

## Dějiny věd a techniky History of Sciences and Technology

All must  
be made with  
the galvanometer!

9. February 1922 afternoon:  
 $T = 22.5^{\circ}\text{C}$

mm 0.300	3.06605	102.4
0.300	3.06605	102.7

0.400	3.07150	104.5
0.400	3.07150	105.1

0.500	3.07525	106.6
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0.550	3.0814 (!?)	108.0
0.550	3.0794 (!)	107.8
0.530	3.0798 !	108.2

at the maximum is something  
happening, but no time to look  
for this now!

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### COVER

100 years since the first publication of Jaroslav Heyrovsky's discovery of polarography



## Editorial

Dear readers,

It is my honour to present to you an issue of the Journal for the History of Sciences and Technology (DVT) focused on the archaeology of medicine. The idea of preparing such a thematic journal issue or a composite book came to my mind during the European Association of Archaeologists Annual Meeting in Bern in September 2019, where I co-organized, together with Dr. Christina Aamodt, a session entitled “Archaeology of Medicine and Healing in Prehistoric and Protohistoric Europe.” Still, during the concluding discussion of this session, the preparation of several collective volumes, reflecting this fascinating but relatively neglected discipline in various chronological eras and geographical units, was agreed on with the session participants.

Contrary to the discussed session, papers in this issue are not restricted chronologically or regionally. The chronological span of the discussed paper topics is almost four millennia. The chronologically oldest paper deals with the Bronze Age (3<sup>rd</sup>–2<sup>nd</sup> mill. BC); the youngest topic is based in the High Middle Ages (12th–13th century AD).

These papers also reflect and are based on various methodological perspectives and approaches. The first paper focuses on examining the state of health and sickness rates of particular prehistoric populations in the territory of modern-day Greece. It thus uses bioarchaeological or, instead, palaeopathological methods. The second paper tries to resolve the issues related to the figure of Hygieia (ὕγεια) in the ancient world. It investigates if she should be viewed as a full goddess of health or only as a personification of this vital quality and her place within the Greek religion and cult. This topic is naturally based on Classical studies but uses perspectives of ritual studies. Also, the third paper is somewhat theoretical, employs philosophic-linguistic approaches, and deals with the basic definitions of the terms “physician” and “medical” in the context of protohistoric Central Europe. The fourth paper primarily uses literary sources to discern precise details about diet, especially in the Roman world, but partially relates to the archaeobotany and archaeology of food. Finally, the last paper endeavours to undertake an archaeobotanical evaluation of herbal remedies in the work of one medieval Arabian author. All these papers and their mentioned methodological approaches and specializations clearly show that the archaeology of medicine is an interdisciplinary science, staying on the borders of archaeology, Classical studies, medical and natural sciences.

Four papers in this issue are written by young scholars (mostly doctoral candidates), and two authors have already obtained their doctoral degrees. In any case, all authors are connected or occasionally collaborate with the university institute of the guest editor (see below). This Institute is the only department in the Czech Republic performing research on the history and archaeology of medicine and

belongs among the oldest such institutions in Europe. Let me take the opportunity to introduce all authors in short here.

Mark Beumer obtained his Master's degree in Ancient History at the Radboud University Nijmegen. He graduated with a master's thesis on the identity of Hygieia as a goddess or personification. He is now working on a dissertation at Charles University, First Faculty of Medicine, on the ritual dynamics of temple sleep in Late Antiquity, examining the Christian transformation of this ritual through the lens of ritual studies.

Lucie Burešová earned her Master's degree in Nursing (Intensive Care) at the First Faculty of Medicine, Charles University, and a Master's degree in Systematic Integration of Processes in Health Service at the Faculty of Biomedical Engineering, Czech Technical University in Prague. She then received a Bachelor's degree in Archaeology at the Faculty of Arts, Charles University. She is currently pursuing a doctorate specializing in the archaeology of medicine, alongside working at the National Technical Museum in Prague as a Curator of Medical technology collection.

Martin Zázik obtained his Bachelor's degree in Classical archaeology at Trnava University. He graduated with a bachelor's thesis on Mushrooms and their use in ancient Rome. Nowadays, he is working on a Master's thesis at Trnava University on the Roman Gems from Slovakia.

Miroslava Daňová obtained her Ph.D. degree in Classical archaeology at Trnava University. She was recently promoted to Associate Professor. She currently lectures at the Department of Classical Archaeology of the same university on the history of the Roman Empire, Roman architecture, and ancient jewellery. She also deals with underwater archaeology and is a member of interdisciplinary research teams.

Mandy Bertram got her BA degree in archaeology at Freie Universität in Berlin. She is currently studying for her MSc in archaeobotany at Eberhard Karls Universität Tübingen. Since the last year, she has been participating in the excavations of Brillenhöhle in Blaibergen (Baden-Württemberg).

Finally, the guest editor of this issue and author of the first paper, I got my Master's and Ph.D. degrees in Classical Archaeology at Charles University (Faculty of Arts). However, I have been specializing in the archaeology of medicine and palaeopathology in recent years. In 2019 I was promoted to an Associate Professor of the History of Medicine at Charles University (my Associate Professorship thesis focused on health and medicine in prehistoric and Archaic Greece).

Finally, I would also like to thank the Journal Editorial Board for the opportunity to be a guest editor of this particular issue. I believe you will appreciate the authors' expertise and the Mediterranean taste of the issue.

Tomáš Alušík, Guest Editor  
Institute for History of Medicine and Foreign Languages  
First Faculty of Medicine, Charles University, Prague

# State of health, medicine and diet on the opposite sides of the Gulf of Corinth (Greece) in the Bronze Age

Tomáš Alušík

This paper presents an overview and the subsequent comparison of population health status, medicine (and medical knowledge) and diet in the Bronze Age in the regions to the north and south of the Gulf of Corinth, Greece. The main sources for this study are the published reports on the preserved human skeletal remains, which can tell us a lot about the actual individuals and their life histories. Unfortunately, from the regions to the north of the Gulf of Corinth, only 3 human skeletal assemblages were processed anthropologically and published. These include 59 individuals from 3 sites in total – 20 subadults and 32 adults (7 males and 9 females). From the southern – Peloponnesian – side of the Gulf of Corinth, the preserved human skeletal material has been processed and published from 9 sites altogether. The stable isotopic analyses of nitrate and carbon for the discerning of the prevailing diet of the population were performed for 6 sites. The skeletal assemblage from these southern regions includes in total 1246 individuals (94 subadults and 629 adults (of which there are 307 males and 203 females)). Of special importance is the existence of 4 cases of trepanations – in Agia Triada, Achaia Klauus, Kirrha and Laganidia Kallithea – on both sides of the Gulf. All were successful, with clear signs of healing along the edge of the trepanation opening. The occurrence of this complicated and sophisticated surgical intervention gives evidence of the presence or availability of a sufficiently skilled physician and of personnel willing to look after the patient.

**Keywords:** human skeletal remains; palaeopathology; state of health; diet; Bronze Age; Greece; Gulf of Corinth

## I. Introduction

This paper, which is based on the conference poster,<sup>1</sup> presents an overview of population health status, medicine and diet in the Bronze Age<sup>2</sup> in the regions to

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<sup>1</sup> A poster on a similar topic was presented at the international conference “Archaeology of the Ionian Sea: Landscapes, seascapes and the circulation of people, goods and ideas (Palaeolithic – Bronze Age)”, 10<sup>th</sup>–11<sup>th</sup> January 2020 in Athens.

<sup>2</sup> Bronze Age culture in mainland Greece, c. 3000–1100/1050 BC, is labelled “Helladic” and divided into three main period: Early Helladic (EH), Middle Helladic (MH) and Late Helladic (LH; also known as “Mycenaean”).

the north and south of the Gulf of Corinth. The main sources for this study are the published reports on the preserved human skeletal remains, which can tell us a lot about the actual individuals and their life histories.<sup>3</sup> The amount of data, which can be read from them, (i.e. the physical-anthropological, palaeodemographic and palaeopathological characteristics of the population), depend, however, on the state of preservation of the skeletal remains, reflecting a wide range of different factors (in particular the kind and details of a funeral rite and a type of grave, soil acidity and natural taphonomic processes).

This paper aims to present a regional synthesis summarizing the health and dietary characteristics of the Bronze Age populations buried in several necropoleis and the subsequent comparison of the state of health in those two main selected regions, with some reflections regarding the medical knowledge. First, the overview of the state of health and basic demographic indicators in both regions in question is presented (including a survey of prevailing diet, if applicable). Then an interregional comparison and analyses are performed and conclusions formulated.

## II. Regions to the north of the Gulf of Corinth (Phocis and Thesprotia)

Unfortunately, from the regions to the north of the Gulf of Corinth, only 3 skeletal assemblages were processed anthropologically (at least in the preliminary way) and published – Goutsoura in Thesprotia and Kirrha and Kastrouli-Desfina in Phocis. No human skeletal assemblage has been published yet of other regions to the north of the Corinthian Gulf and in the Ionian Archipelago area (e.g., in Aetolo-Akarnania,

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<sup>3</sup> See e.g., Parker Pearson 1999; Bahn (ed.) 2002; Waldron 2008; Mays 2010; Roberts – Manchester 2010; Aufderheide – Rodríguez-Martín 2011. It is possible to find out a wide range of pathologies from human remains with the use of palaeopathological methods, but only those, which leave traces on bones, or on teeth respectively. Unfortunately, in the preserved skeletal remains it is neither possible to find out, for example, some serious illnesses of the circulatory system, nor injuries of soft tissues. Generally, it is possible to observe on bones, for example, congenital disorders, traumas, infectious diseases, tumours, metabolic, endocrine and other osteopathies, musculoskeletal markers of physical load, signs of degenerative disorders (above all arthrotic changes) and signs of physiological stress, reflecting anaemia and various episodes of malnutrition etc. Concerning dental pathologies, dental carries and calculus are the most frequent, dental enamel hypoplasia, periapical abscesses, and periodontitis (or paradontosis) are usually less common.

