phenomenological experiences of teething offered to me in great detail by the excellent Orla Parker (currently aged 15 months).

Competing Interests

The author has no competing interests to declare.

References

Ancient Sources

Pliny the Elder (Translated by J. Bostock 1855). *Natural History*. London: Taylor and Francis.

Serenus Sammonicus (Translated by R. Pépin 1950). *Liber Medicinalis*. Paris: Presses Universitaires de France.

Soranus (Translated by Owsei Temkin 1991). *Gynecology*. Baltimore, MD: Johns Hopkins University Press.

Varro (Translated by W.D. Hooper and H.B. Ash 1934). *De Re Rustica* (Loeb Classical Library 283). London: Heinemann.

Modern Sources

Ager, Britta. 2022. *The Scent of Ancient Magic*. Ann Arbor: University of Michigan Press. DOI: <https://doi.org/10.3998/mpub.10082698>

Allason-Jones, Lindsay. 2005. *Women in Roman Britain* (2nd Edition). York: Council for British Archaeology.

Ammerman, Rebecca Miller. 2007. Children at risk: votive terracottas and the welfare of infants at Paestum. *Hesperia Supplements 41 (Constructions of Childhood in Ancient Greece and Italy)*. Athens: The American School of Classical Studies at Athens: 131–151.

Arvedson, Joan C. 2006. Swallowing and feeding in infants and young children. *GI Motility Online*: 2006.

Becker, Marshall Joseph. 2014. Dentistry in Ancient Rome: direct evidence for extractions based on the teeth from excavations at the Temple of Castor and Pollux in the Roman Forum. *International Journal of Anthropology* 29(4): 209–226. DOI: http://digitalcommons.wcupa.edu/anthrosoc_facpub/29

Bel, Valérie. 2012. Les Dépôts de Mobilier dans les Tombes d'Enfants et d'Adolescents en Gaule Narbonnaise au Haut-Empire. In: Antoine Hermany and Céline Dubois (eds). *L'Enfant et la Mort dans l'Antiquité iii. Le Matériel Associé aux Tombes d'Enfants (Actes de la Table Ronde Internationale Organisée à la Maison Méditerranéenne des Sciences de l'Homme (MMSH) d'Aix-en-Provence, 20–22 Janvier 2011)*. Aix-en-Provence: Centre Camille Jullian: 193–216. DOI: <https://doi.org/10.4000/books.pccj.1370>

Betts, Eleanor (ed.). 2017. *Senses of the Empire: Multisensory Approaches to Roman Culture*. London: Routledge. DOI: <https://doi.org/10.4324/9781315608358>

Bradley, Mark, Victoria Leonard, and Laurence Totelin (eds). 2021. *Bodily Fluids in Antiquity*. London: Routledge. DOI: <https://doi.org/10.4324/9780429438974>

Cattaneo, Cristina, Davide Porta, Davide Steffenini, Alberto Brandone, Laura Giordani, and Cristina Ravedoni. 2005. Analisi Antropologiche e Patologiche dei Resti Scheletrici. *Rivista Archeologica dell'Antica Provincia e Diocesi di Como* 187: 351–370.

Chapman, Henry P. and Benjamin R. Gearey. 2019. Towards an archaeology of pain? Assessing the evidence from later Prehistoric Bog Bodies. *Oxford Journal of Archaeology* 38(2): 214–227. DOI: <https://doi.org/10.1111/ojoa.12165>