Preveza or the western coast of Boeotia). This state clearly reflects the state of osteoarchaeological research in this part of Greece.

Kirrho was an important coastal settlement and is mostly known as the port of the famous panhellenic sanctuary of Apollo at Delphi in the historic (Archaic to Roman) periods. The prehistoric remains of a settlement and cemetery were found in the centre of the modern town (formerly known as Xeropigado).<sup>4</sup> The site of Goutsoura is situated on the Liminari Hill near Sevasto and was found by The Thesprotia Expedition, under the auspices of the Finnish Institute at Athens. It is an Early to Late Bronze age settlement with cemetery.<sup>5</sup> Only a preliminary study of the excavated skeletal remains was performed.<sup>6</sup> Kastrouli-Desfina is a large Mycenaean (LH IIIA2–IIIC early) fortified citadel.<sup>7</sup> During the recent research, a few chamber tombs with preserved skeletal remains were also excavated.<sup>8</sup>

The earliest skeletal assemblage, which dates to MH II–III (to LH) periods, comes from **Kirrho** in Phocis.<sup>9</sup> Only the human remains from 5 tombs (MNI=14)<sup>10</sup> have been published so far – 6 subadults and 2 adults. The skull of 1 subadult individual (4–5 years) bears traces of cribra orbitalia and his long bones show sc. Harris lines (both are a mark of physiological stress). One adult individual (35–45 years) shows degenerative changes on his spine and two dental pathologies – carious lesions on several teeth, some of his teeth were also lost ante mortem. In the skull – on the right parietal bone – of a 30–35-year-old male (from MH period) a small ellipsoid trepanation opening (8 x 7.5 mm) is visible, made by the scraping technique, presumably using a metal instrument. The edges of the trepanation show clear signs of a complete healing.

**Goutsoura** in Thesprotia is the northernmost site of these three. This anthropological set dates to the (Middle to) Late Bronze Age and contains the skeletal remains of at least 12 subadults and 15 adults (5 males and 8 females; MNI=28).<sup>11</sup> It was only preliminarily published, and no skeletal pathologies were mentioned. Regarding dental pathologies, only caries and (mostly strong) dental

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<sup>4</sup> See e.g., Dor et al. 1960.

<sup>5</sup> Forsén et al. (eds.) 2016, 121–44, 157–244.

<sup>6</sup> Niskanen 2016.

<sup>7</sup> See e.g., Sideris et al. 2017; Southern Phokis Regional Project Web: <https://kastrouli.wordpress.com/>

<sup>8</sup> Chovalopoulou et al. 2017.

<sup>9</sup> Manolis et al. 1994; Zurbach et al. 2012–13; Papagrigorakis et al. 2014; Lagia et al. 2016.

<sup>10</sup> MNI = minimum number of individuals.

<sup>11</sup> Niskanen 2016.



wear were recorded in the remains of a few individuals. The height of several males was calculated as 158.2 to 163.6 cm and of females as 143 to 158.06 cm.

The anthropological set from **Kastrouli-Desfina** (in Phocis) is, unfortunately, very fragmentary.<sup>12</sup> It dates from LH IIIA2–IIIC Early/Advanced and consists of the remains of 2 subadults (1 child younger than 11 years and a 1 foetus) and 15 adults (2 males and 1 female; MNI=17). Only Schmorl nodes were noticed from the skeletal pathologies on several vertebrae (mainly on thoracic ones), which is a degenerative condition of the spine. Regarding the dental pathologies, caries, periodontitis, and dental wear were documented.

### III. Regions to the south of the Gulf of Corinth

From the southern – Peloponnesian – side of the Gulf of Corinth (the regions of Corinthia, Achaea and Ilia), the preserved human skeletal material has been processed and published from 9 sites in total. Stable isotopic analyses of nitrate (<sup>14</sup>N and <sup>15</sup>N) and carbon (<sup>12</sup>C and <sup>13</sup>C) for the discerning of the prevailing diet of the population were performed for 6 sites.<sup>13</sup>

These 12 sites (as stable isotopic analyses were performed in three sites together with the basic anthropological analyses) are of different kind. There are several large cemeteries (of chamber tombs) with a minimum number of individuals being at least 100 – Agia Triada,<sup>14</sup> Voudeni,<sup>15</sup> Achaea Klaus<sup>16</sup> and Laganidia Kallithea<sup>17</sup> – and small cemeteries as well (Agios Vasileios Chalandritsa,<sup>18</sup> Spaliareika

<sup>12</sup> Chovalopoulou et al. 2017.

<sup>13</sup> In 4 of them (Almyri, Kalamaki, Perachora and Voudeni), the skeletal assemblage was not studied and published with a primary focus on the population state of health, but only the mentioned isotopic analyses were done.

<sup>14</sup> LH III cemetery (consisting of ca. 50 chamber tombs) is located on the summit of the mountain in north-east Ilia, above Peinios River.

<sup>15</sup> Voudeni is located in western Achaea, a few kilometres from Patras, and consists of the LH IIB–IIIA cemetery of 55 tholos tombs and a few pit graves and an associated settlement. See e.g. Moutafi 2015, 12–26.

<sup>16</sup> LH IIIA1–IIIC cemetery, consisting of 28 chamber tombs, is situated at the foot of the Koukouras hill, to the south and not far from Patras. See e.g. Paschalidis 2018.

<sup>17</sup> LH III cemetery of Laganidia Kallithea consists of 23 chamber tombs and 1 tholos tomb and is located to the south of Patras. See e.g. Graff 2011, 23–28.

<sup>18</sup> The site consists of 29 chamber tombs, with the main burial horizons of LH IIIA1–IIIC date and a limited reuse at the beginning of the 1st mill. BC (Late Protogeometric to

(Lousikon),<sup>19</sup> Kalamaki,<sup>20</sup> Almyri,<sup>21</sup> Agia Sotira<sup>22</sup> and a single tholos tomb at Barnavos<sup>23</sup>). Specific burial contexts include the Cheliotomylos well at Corinth,<sup>24</sup> where the human skeletal remains were found in various depths, and a burial cave at Perachora.<sup>25</sup> These two last mentioned skeletal sets (and a few individuals from Kalamaki) are chronologically the oldest, dating back to the EH period. Other skeletal sets come only from the LH period.<sup>26</sup> Unfortunately, the anthropological assemblages from Agia Triada, Laganidia Kallithea and Achaea Klauss have not been studied and published as a whole yet and the assemblages from Perachora, Almyri and Kalamaki have not been studied and published at all. In the last 3 mentioned sites only stable isotopic analyses were performed.

### *III.1 Pathologies and basic demographic indicators*

The oldest skeletal assemblage from the southern side of the Corinthian Gulf comes from **Corinth** (the area of Cheliotomylos; Corinthia) and is dated to EH III. Unfortunately, it has been published only as a preliminary report.<sup>27</sup> In total, the skeletal remains of 30 individuals were found in a former, 17.35 m deep well, in several layers of depth ranging from 2–10.75 m. Of the deceased, 9 were subadults

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Early Geometric phases). It is located in central Achaea (Kalavryta region), on the southwestern foot of Mt. Panachaikon. See e.g. Aktypi 2017, 1–17.

- <sup>19</sup> LH III cemetery of Spaliareika Lousikon is situated in western Achaea, on the slopes of a low hill to the southeast of Rachi, and comprised of 9 chamber tombs. See e.g. Petropoulos 2000.
- <sup>20</sup> This site is located ca. 30 km southwest of Patras in Achaea, at the foot of Movri Mountain. The cemetery was first constructed and used in EH period. Later in LH III, new chamber tombs were built over the earlier ones, partly disturbing them. See e.g. Vassilogamvrou 2008.
- <sup>21</sup> The author was unable to find any information regarding the exact location (within Corinthia) of this small LH cemetery, comprising a few chamber and tholos tombs.
- <sup>22</sup> A small LH IIIA1–B2 cemetery comprising of 4 chamber tombs is located outside of Koutsomodi, near Ancient Nemea archaeological site. See e.g. Smith et al. 2006–07.
- <sup>23</sup> This looted LH IIIA2 chamber tomb is located west of the Ancient Nemea village. See e.g. Wright et al. 2008.
- <sup>24</sup> This well is situated less than 2 km north of the centre of ancient Corinth.
- <sup>25</sup> The burial cave is situated in the slope above Lake Vouliagmeni and not far from the famous ancient sanctuary of Hera.
- <sup>26</sup> Including the most of individuals from Kalamaki.
- <sup>27</sup> Waage 1949.

and at least 16 individuals were adults (9 females and at least 5 males).<sup>28</sup> The cause of death of these individuals has not been proved with certainty, as no pathologies were recorded (or at least described), but they could have been (among others) victims of epidemics.

The skeletal material from **Voudeni** (in Achaea), which dates to LH IIB–IIIA, has not been published in detail yet. It contains the remains of a minimum of 383 individuals (33 subadults and 255 adults – 175 males and 80 females), of which, however, only 206 were studied (31 subadults and 175 adults, of which 73 males and 69 females can be sexed) from a social bioarchaeology viewpoint.<sup>29</sup> As the main research focus was not related to the state of health, only a few cases of pathologies were noted. Several individuals show only minimal evidence for degenerative joint disease. Regarding dental pathologies, some individuals show enamel attrition. The most interesting case is, however, an individual T5/ $\Delta$  (old adult male, c. 164 cm tall), who completely lost his dentition ante mortem. This is the only prehistoric example so far of an individual in Greece who was completely edentulous at the time of his death. The average age at death for both sexes was high for the Bronze Age Greece – 41.2 years for males and 35.7 years for females.