- Cianfriglia, Laura and Alessio De Cristofaro. 2013. I Crepundia dalla Tomba 37 della Necropolis de Castle Malnome: Usi Funerary e Rituali Magici. In: Francisco Marco Simón and Marina Piramonte (eds). *Contesti Magici, Contextos Magicos (Atti del Convegno Internazionale)*. Rome: De Luca: 233–245.
- Croom, Alexandra T. 2000. *Roman Clothing and Fashion*. Stroud: Tempus.
- Crummy, Nina. 1983. *The Roman Small Finds from Excavations at Colchester 1971–9* (Colchester Archaeology Report 2). Colchester: Colchester Archaeology Trust.
- Crummy, Nina. 2010. Bears and coins: the iconography of protection in Late Roman infant burials. *Britannia* 41: 37–93. DOI: <https://doi.org/10.1017/S0068113X1000005X>
- Dasen, Veronique. 2015. Probaskania: amulets and magic in antiquity. In: Dietrich Boschung and Jan N. Bremmer (eds). *The Materiality of Magic (Morphomata 20)*. Paderborn: Wilhelm Fink: 177–204. DOI: https://doi.org/10.30965/9783846757253_010
- Dasen, Veronique. 2021. Omphale and Heracles: a knotted life. *Gemmae* 3: 61–82. DOI: <https://doi.org/10.19272/202114201003>
- Eckardt, Hella. 1999. The Colchester 'Child's Grave'. *Britannia* 30: 57–90. DOI: <https://doi.org/10.2307/526673>
- Faraone, Christopher A. 2011. Text, image and medium: the evolution of Graeco-Roman magical gemstones. In: Chris Entwistle and Noel Adams (eds). *Gems of Heaven: Recent Research on Engraved Gemstones in Late Antiquity, c. AD 200–600*. (British Museum Research Publications 177). London: British Museum: 50–61.
- Faraone, Christopher A. 2018. *The Transformation of Greek Amulets in Roman Imperial Times*. Philadelphia: University of Pennsylvania Press.
- Fulford, Michael. 2001. Links with the past: pervasive 'ritual' behaviour in Roman Britain. *Britannia* 32: 199–218. DOI: <https://doi.org/10.2307/526956>
- Gilleard, Chris and Paul Higgs. 2013. *Ageing, Corporeality and Embodiment*. London: Anthem Press.
- Goberman-Hill, Rachael. 2015. Ethnographies of pain: culture, context, and complexity. *British Journal of Pain* 9(1): 32–35. DOI: <https://doi.org/10.1177/2049463714555439>
- Gorczyca, Rafał, Rafał Filip, and Ewa Walczak. 2013. Psychological aspects of pain. *Annals of Agricultural and Environmental Medicine*. Special Issue 1: 23–27. DOI: <http://www.aaem.pl/Psychological-Aspects-of-Pain,72041,0,2.html>
- Graham, Emma-Jayne. 2011. Memory and materiality: re-embodying the Roman funeral. In: Valerie M. Hope and Janet Huskinson (eds). *Memory and Mourning: Studies on Roman Death*. Oxford: Oxbow: 23–39.
- Greep, Stephen J. 1983. *Objects of Animal Bones, Antler, Ivory and Teeth from Roman Britain* (Vol I). Unpublished thesis (PhD), University College Cardiff.
- International Association for the Study of Pain (IASP). Pain. Available at <https://www.iasp-pain.org/resources/terminology/#pain>. [Last accessed 03 December 2023].
- Irvin, Aaron W. and Jason Lundock. 2020. Purification through puppies: dog symbolism and sacrifice in the Mediterranean world. In: Aaron W. Irvin (ed.). *Community and Identity at the Edges of the Classical World*. Hoboken, NJ: Wiley: 173–208. DOI: <https://doi.org/10.1002/9781119630746.ch11>