The other skeletal assemblages that were studied and published come only from the LH III period. A fragmentary set from **Agia Sotira** (in Corinthia) from LH IIIA1–B2 includes the remains of 34 individuals – 8 subadults and 26 adults (13 males and 5 females).<sup>30</sup> Musculoskeletal markers of physical exertion are the most numerous kinds of the skeletal pathologies, as they were documented in 7 individuals, mostly on the lower limbs. Individual 6.8 (young adult female, c. 17–25 years old) suffered from a spiral fracture of the distal third of her left tibia. It was healed, but the bone fragments were misaligned. Marks of posttraumatic osteomyelitis with a periosteal new bone formation is well visible on the afflicted bone surface. Two more cases of nonspecific infection are to be seen on the temporal bone of two adult male individuals (4.1 – 24–30 years old and 4.5 – c. 40 years old). Regarding dental pathologies, caries (9.91% frequency) is more prevalent in males. Ante-mortem tooth loss is less frequent (7.29%) and a dental wear and enamel hypoplasia (4 teeth; 1.16% frequency) are very rare.

<sup>28</sup> These numbers are copied from the original publication (Waage 1949). The new information table in the Prehistoric room of the Ancient Corinth Museum states a slightly different demographic profile: 9 subadults and 21 adult individuals, of these 12 males and 9 females.

<sup>29</sup> Moutafi 2015 and 2021.

<sup>30</sup> Smith et al. 2006–07, 2013 and 2017.

A small and fragmentary skeletal assemblage from another site in Corinthia – **Barnavos** – dates to LH IIIA2–B1. It contains the remains of only 4 individuals (1 subadult and 3 adults). Due to the very bad state of preservation, only the dental pathologies can be identified. The subadult individual (9–10-year-old child) suffered from 2 carious teeth and dental enamel hypoplasia.

Less than a half (39) of the preserved individuals' skeletal remains (MNI=100) from **Laganidia Kallithea** in Achaia were examined and published.<sup>31</sup> These are 5 subadults and 33 adults (10 males and 17 females), dated to LH IIIA–C. Among the most frequent pathologies belong physiological stress (15 cases in 12 individuals; both in the form of the porotic hyperostosis and cribra orbitalia), infections and trauma (5 individuals, including 3 cases of healed cranial depressed fractures). 14 individuals suffered from bacterial infections – there were 10 cases of otitis media, 5 cases of sinus infections and 3 cases of meningitis recorded in this skeletal assemblage. Specific endocranial lesions in the skeletal remains of 9 individuals were also interpreted as the results of infections.<sup>32</sup> The endocranial surface of several bone fragments is very smooth and has a resurfaced ivory appearance. As Graff states, brucellosis could be the cause of this lesions, but the most typical symptom of this disease – the specific lesions of the vertebrae, often in combination with a vertebral fusion – is missing (also due to the very few surviving vertebral bodies).<sup>33</sup> So, these individuals cannot be regarded as suffering from brucellosis. As Graff pointed out, 7 of these 9 individuals with endocranial lesions show signs of otitis media and this correlation must be taken into account during the establishing of the differential diagnosis and cause of these lesions.<sup>34</sup> On the contrary, only 1 case of periosteal infection (non-specific inflammation) was noticed, as well as 1 case of the musculoskeletal markers of physical load (in the form of the bilateral femoral enthesopathies). 2 individuals suffered from hyperostosis frontalis interna and 1 individual from a congenital disorder – a mild case of bilateral mandibular hypoplasia. Neoplastic activity is represented by 1 case of benign osteoma on the frontal bone (in 1 older male). Surprisingly, no case of degenerative arthrosis (or other rheumatic diseases) was mentioned. On the left parietal bone of 1 individual (older female), a probable case of trepanation was described. The trepanation opening, located c. 6.5 cm from the coronal suture and c. 4.8 cm from the sagittal suture, was made by the scraping technique and is, unfortunately, not completely preserved. Its diameter was slightly more than 1 cm and there are clear signs of

<sup>31</sup> Graff 2011; Liston et al. 2016.

<sup>32</sup> Graff 2011, 44–45, 93–95, fig. 5.1–5.3.

<sup>33</sup> Graff 2011, 94.

<sup>34</sup> Graff 2011, 95–96.

healing along its edges, indicating that the intervention was successful. Dental pathologies include caries (high occurrence), ante-mortem tooth loss (10 individuals), periapical abscesses, periodontitis, and enamel attrition (both mild and severe form). Dental enamel hypoplasia is very rare.

The preserved skeletal remains from the LH III site of **Agia Triada** (in Ilia) unfortunately have not been described and published as a whole. Of the minimum number of 350 individuals there are at least 9 subadults and 163 adults (of which 50 males and 48 females could be sexed). Probably the most noticeable skeletal remains are those of an adult male from tomb no. 2, whose skull preserves a trepanation opening (32.53 x 25.37 mm) on his right parietal bone at coronal suture (sutura coronalis).<sup>35</sup> The trepanation was made by the scraping technique and its edges show (along the full length) clear signs of healing. Worth noting is also the results of a study on the state of dentition of 172 individuals.<sup>36</sup> Of these 172 individuals, periodontitis was found in 37 individuals (of 107 with sufficiently preserved jaws; 34.58% frequency) – 39% females and 32% males. The incidence of this disease increases with age, so the most cases were documented in the group of 36 years of age and above. Although the occurrence is high, most of the afflicted individuals suffered only from a mild form of this disease and only 10% from a serious form (i.e., generalized destructive periodontitis). The frequency of the ante-mortem tooth loss is also very high – 53% of individuals lost at least 1 tooth, 24% lost 3 and more teeth, which makes 300 lost teeth of 1737 preserved alveoli and the mean tooth loss 11 teeth per 1 complete dentition. It is not sufficiently clear what the main cause of such a high ante-mortem tooth loss was. The caries was less frequent, and it was documented in 65 cases (7.68%). The enamel of a lot of teeth was also quite worn. In general, the local population shows one of the worst states of dentition within prehistoric Greece. A surprising fact is a relatively high (for the period) average age of the population – 38 years – despite such a very bad state of dentition.

Unfortunately, a fragmentary LH IIIA1–IIIC late<sup>37</sup> skeletal assemblage (MNI=57) from **Agios Vasileios-Chalandritsa** (in Achaia) has been only preliminarily published.<sup>38</sup> It contains the remains of at least 5 subadults and 52 adults (11 males and 10 females). Most subadults died between the 5<sup>th</sup> and 12<sup>th</sup> year of age, the adults between 24<sup>th</sup> and 35<sup>th</sup> year of age. From the pathologies, only the dental ones were

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<sup>35</sup> Mountrakis et al. 2011.

<sup>36</sup> Petroutsa et al. 2002; Tsilivakos et al. 2002.

<sup>37</sup> There is also a limited Late Protogeometric to Early Geometric (beginning of 1<sup>st</sup> mill. BC) activity in some tombs.

<sup>38</sup> Jones 2014 and 2017.

mentioned in the skeletal remains of 1 individual (from LH period) – he lost several teeth ante mortem.

Unfortunately, the skeletal remains from **Achaia Klauss** (in Achaea), dating to LH IIIA1 to LH IIIC final, haven't been published as a whole.<sup>39</sup> Of the minimum number of 129 individuals (including 1, who was cremated) there are 20 subadults (1 newborn, 1 child c. 18 months old and 18 children 3+ years) and 55 adults (of which 29 males and 26 females can be sexed). The most interesting case of pathologies was recorded in the remains of individual Γ (from Tomb E; female 17–23 years old; LH IIIC middle). In her sacral bone a spina bifida occulta<sup>40</sup> of the sacral vertebrae – which is a congenital disorder, a malformation of the spine – is well visible (Fig. 1). This woman also suffered from a bacterial infection – TBC or brucellosis – of the 12<sup>th</sup> thoracic and of the lumbar vertebrae. Individual Z (adult male from Tomb ΣΤ; LH IIIC late) underwent a complicated surgical intervention – a trepanation. Unfortunately, only a segment of his calva is preserved, with a part of the trepanation opening (Fig. 2). It was made by the scraping technique and the signs of healing are clearly noticeable. In the remains of a few other individuals, degenerative arthrotic changes (degenerative joint disease on humerus – Individual 1, Burial A (adult female, 25–30 years) of Tomb N; osteophytes on several vertebrae – Individual 1, Burial I (older adult male(?), 40+ years) of Tomb N), trauma (fracture of metacarpal – Individual 1, Burial A (adult female, 25–30 years) of Tomb N) and possibly periostitis (Individual 2, Burial A of Tomb Ma) were described, too. Dental pathologies include caries, periapical abscess, ante-mortem tooth loss and enamel attrition. The average age of males was 33.25 years and 25.26 years in females. The average stature of males reached 168.32 cm and 156.07 cm in females.

Finally, a small LH IIIA–C skeletal assemblage (MNI=25) from **Spaliareika** (in Achaea) contains remains of 4 subadults and 21 adults (7 males and 8 females).<sup>41</sup> The most frequent skeletal pathologies were manifestations of physiological stress (porotic hyperostosis and cribra orbitalia; 26.8%), non-specific infections (periostitis; 24%) and osteoarthritis. Also 1 case of healed cranial trauma was recorded. Dental pathologies include a high occurrence of ante-mortem tooth loss (26.1%; 24 afflicted teeth of 92 preserved teeth/alveoli) and of the dental enamel hypoplasia (10.8%; 10 afflicted teeth of 92). On the contrary, the frequency of caries is low (3.3%; 3 afflicted teeth of 92). The average age of this population was 35.7 years; the average stature of males was 167 cm and of females 157 cm.

<sup>39</sup> Paschalidis – McGeorge 2009, 101ff; McGeorge 2018; Wieckowski 2018.

<sup>40</sup> It is a vertebral cleft, where the vertebral (neural) arch is not closed. Usually, this condition does not cause any disabilities.

<sup>41</sup> Papathanasiou 2002–2005.

### III.2 Diet

As bone collagen reflects the isotopic composition of an individual's dietary protein intake over a long period, it is possible to perform stable isotopic analyses of nitrate and carbon for the discerning of his/her prevailing diet.<sup>42</sup> Carbon stable isotope analysis (<sup>12</sup>C and <sup>13</sup>C) can differentiate between marine versus terrestrial ecosystems, or C<sub>3</sub> (mostly plants adapted to tempered environments) versus C<sub>4</sub> plants (plants adapted to arid, hot environments). Nitrogen isotope ratio (<sup>14</sup>N and <sup>15</sup>N) can help to define the consumption of aquatic (marine and freshwater) food. Analyses of the bone tissue samples were performed for the following six sites.

The EH skeletal assemblage from the burial cave at **Perachora** (in Corinthia) has not been studied and published yet.<sup>43</sup> Only samples were taken for stable isotopic analyses discerning the prevailing diet. The results showed that most of individuals consumed C<sub>3</sub> terrestrial plant-based diet with certain amount of animal protein. A few individuals, however, consumed C<sub>4</sub> plant-based food as well, or possibly marine protein.<sup>44</sup>

The LH fragmentary skeletal assemblage (MNI=23) from **Almyri** (in Corinthia) hasn't been studied and published yet. Only stable isotopic analyses were performed to discern the prevailing diet. These proved C<sub>3</sub> terrestrial plant-based diet as the basic nourishment, but with a substantial intake of animal protein (meat or dairy products) and a low percentage of C<sub>4</sub> terrestrial plant-based food (e.g., millet).<sup>45</sup>

In **Voudeni**, the results of 36 samples proved that the local population in LH IIB–IIIA consumed a mainly C<sub>3</sub> terrestrial plant-based diet (e.g. wheat), but with a substantial amount of animal protein (in the form of meat from goats, sheep or cattle or dairy products).<sup>46</sup> The values differ in some individuals, which means that certain individuals consumed a more plant-based diet and others more animal products. There are no relevant differences in the diet among males and females.<sup>47</sup>

Analyses of stable isotopes of nitrogen and carbon levels in the bone tissue of some individuals from LH III **Agia Triada** proved that these individuals mostly consumed a C<sub>3</sub> terrestrial plant-based diet (e.g. wheat) with a certain amount of

<sup>42</sup> See e.g., Mays 2010, 265–289; Papathanasiou et al. 2013; Voutsaki – Valamoti (eds.) 2013; Richards 2015.

<sup>43</sup> Unfortunately, the minimum number of individuals of this skeletal set is not stated anywhere. The only published information is that samples of bone tissue from 34 individuals were taken; however, the total MNI can be up to several times higher.

<sup>44</sup> Petroutsas et al. 2007.

<sup>45</sup> Petroutsas – Manolis 2010.

<sup>46</sup> The skeletal remains are described above in III.1.

<sup>47</sup> Petroutsas et al. 2009.

animal protein (in a form of meat from goats, sheeps or cattle or dairy products).<sup>48</sup> Some individuals also consumed a C<sub>4</sub> plant-based diet (e.g. millet). It is certain that the diet of this population was rich in carbons, which contributed to the bad state of dentition.<sup>49</sup>

The local population of **Spaliareika** consumed in LH IIIA–C almost exclusively C<sub>3</sub> terrestrial plant-based diet (e.g. wheat), with only a limited amount of animal protein.<sup>50</sup>

The human skeletal remains (MNI=77) from **Kalamaki** (in Achaea), which are dated to EH and LH III, have not been published yet. Only the analyses of stable isotopes of nitrogen and carbon levels in the bone tissue of some individuals were conducted in order to reconstruct the prevailing diet. The results of 32 samples proved that the local population consumed almost exclusively a C<sub>3</sub> terrestrial plant-based diet (e.g. wheat), with only a limited amount of animal protein (in a form of meat from goats, sheeps or cattle or dairy products).<sup>51</sup> Only 1 adult individual (whose dating was not stated) also consumed a significant amount of C<sub>4</sub> plant-based diet (most probably millet).

## IV. Analyses and discussion

### *IV.1 Regions to the north of the Gulf of Corinth (see Graph 1)*

The published skeletal material from the regions to the north of the Corinthian Gulf is, unfortunately, rather limited and includes 59 individuals from 3 sites in total – 20 subadults and 32 adults (7 males and 9 females). It dates to MH and LH periods. From the skeletal pathologies only vertebral arthrosis (in 2 sites) and manifestations of physiological stress (in 1 site; in the form of cribra orbitalia and “Harris lines”) were described. Dental pathologies were more often. Caries was recorded in all 3 sites, dental wear in 2 sites and periodontitis and ante-mortem tooth loss were noted in 1 site. Unfortunately, the frequency rates of all kinds of pathologies were not stated. The arithmetic means of the stature range in Goutsoura are 160.9 cm for males and 150.53 cm for females. These values cannot be taken as definitive, but they show that Goutsoura population was generally considerably shorter than other Greek populations of Middle to Late Bronze Ages (for example,

<sup>48</sup> The overview of the state of health of this population is stated above in III.1.

<sup>49</sup> Petroutsa – Manolis 2010.

<sup>50</sup> Richards – Vika 2008. The overview of the state of health of this population is stated above in III.1.

<sup>51</sup> Richards – Vika 2008.



the mean male stature is c. 7–8 cm shorter and the mean female stature c. 6–7 cm shorter than in Ilia and Achaia).

From the viewpoint of the health status of the population to the north of the Gulf of Corinth in the Bronze Age, it is necessary to mention the existence of healed trepanation in MH Kirrha. The occurrence of this complicated and sophisticated surgical intervention, often carried out as a result of the treatment of cranial trauma, gives evidence of the presence or availability of a sufficiently skilled physician. For the successful performance of it and the successful healing of the cranium it is necessary to have both the medical and caring knowledge and abilities.

#### *IV.2 Regions on the southern side of the Gulf of Corinth (see Graph 1)*

The published skeletal material from the regions on the southern – Peloponnesian – side of the Corinthian Gulf (Ilia, Achaia and Corinthia) is ca. 20 times more numerous than in the opposite side of the Gulf and includes in total 1246 individuals from 12 sites. It is dated mostly to LH III period, with some individuals of EH and LH II date. Of these 1246 individuals, there are 94 subadults and 629 adults (307 males and 203 females). The variability of skeletal and dental pathologies is bigger.

The most numerous kinds of skeletal pathologies are traumatic injuries and non-specific inflammations, which were proved in 4 sites each (although the case of periostitis in Achaia Klauss is not entirely clear). The degenerative arthrotic changes were proved in 3 sites (although rather in a low rate) and the manifestations of the physiological stress (in the form of the porotic hyperostosis and cribra orbitalia) in 2 sites (notable is the high occurrence in Spaliareika – 26.8%). The musculoskeletal markers of physical load were also described in 2 sites. However, the most interesting category includes the generally less common skeletal pathologies, such as congenital disorders (1 site; vertebral cleft), bacterial infections (altogether 15 afflicted individuals from 2 sites, who suffered from otitis media, sinusitis, meningitis and TBC or brucellosis), internal diseases (2 cases of hyperostosis frontalis interna in 1 site) and a (benign) neoplastic activity (1 case in 1 site).

The most numerous kind of dental pathology was ante-mortem tooth loss, documented in 7 sites. Its occurrence was mostly high, especially in Agia Triada (53% of individuals and 11 lost teeth per 1 dentition) and Spaliareika (26.8%). In Voudeni, individual T5/Δ was completely edentulous at the time of his death – the only such case in prehistoric Greece. Caries was noted in 6 sites, with a different frequency rate (both low and high). Dental wear and dental enamel hypoplasia occurred in 4 sites, periodontitis, and periapical abscesses in 2 sites each.

The average age of the population in Ilia and Achaia was 35.37 years (based on the populations from Agia Triada, Achaia Klauss, Spaliareika and Voudeni). The

average male stature was 167.66 cm and average female stature 156.535 cm (both based on the populations in Achaia Klauss and Spaliareika).

The populations of the southern side of the Gulf of Corinth consumed mainly a C<sub>3</sub> terrestrial plant-based diet (e.g. wheat), with low to substantial amounts of animal protein (local differences among the individual sites). In Agia Triada, Almyri, Kalamaki and Perachora several individuals consumed also a significant amount of C<sub>4</sub> plant-based diet (e.g. millet).

In the regions on the southern side of the Corinthian Gulf 3 cases of trepanations were recorded – and all were successful (the patients survived). This is an important fact documenting the high level of medical practice (availability of a skilled physician and subsequent care) on the Peloponnese in the LH III period.

## V. Conclusions

From the occurrence of the main types of skeletal and dental pathologies it might seem that the populations to the north of the Gulf of Corinth were healthier than those on its southern side (e.g. there are no cases of bacterial infections or congenital disorders to the north of the Gulf). But this impression is caused by the uneven state of research and publication. It is certain that after the studies of the, as yet unpublished, human skeletal assemblages from the regions to the north of the Gulf new cases of pathologies will be discovered and described. New stable isotopic analyses for discerning the prevailing diet of the populations should be also performed.