- Jackson, Ralph. 1988. *Doctors and Diseases in the Roman Empire*. London: British Museum.
- Kjellström, Anna. 2010. Tracing pain: identifying suffering in skeletal remains. In: Fredrik Fahlander and Anna Kjellström (eds). *Making Sense of Things: Archaeology of Sensory Perception* (Stockholm Studies in Archaeology 53). Stockholm: University of Stockholm: 51–68.
- Leeming, David. 2005. *Oxford Companion to World Mythology*. Oxford: Oxford University Press. DOI: <https://doi.org/10.1093/acref/9780195156690.001.0001>
- MacKinnon, Michael. 2001. High on the hog: linking zooarchaeological, literary, and artistic data for pig breeds in Roman Italy. *American Journal of Archaeology* 105: 649–673. DOI: <https://doi.org/10.2307/507411>
- Malinowski, Bronisław. 1948. *Magic, Science and Religion, and Other Essays*. New York: Anchor Books.
- Martin-Kilcher, Stefanie. 2000. *Mors Immatura* in the Roman world – a mirror of society and tradition. In: John Pearce, Martin Millet, and Manuela Struck (eds). *Burials, Society and Context in the Roman World*. Oxford: Oxbow: 63–77.
- Mattingly, David. 2006. *An Imperial Possession: Britain in the Roman Empire 54 BC – AD 409*. London: Penguin.
- Melzack, Ronald. 1975. The McGill pain questionnaire: major properties and scoring methods. *Pain* 1: 277–299. DOI: [https://doi.org/10.1016/0304-3959\(75\)90044-5](https://doi.org/10.1016/0304-3959(75)90044-5)
- Melzack, Ronald and Patrick D. Wall. 1988. *The Challenge of Pain*. London: Penguin Books.
- Morris, David B. 1991. *The Culture of Pain*. Berkeley, CA: University of California Press.
- Nader, Nader, Haleh Farzin, and Hanieh Sakha. 2020. A brief review on the relationship between pain and sociology. *Anesthesiology and Pain Medicine* 10(2). DOI: <https://doi.org/10.5812/aapm.99229>
- National Health Service (NHS). 2022. Baby teething symptoms, 09 August 2022. Available at <http://www.nhs.uk/conditions/pregnancy-and-baby/pages/teething-and-tooth-care.aspx#> [Last accessed 03 December 2023]
- Newstead, Sarah and Tânia Manuel Casimiro. 2020. What's that smell? New directions for materials studies. *Antiquity* 84 (337): 1314–1324. DOI: <https://doi.org/10.15184/aqy.2020.156>
- Parker, Adam. 2020. His and hers: magic, materiality and sexual imagery. In: Tatiana Ivleva and Rob Collins (eds). *Un-Roman Sex: Gender, Sexuality, and Lovemaking in the Roman Provinces and Frontiers* (Routledge Monographs in Classical Studies). London: Routledge: 90–113. DOI: <https://doi.org/10.4324/9781315269894-4>
- Parker, Adam. 2022. *The Materiality of Magic in Roman Britain*. Unpublished thesis (PhD), Open University.
- Powell, Lindsay, Rebecca Redfern, Andrew R. Millard, and Darren R. Gröcke. 2014. Infant feeding practices in Roman London: evidence from isotopic analyses. In: Maureen Carroll and Emma-Jayne Graham (eds). *Infant Health and Death in Roman Italy and Beyond* (JRA Supplementary Series 96). Portsmouth, RI: Journal of Roman Archaeology: 89–110.
- Puttock, Sonia. 2002. *Ritual Significance of Personal Adornment in Roman Britain*. BAR British Series 327. Oxford: BAR. DOI: <https://doi.org/10.30861/9781841712901>

- Redfern, Rebecca and Rebecca Gowland. 2012. A bioarchaeological perspective on the pre-adult stages of the life course: implications for the care and health of children in the Roman Empire. In: Mary Harlow and Lena Larsson Lovén (eds). *Families in the Roman and Late Antique World*. London: Continuum: 111–140.
- Riha, Emilie. 1990. *Der römische Schmuck aus Augst und Kaiseraugst* (Forschungen in Augst 10). Augst: Römermuseum.
- Scarry, Elaine. 1985. *The Body in Pain: The Making and Unmaking of the World*. Oxford: Oxford University Press.
- Smith, Justin E.H. 2017. Introduction. In: Justin E.H. Smith (ed.). *Embodiment: A History*. Oxford: Oxford University Press. DOI: <https://doi.org/10.1093/acprof:oso/9780190490447.003.0001>
- Tarlow, Sarah. 2012. The archaeology of emotion and affect. *Annual Review of Anthropology* 41: 169–185. DOI: <https://doi.org/10.1146/annurev-anthro-092611-145944>
- Toates, Frederick (ed.). 2007. *Pain* (Introducing Health Science). Oxford: Oxford University Press/Open University.
- Tomlin, Roger S.O. 2008. Special delivery: a Graeco-Roman gold amulet for healthy childbirth. *Zeitschrift für Papyrologie und Epigraphik* 167: 219–224.
- Tuck, Steven L. 2005. The origins of Roman imperial hunting imagery: Domitian and the redefinition of virtus under the principate. *Greece & Rome* 52(2): 221–245. DOI: <https://doi.org/10.1093/gromej/cxi024>
- Vadivelu Nalini, Alice M. Kai, Gopal Kodumudi, Karine Babayan, Manuel Fontes, and Matthew M. Burg. 2017. Pain and psychology – a reciprocal relationship. *Ochsner Journal* 17(2): 173–180. DOI: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5472077/>
- Yébenes, Sabino Perea. 2010. Magic at sea: amulets for navigation. In: Francisco Marco Simón and Richard L. Gordon (eds). *Magical Practice in the Latin West: Papers from the International Conference Held at the University of Zaragoza 30th Sept.-1 Oct 2005* (Religions in the Graeco-Roman World Series no. 168). Leiden and Boston: Brill: 457–486. DOI: <https://doi.org/10.1163/ej.9789004179042.i-676.90>