Of special importance is the existence of 3 cases of trepanations – in Agia Triada, Achaia Klauss and Laganidia Kallithea – in the regions on the south side of the Gulf. All were successful, with clear signs of healing along the edge of the trepanation opening. The occurrence of this complicated and sophisticated surgical intervention gives evidence for the presence or availability of a sufficiently skilled physician and also of personnel willing to look after the patient. In total, there are 6 fully proven Bronze Age trepanations known from the Peloponnese (of 9 prehistoric Greek trepanations). In contrast, only 1 case of Bronze Age trepanation comes from the northern regions of the Greek mainland – to the north of the Gulf of Corinth and Attica – it is the already mentioned trepanation from Kirrha. Even though there are less published Bronze Age human skeletal assemblages from the north of Greece than from its southern regions, such a high difference in the known number of complex surgical interventions is striking. A possible explanation of this fact could be a transfer of medical knowledge regarding complex surgical interventions and subsequent (postoperative) care from the “core areas” of the Mycenaean civilization

(Peloponnese – Attica – Boeotia) to the peripheral regions on the northern side/ to the north of the Gulf of Corinth.<sup>52</sup>

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<sup>52</sup> The oldest certain case of trepanation from the Greek mainland comes from Asine in the Argolid (Peloponnese) and dates back to the MH period (male individual 107 As, c. 30–40 years old; Angel 1982, 109, fig. 1, 14). It is thus more or less contemporary with the Kirra trepanation (or at least both cases come from the same general (MH) period).

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*Correspondence*

*Prof. Assoc. Tomáš Alušík, Ph.D.*

*Institute for History of Medicine and Foreign Languages*

*First Faculty of Medicine, Charles University*

*U Nemocnice 4*

*CZ-12108, Prague 2*

*Czech Republic*

*alusikt@gmail.com*

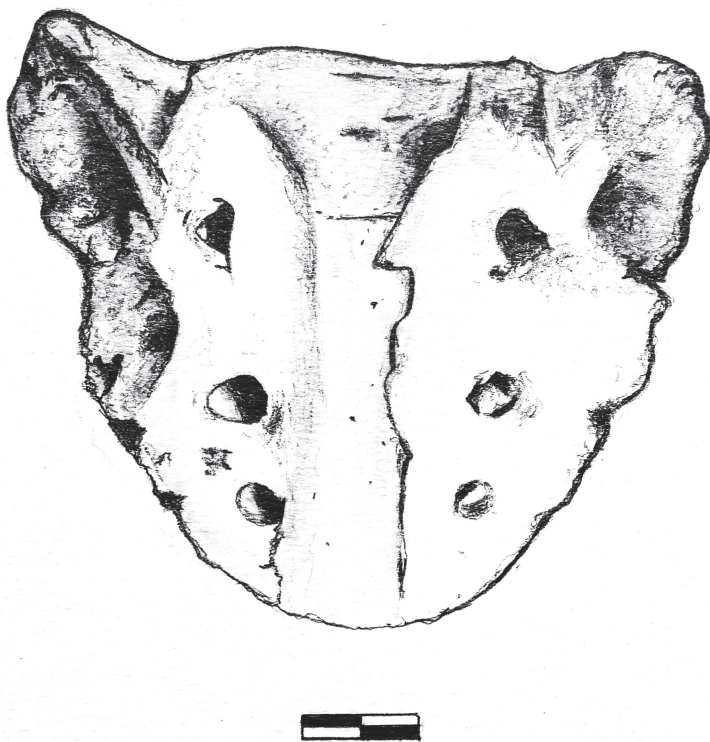
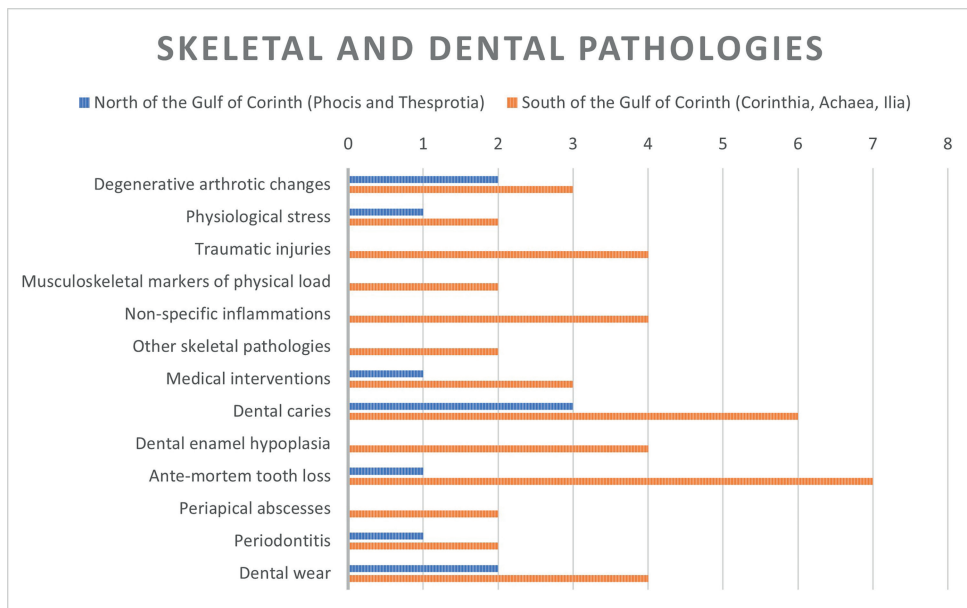


Fig. 1: Sacral bone showing congenital spina bifida occulta (a vertebral cleft, where the vertebral arch is not closed). Achaia Klauss, Tomb E, Individual Γ (female, 17-23 years), LH III C middle. Drawing by Pavla Alušíková Dostalíková.



Fig. 2: Segment of calva with a part of the trepanation opening with evidence of healing. Achaia Klauas, Tomb ΣΤ, Individual Z (adult male), LH IIIC late. Drawing by Pavla Alušíková Dostalíková.





Graph 1: Numbers of sites with cases of skeletal and dental pathologies in both main studied regions. Created by the author.

# A Woman's Touch Hygieia, Health and Incubation<sup>1</sup>

Mark Beumer

In this paper, I argue that Hygieia has to be viewed as a full goddess in Greek religion and medicine, with a special focus on her position within the Asklepios cult. I will examine her identity, to which scholars attribute several labels like goddess, abstraction and personification. I further argue that Hygieia's role in performing incubation rituals gradually became as important as that of her mythological father Asklepios, by examining her representation and the meaning of the ancient concept of health (ὑγίεια).

**Keywords:** Hygieia; goddess; personification; ancient medicine; incubation ritual

## Introduction

Modern medicine has its origin in the ancient world.<sup>2</sup> The oldest civilizations used magic and herbs to cure diseases, but they also used religion and rituals to free them from harm and to protect their health. The medical care of today has its roots in ancient Greece.<sup>3</sup> With the introduction of Asklepios and Hygieia into Athens, there sprouted a very important healing cult, that existed from about 500 BC until 500 AD. Incubation or temple sleep formed the core of the Asklepios cult, in which patients would visit an Asklepieion to be cured from their diseases. After performing several preparatory rites, such as offering, fasting, praying and purification, patients would be guided at nightfall to the temple, where they had to sleep on a bed (*klinē*) or on animal skins. During sleep, a god or hero would appear in their dreams and

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<sup>1</sup> I would like to thank Prof. Assoc. Tomáš Alušík Phd. for the opportunity to revise my paper on Hygieia I presented at the Historicization Congress in 2011 (University of Bergen, Norway). Second, I would like to thank prof. dr. Emma Stafford (University of Leeds) for her valuable comments on my article. In closing, I would like to thank the anonymous reviewers for their constructive comments.

<sup>2</sup> Martyn Evans, Pekka Louhiala and Raimo Puustinen, *Philosophy for Medicine: Applications in a Clinical Context* (Oxford/San Francisco: Radcliffe Medical Press, 2003), 114–115. Mesopotamia and Egypt influenced Greece, so medicine did not develop in a vacuum.

<sup>3</sup> Andrew D. Gregory, "Magic, Curses, and Healing," in Georgia L. Irby, ed., *A Companion to Science, Technology, and Medicine in Ancient Greece and Rome* (Oxford: Wiley Blackwell, 2016), 418–433, there 418–425.

cure them instantly by operation, touch, or given a receipt. After awakening, the patient was cured and healthy again and offered a votive to thank the god or hero.<sup>4</sup> Although Asklepios is the protagonist of this cult, Hygieia is also dominant, but plays a very unusual role in Greek religion, because of her unclear identity. She was mythologically connected to Asklepios in the fifth century BC as either his wife, sister or as one of his daughters. Mainly, as father and daughter, they became the most famous healing couple within the Graeco-Roman world.<sup>5</sup> Still, one of the main problems is her identity. She has been given several names within modern literature since the late nineteenth century. Terms like goddess, personification, abstraction, and extension of Asklepios are just a few of the labels given to her. It is an interesting question why modern scholars use different names for Hygieia, when ancient sources literally state that she is a goddess. To determine her identity correctly, we must examine ancient sources and modern literature. First, we look at how ancient sources describe Hygieia.

## Ancient sources<sup>6</sup>

The number of ancient sources which describe Hygieia differ in time, geographical origin and medium. The poet and orator Likymnios described Hygieia around 420 BC as “Bright-eyed mother, highest queen of Apollo’s august throne, desirable, laughing gently Health.”<sup>7</sup> Next, Hygieia is mentioned right after Apollo and Asklepios in the *Oath of Hippocrates*, which was probably composed after the fourth century

<sup>4</sup> Hedvig von Ehrenheim, *Greek Incubation Rituals in Classical and Hellenistic Times* (Liège: Press Universitaires de Liège, 2015), 18–23; Gil Renberg, *Where Dreams May Come. Incubation Sanctuaries in the Graeco-Roman World* (Leiden/Boston: Brill, 2017), 7–19.

<sup>5</sup> M. Alcock, “Introducing Hygieia. The family tree,” *Journal of Epidemiology & Community Health*, Volume 57, Issue 6 (2003): 394; Emma Stafford, *Worshipping Virtues. Personification and the Divine in the Ancient Greece* (London: Duckworth and The Classical Press of Wales, 2000), 159; Vivian Nutton, *Ancient Medicine. Second Edition* (London and New York: Routledge, 2013), 37–38, 107.

<sup>6</sup> This section was previously published in a slightly different version in Mark Beumer, “Hygieia. Identity, Cult and Reception,” *Kleio-Historia*, nr. 3. (2016): 2–3. I have added extra sources here.

<sup>7</sup> *Likymnios*, Fragment 769 in David A. Campbell, ed., *Greek Lyric V. The New School of Poetry and Anonymous Songs and Hymns*. Loeb Classical Library 144 (Cambridge, MA: Harvard University Press, 1993), 35; P.M.H. Lardinois, J.H. Blok & M.G.M. van der Poel, eds., *Sacred Words: Orality, Literacy and Religion. Orality and Literacy in the Ancient World*, Vol. 8 (Leiden/Boston: Brill, 2011), 220.

BC but there is no consensus about the exact date in scholarship. The first line reads as follows: “I swear by Apollo Iatros, by Asklepios, by Hygieia, by Panakeia, and by all the gods and goddesses, making them my witnesses, that I will carry out, according to my ability and judgment, this oath and this indenture”.<sup>8</sup> Robin Lane Fox describes this problem in more detail, stating that since Galen, dates for the Oath have varied from 500 BC to the Hellenistic period circa 300–100 BC.<sup>9</sup> Next, Pausanias (115–180 AD) wrote a description of Greece which includes discussion of buildings and monuments he saw which date back to the Archaic and Classical periods.<sup>10</sup> Pausanias mentions temples and statues, but also historical events, although he is much more reliable as an archaeologist since his archaeological data have been confirmed by modern excavations.<sup>11</sup> His historical stories are less reliable, because he sometimes quotes the work of previous authors like Herodotos indiscriminately.<sup>12</sup> The *Orphic Hymns* are a collection of hymns in which Hygieia often occurs. After a long discussion about the dating, there is now a consensus that this collection originates in the third century AD from Western Anatolia. In *Hymn to Hygieia*, Hygieia is not described as a goddess or personification. The first two lines say:

<sup>8</sup> Hippocrates, *Oath of Hippocrates*. See Owsei Temkin and C. Lilian Temkin (eds.), *Ancient medicine: selected papers of Ludwig Edelstein* (Baltimore: The John Hopkins Press, 1967), 1, 55–63. The *Corpus Hippocraticum* is wrongly attributed to Hippocrates (ca. 460–370 BC).

<sup>9</sup> Robin Lane Fox, *The Invention of Medicine. From Homer to Hippocrates* (London: Penguin Random House UK, 2020), 109–113. Besides the problem of dating, Lane Fox also addresses that there is also the problem of translation, as the Oath’s Greek is not always straightforward.

<sup>10</sup> See Peter Kranz, *Hygieia – Die Frau an Asklepios’ Seite. Untersuchungen zu Darstellung und Funktion in klassischer und hellenistischer Zeit unter Einbeziehung der Gestalt des Asklepios* (Möhnesee: Bibliopolis, 2010), 1–6, who questions this thesis on the basis of this votive relief which includes discussion of buildings and monuments he saw which date back to the archaic and classical periods which includes discussion of buildings and monuments he saw which date back to the archaic and classical periods’. Kranz assumes that “Hygieia” has taken the place of another female deity and criticizes Pausanias’ assumption of the Hygieia identification.

<sup>11</sup> Maria Pretzler, *Pausanias. Travel Writing in Ancient Greece*, London: Bristol Classical Press, 2007), 12–13.

<sup>12</sup> Pretzler, *Pausanias*, 55–56); Christian Habicht, *Pausanias’ Guide to Ancient Greece*, London: University of California Press, 1998), 103, 133. This book includes discussion of buildings and monuments he saw which date back to the archaic and classical periods’ view that Pausanias takes over uncritically Herodotos or quotes, is in opposition to the thought that Pausanias writes nothing about what other authors such as Herodotos have said.

“Queen of all, charming, beautiful and blooming, blessed Hygieia, mother of all, bringer of prosperity, hear me”.<sup>13</sup> Finally, the *Hymn to Hygieia* is attributed to Ariphron of Sikyon, but was erroneously attributed by Sextus Empiricus to Likymnios. Although Ariphron is seen as a late Classical or early Hellenistic poet, his hymn will only be confirmed into the third century AD.<sup>14</sup> The source material consists of two inscriptions. One inscription from Attica was found on a stone<sup>15</sup> in Kassel and is dated in the third century AD. The second inscription is from Epidauros and is situated in the second or third century AD.<sup>16</sup> In the first line we read: “Health, most cherished of gods for men”. Summarizing, we can state that Hygieia is described in varied ways in sources by different authors between the fifth century BC and the third century AD, which address Hygieia as a pivotal religious figure responsible for good health, preventive medicine and cures for various maladies. Hygieia has been described among other gods, as a noun with a capital H and without defining her as goddess or personification. Now, I will turn to modern scholarship, where I focus only on monographs.

## Modern scholarship

In order to examine Hygieia correctly, I give an overview of previous scholarship before advancing on my own interpretation. Concerning Hygieia, we have a limited number of monographs concerning this figure. The first book was written by Hildegard Sobel in 1990 and is titled *Hygieia. Göttin der Gesundheit (Hygieia. Goddess of Health)*. In her book, she aims to give a view of Hygieia over eight centuries, using archaeological material such as inscriptions and statues, and discusses items like hairdressing and different statuesque poses. She also describes the genesis of the Hygieia cult together with her mythological father Asklepios and acknowledges

<sup>13</sup> Jan N. Bremmer and Andrew Erskine, eds., *The Gods of Ancient Greece. Identities and Transformations* (Edinburgh: Edinburgh University Press, 2005), 394. For an overview of the debate about the *Orphic Hymns* see Radcliffe G. Edmonds, “Who are you? A brief history of the scholarship,” in Radcliffe G. Edmonds III, ed., *The Orphic Gold Tablets and Greek Religion. Further along the path* (New York: Cambridge University Press, 2011), 3–14.

<sup>14</sup> Lardinois, Blok & van der Poel, *Sacred Words*, 220.

<sup>15</sup> This stone would be taken by Greek-speaking soldiers in the Roman army as talisman to their garrison cities. The function as anthem would then fall away, because singing just before an attack seems unlikely. See H.S. Versnel, ed., *Faith, Hope and Worship: Aspects of Religious Mentality in the Ancient World*. Volume 2 (Leiden: Brill, 1981), 210.

<sup>16</sup> IG IV<sup>2</sup> 1, 132. I accept the second and third century AD as date.

the separate cult of Athena Hygieia. The snake is also part of this book, due to the fact that and Asklepios were brought to Athens in the form of snakes. Her time frame is 400 BC until 400 AD. She does not describe the meaning of health itself in Antiquity. Hygieia. Sobel views Hygieia as a goddess and as personification, but favors the term goddess, although she also defines Hygieia as a cultic personification next to Tyche, Nemesis, Nike and Eros.<sup>17</sup>

The second book, *The Worship of Asklepios and Hygieia in Arkadia*, was written by Elpis Mitropoulou in 2001. She discusses only reliefs and statues that depict Asklepios and Hygieia. She describes the different poses and images and designates her as goddess.<sup>18</sup> The third publication was written in 2003 by Iphigeneia Leventi and is titled *Hygieia in Classical Greek Art*, which is based on her doctoral thesis (1992).<sup>19</sup> Here, Leventi refers to Hygieia as the Greek goddess of health, but also mentions the debate about her identity as goddess and personification since the nineteenth century. Next, the fourth book was written in 2005 by Sarah Brill and is also a doctoral thesis, entitled *Hygieia: Health and Medicine in Plato's Republic*. Health, by default, has proven to be as fertile a source of philosophical interest as it is enigmatic.<sup>20</sup>

The fifth book on Hygieia was published in 2010 by Peter Kranz and is titled *Hygieia – Die Frau an Asklepios' Seite. Untersuchungen zu Darstellung und Funktion in klassischer und hellenistischer Zeit unter Einbeziehung der Gestalt des Asklepios (Hygieia – The Woman at Asklepios' Side. Investigations into Representation and Function in Classical and Hellenistic Times including the Figure of Asklepios)*.<sup>21</sup> He argues that, among the ancient deities, the figure of Hygieia remains remarkably poorly defined. With the exception of Athena Hygieia, Hygieia then left before the end of the fifth century BC, apparently neither having proven a cult image. But then it is attested not only as one among several female personifications – such as on the vases during the Meidias time – but we also know votive reliefs from the side of Asklepios. This book examines in addition to some supposedly early products of cult worship or pictorial representation of Hygieia, during the time of Meidias, their first appearance on Attic votive reliefs of the late fifth and fourth century BC and vases and reliefs as reaction to the introduction of the cult in 420/19 BC. The so-called Telemachos-

<sup>17</sup> Hildegard Sobel, *Hygieia. Die Göttin der Gesundheit* (Darmstadt: Wissenschaftliche Buchgesellschaft, 1990), 1, 6–11.

<sup>18</sup> Elpis Mitropoulou, *The Worship of Asklepios and Hygieia in Arkadia* (Athens: Georgiadis, 2001), 44–47, 49–53, 67–68, 81, 90.

<sup>19</sup> Iphigeneia Leventi., *Hygieia in Classical Greek Art* (Athens: Archaiognōsia, 2003), 29–31.

<sup>20</sup> Sarah Brill, *Hygieia: Health and Medicine in Plato's Republic* (PhD diss., Pennsylvania State University, 2005).

<sup>21</sup> Kranz, *Hygieia – Die Frau an Asklepios' Seite*.

Monument from the early fourth century BC gives a very detailed description of the introduction and the origin of the Asklepios' cult (Fig.1). The inscription explains that Telemachos first set up which includes a discussion of buildings and monuments he saw which date back to the archaic and classical periods' the sanctuary and altar of Asklepios and Hygieia, the Asklepiadae and the daughters of Asklepios. Asklepios, who came up from Zea during the Great Mysteries, arrived at the Eleusinion where Telemachos, having sent for temple attendants from the god's home (on the Akropolis), brought him in accordance with the Oracle to the Akropolis in a chariot. Hygieia came along with him and thus this whole sanctuary was established when Astyphillos was archon in 420/19 BC. On the monument is an upright Asklepios, on his right a female figure seated on a table (Hygieia), and beneath her a dog. On the left is a smaller figure depicted, who raises his hands as if in prayer. This is likely Telemachos.<sup>22</sup> While Hygieia is not differentiated from other personifications on the vase paintings, she appears on the votive reliefs in matronly form first, then later as a youthful figure, where her appearance obviously is bound to no firm figure type – in contrast to Asklepios, because he has a more fixed iconography. Kranz discusses her status as goddess and personification within this context, where he follows Stafford. He concludes that in no way she could be a goddess next to Asklepios and therefore must be a (special) personification.

Sixth, in 2014, *Hygieia. Health, Illness, Treatment from Homer to Galen* was published as a catalog for the eponymous exhibition at the Museum for Cycladic Art in Athens by Nicholas Chr. Stampolidis and Yorgos Tassoulas.<sup>23</sup> In this publication, Hygieia is described as personification and goddess. Stampolidis states: "This is why, in the history of ancient Greek medicine, the gods – many possessing healing abilities – appear first and among them Asklepios, the foremost god of the art of healing. It is only much later that his daughter Hygieia appears and is personified, representing the system of those pre-Socratic philosophical observations and assumptions that keep the body physically and mentally balanced and therefore healthy"<sup>24</sup> Next, it is also stated that Hygieia is a goddess who is equally divine as Asklepios.<sup>25</sup>

<sup>22</sup> Ibid., 44.

<sup>23</sup> Nicholas Chr. Stampolidis and Yorgos Tassoulas, eds., *Hygieia. Health, Illness, Treatment from Homer to Galen* (Athens: Museum for Cycladic Art, 2014);

<sup>24</sup> Nicholas Chr. Stampolidis, "Preface," in Nicholas Chr. Stampolidis and Yorgos Tassoulas, eds., *Hygieia. Health, Illness, Treatment from Homer to Galen* (Athens: Museum for Cycladic Art, 2014), xx.

<sup>25</sup> Anagnostis P. Agelarakis, "Veteran's Wounds: Traces of Ancient Greek Surgeon-Physicians," in Nicholas Chr. Stampolidis and Yorgos Tassoulas, eds., *Hygieia. Health, Illness, Treatment from Homer to Galen* (Athens: Museum for Cycladic Art, 2014), 76–85, there 85; Mario

The last book was published by me in 2015, titled *Hygieia. Godin of Personificatie? (Hygieia. Goddess or Personification?)* in which I examined Hygieia as personification and goddess. I concluded that Hygieia cannot be viewed as a personification, since this is a post-medieval term which does not relate to the Greek concepts of *prosōpopoia* and *ēthopoia* which are related to putting speech in the mouth of a character and are connected to theatre.<sup>26</sup> It is striking is that most publications do not pay attention to the ancient concept of health, other than Sarah Brill. We can further conclude that most monographs pay (briefly) attention to the debate about Hygieia's identity, where Kranz and Beumer are the most outspoken scholars, who have opposite views concerning Hygieia's identity. So, we still have to examine the identity of Hygieia, before which I first will examine the concept of *prosōpopoia* and personification.

### From *prosōpopoia* to personification<sup>27</sup>

The concept of personification is a post-medieval term.<sup>28</sup> Although scholars agree that the term personification is not an ancient term, it does not mean that personification as a phenomenon did not exist in Antiquity.<sup>29</sup> For example, although the Greeks

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Iozzo, "107. Anatomical Votive 3<sup>rd</sup>–2<sup>nd</sup> c. BC," in Nicholas Chr. Stampolidis and Yorgos Tassoulas, eds., *Hygieia. Health, Illness, Treatment from Homer to Galen* (Athens: Museum for Cycladic Art, 2014), 235; Kalliopi Bairami, "S4 Statue of Hygieia 3<sup>rd</sup> c. AD," in Nicholas Chr. Stampolidis and Yorgos Tassoulas, eds., *Hygieia. Health, Illness, Treatment from Homer to Galen* (Athens: Museum for Cycladic Art, 2014), 171–172, there 172.

<sup>26</sup> Mark Beumer, *Hygieia. Godin of Personificatie?* (Assen: Boekscout, 2<sup>e</sup> druk 2016).

<sup>27</sup> The section about *prosōpopoia* and personification was earlier published in a different version in Mark Beumer, "Hygieia. A New Conceptual Approach? Second Edition," *Kleio-Historia*, nr. 12. (2020): 45–60, there 51–57.

<sup>28</sup> Nicolette Zeeman, *The Arts of Disruption. Allegory and Piers Plowman* (Oxford: Oxford University Press, 2020), 20.

<sup>29</sup> Stafford, *Worshipping Virtues*, 5; Karl Reinhardt, *Vermächtnis der Antike. Gesammelte Essays zur Philosophie und Geschichtsschreibung*. Herausgegeben von Carl Becker. Unveränderter Nachdruck der zweiten, durchgesehenen und erweiterten Auflage (Göttingen: Vandenhoeck & Ruprecht, 1989), 8–9; Wolfgang Messerschmidt, *Prosopopoiia: Personifikationen politischen Charakters in spätclassischer und hellenistischer Kunst* (Köln: Bohlau Verlag, 2003), 1; Barbara Borg, *Der Logos des Mythos: Allegorien und Personifikationen in der frühen griechischen Kunst* (München: Wilhelm Fink Verlag, 2002), 49; Amy C. Smith, *Polis and Personification in Classical Athenian Art* (Brill: Leiden • Boston, 2011), 11; H.A. Shapiro, *Personifications in Greek Art: The Representation of Abstract Concepts 600–400 B.C.* (Akanthus: Kilchberg/Zürich, 1993), 12.



did not have a proper term for religion, they were very religious.<sup>30</sup> The main focus is on archaic Greece which Reinhardt labels as the time of true, genuine and great personifications.<sup>31</sup> Different authors like Allan Shapiro, Emma Stafford, Amy C. Smith and Wolfgang Messerschmidt argue that *prosōpopoiia* is the only concept that is known as indicating something like personification.<sup>32</sup> Karl Reinhardt argues that the term personification without doubt is the humanistic translation of *prosōpopoiia*.<sup>33</sup> Demetrios of Phaleron defines this concept for the first time in the late fourth century BC as placing the private thoughts and arguments into the mouth of another person, which is actually not a person, because he is either died or cannot be understood literally as a person, such as countries, peoples, cities or abstractions. *Prosōpopoiia* refers to *ēthopoiia*, which means “mask” and appears in a dramatic context. *Prosōpopoiia* also has a wider meaning in rhetorical treatises in which *prosōpopoiia* means speaking with the voice of a character that is not actually present, real or imaginary and when a thing or condition is put up a “mask”.<sup>34</sup> Still, this term is not identical with the meaning of personification.<sup>35</sup> The most comprehensive definition of *prosōpopoiia* is given by the first century AD retor Aelius Theon:

“*Prosōpopoiia* is the representation of a character speaking words appropriate both to itself and to the known circumstances, e.g. a man about to leave home would say certain words to his wife, or a general to his soldiers about their dangers. Also, in the case of characters already known, e.g. Cyrus would say certain words as he marched against the Massagetai, or Datis after the battle of Marathon on meeting the King. Into this category of exercise fall also the figures of panegyric, persuasion (*protreptic*) and commission (*epistolic*). So, first of all one has to consider carefully what kind of character the speaker has, and the place and circumstances, and

<sup>30</sup> For this discussion see Nickolas P. Roubekas, “Thrēskeia: From Etymology to Ideology and the Academic Study of Ancient Greek Religion,” *Journal of Hellenic Religion* 12 (2019): 39–59; Brent Nongbri, *Before Religion. A History of a Modern Concept* (Yale University Press 2013); Carlin A. Barton and Daniel Boyarin, *Imagine No Religion: How Modern Abstractions Hide Ancient Realities* (New York: Fordham University Press, 2016).

<sup>31</sup> Reinhardt, *Vermächtnis der Antike*, 13.

<sup>32</sup> Shapiro, *Personifications in Greek Art*, 12; Smith, *Polis and Personification*, 11–12; Stafford, *Worshipping Virtues*, 3; Messerschmidt, *Prosopopoiia*, 1.

<sup>33</sup> Reinhardt, *Vermächtnis der Antike*, 8.

<sup>34</sup> Stafford, *Worshipping Virtues*, 5–6; Messerschmidt, *Prosopopoiia*, 1; Reinhardt, *Vermächtnis der Antike*, 8–9.

<sup>35</sup> Stafford, *Worshipping Virtues*, 5; Shapiro, *Personifications in Greek Art*, 12.

the subject matter proposed about which his words will speak; then one could try out the prepared speech, for different words are appropriate for different people, according to their age... This exercise is especially good for displaying character and feeling.”<sup>36</sup>

A character is often wrongly equated to a person and refers to personal qualities, such as anger or jealousy. In the matter of Hygieia, character refers to health, but character is not a personal property, since a person who is not healthy is still seen as a person. Stafford cites Quintilian, who gives the most detailed description of *prosōpopoia* as a “representation of characters”, but encompassing also all literary and visual personifications.<sup>37</sup> Stafford also cites Hermogenes of Tarsos who differentiates *ēthopoia* from *prosōpopoia*. According to Hermogenes, *ēthopoia* is the representation of the underlying character of a person. One speaks of *prosōpopoia*, when a character is attributed to a thing, as evidence (*elenchos*) in Menander, or in Aristeides where the sea holds a speech to the Athenians.<sup>38</sup> This is really something else: with *ēthopoia* words for a real character are created, with *prosōpopoia* words are attributed to a character that does not really exist, thus *prosōpopoia* is used to identify non-existent figures within the context of drama.<sup>39</sup> Hygieia does not fit this concept. In addition, Hygieia is a real figure for the Athenians who protects and restores health. Numerous inscriptions and votive reliefs are silent witnesses.<sup>40</sup> In Latin, *prosōpopoia* is translated as *fictio personae* or *personae confictio*. Stafford argues that *personae factio* is the literal translation.<sup>41</sup> Also, *conformatio* and *personarum ficta inductio* are mentioned.<sup>42</sup> The term *personificatio* was first attested in the Middle Ages. What the Greek and Latin terms have in common is that they primarily designate dramatic or rhetorical processes in both Antiquity and modernity. Ancient literature did not coin any term for the

<sup>36</sup> Aelius Theon (*Progymnasmata*, ed. Spengel, *Rhetores Graeci* II, 115.11–28), cited in Stafford, *Worshipping Virtues*, 6.

<sup>37</sup> Contra Stafford, *Worshipping Virtues*, 6.

<sup>38</sup> George A. Kennedy, *Progymnasmata: Greek Textbooks of Prose Composition and Rhetoric* (Brill: Leiden/Boston, 2003), 84. The speech of the Sea to the Athenians in the works of Aristeides is no longer traceable. There footnote 43.

<sup>39</sup> *Progymnasmata* 9.1–7.

<sup>40</sup> F.T. van Straten, *Hiera Kala. Images of Animal Sacrifice in Archaic and Classical Greece* (Brill: Leiden • New York • Köln, 1995), 63–72.

<sup>41</sup> Stafford, *Worshipping Virtues*, 5.

<sup>42</sup> Andreas Bendlin und Alan H. Shapiro, “Personifikationen,” in Hubert Cancik und Helmut Schneider, Hrsg., *Der Neue Pauly. Enzyklopädie der Antike* (Stuttgart • Weimar: Verlag J.B. Metzler, 2000), 639.

representation of personifications in art; the terms used in literary theory did not apply to the visual arts. That is to say, the method under discussion here, of representing abstract concepts, political institutions and corporations, peoples, countries and cities well through the embodiment of a person in visual arts, was never seen by Greek and Roman authors as a problem of art theory. It was only in modern art history that the term personification found its appropriate use.<sup>43</sup> Stafford elaborated further on the linguistic dynamic between the Greek and Latin terms. She cites the following:

“*Allocutio* is the representation of speech appropriate to the character and the supposed *personae*, so Andromache would have said certain words to the dead Hector. *Conformatio*, however, which the Greeks call *prosōpopoiia*, is when a thing is given a persona in which to speak, contrary to its nature, so Cicero gives words to the Fatherland (*patria*) and the Republic (*res publica*) in reproach. There is, moreover, *simulacra factio*, which the Greeks call *eidōlopoiia*, when words are given to the dead, as Cicero did in his *Pro Caelio*, giving words against Clodia to Appia Caecus.”<sup>44</sup>

Although Hygieia is mentioned in several poems, she does not speak herself. If we accept Hermogenes’ simple definition of *ēthopoiia* as a representation of the underlying character of a person, Hygieia can fit into this concept, since health is part of human life and because it is personified as a young woman. All the other ancient concepts and definitions cannot be applied to Hygieia. With this observation, the whole basis for the discussion concerning *prosōpopoiia* and Hygieia is shaky at best, but we first must examine the modern concept of personification further, to draw final conclusions.

Personification has several angles. Roscher, Deubner, Hastings and Shapiro consider personification in connection with inspiration.<sup>45</sup> Shapiro sees personification in literature only as a mental exercise to get a calculated effect, such as “Sondergötter”

<sup>43</sup> Messerschmidt, *Prosopopoiia*, 1.

<sup>44</sup> Stafford, *Worshipping Virtues*, 7.

<sup>45</sup> L. Deubner, “Personifikationen abstrakter Begriffe,” in W.H. Roscher *Ausführliches Lexikon der griechischen und römischen Mythologie*. III Nabaothes – Pasicharea (Leipzig: Druck und Verlag von B. G. Teubner, 1897–1902), 2068–2169; James Hastings, “Personification,” *Encyclopaedia of Religion and Ethics*. Volume IX Munda-Phrygiens (Edinburgh: T. & T. Clark, 1917): 781–803. The two main problems are the exact meaning of personification for man and the reconstruction of the psychological mechanism behind personification; Shapiro, *Personifications in Greek Art*, 12.

or “Augenblicksgötter” and criticises Webster, who says that personified deities don’t have their own identity such as the Olympians, but are only deified in times of great emotion. According to Shapiro, these figures often achieve both persistence and individuality.<sup>46</sup> Borg argues that Webster comes closest to the problem in viewing that man “is surrounded by things physical, animate, and invisible which are insufficiently understood. Personification is a means of taking hold of things which suddenly appear startlingly uncontrollable and independent [...] These all seem to have some kind of life and so are in some way human”. His distinction between deifications, strong and weak personifications and “technical terms” represents a considerably differentiated concept compared to the one just mentioned, which above all has the advantage of not elevating every personification to be treated as a deity.<sup>47</sup> Karl Lehmann argues that when a personification receives a cult with prayers, sacrifices, hope and fear of suppliants, this is a real deity like other deities, which means that a distinction between personifications and gods is no longer needed.<sup>48</sup> Stafford adds cult statues and altars to this list.<sup>49</sup> Unlike Lehmann, Reinhardt claims that personifications of theater and fable were originally actual gods. Personifications of the stage were preceded by the god behind the mask, but Shapiro questions whether a distinction was really made between personified divinities and other gods.<sup>50</sup> The true origins of personification remain obscure, and the same goes for the question of whether gods emerged from personifications or vice versa, but I guess he tends to favour the process from personifications to gods, based on his remark that Greek and Romans “naturally made things and ideas into gods”.<sup>51</sup> Reinhardt is sure that there is no single personification that is not demonstrably created after the model of the gods, be it as satellite or as follower, be it as an

<sup>46</sup> Shapiro accepts Nilsson’s argument concerning the transformation from simple nouns to living figures as mere intellectual process. The title *Sondergötter* is created by Hermann Usener. See Hermann Usener, *Götternamen: Versuch einer Lehre von der religiösen Begriffsbildung* (Bonn: F. Cohen, 1896), 75–79; Shapiro, *Personifications in Greek Art*, 12; Robin Mitchell-Boyask, *Plague and the Athenian Imagination. Drama, History, and the Cult of Asclepius* (Cambridge: Cambridge University Press, 2007), 116; Deubner, “Personifikationen abstrakter Begriffe,” 2069; Shapiro, *Personifications in Greek Art*, 12.

<sup>47</sup> Barbara E. Borg, *Der Logos der Mythos. Allegorien und Personifikationen in der frühen griechischen Kunst* (München: Wilhelm Fink Verlag, 2002), 53.

<sup>48</sup> Shapiro, *Personifications in Greek Art*, 12. Lehmann means specific the fifth century BC.

<sup>49</sup> Stafford, *Worshipping Virtues*, 2.

<sup>50</sup> Reinhardt, *Vermächtnis der Antike*, 8.

<sup>51</sup> Shapiro, *Personifications in Greek Art*, 12–13. Reinhardt follows this argument. See Reinhardt, *Vermächtnis der Antike*, 7–8.

ancestor or descendant, or as an enemy and opposed or as always, whether with or without cult and by virtue of which, be it poetic on speculative genealogy.<sup>52</sup> Despite this problem, Shapiro argues that we can rightly label gods as personifications, in that they were felt to embody the essence of the abstraction. Philologists speak further of strong and weak personifications: which figures are completely deified with associated mythology and what figures remain one-dimensional and appear once and develop no further?<sup>53</sup> Deubner sees an evolution of individual active gods to personifications as a last stage of development and says that gods are abstract concepts.<sup>54</sup> In Roman religion he sees the reverse process, from concepts to gods and calls Hygieia someone who has reached a full divine personality and should be studied separately.<sup>55</sup> In Roman Antiquity, Clark argues that personification is a psychological process that plays an important role in the development of religious concepts; the emergence of non-living and non-material abstract objects, which have to do with body and soul.<sup>56</sup> Today this evolutionary vision of religion is no longer acceptable.<sup>57</sup> Hastings argues that although Salus is mentioned, she cannot yet be identified with Hygieia.<sup>58</sup> Lind, Clark and Williams consider personification from religion, which is the most important aspect to understand personification.<sup>59</sup>

<sup>52</sup> Reinhardt, *Vermächtnis der Antike*, 21.

<sup>53</sup> Shapiro, *Personifications in Greek Art*, 14–15.

<sup>54</sup> Deubner, “Personifikationen abstrakter Begriffe,” 2069

<sup>55</sup> *Ibid.*, 2070. This would mean that Hygieia no longer can be seen as a personification, but as goddess which coincides with Lehmann’s argument.

<sup>56</sup> Clark uses this idea too in her book *Divine Qualities*. See the following section about religion.

<sup>57</sup> Franz Boas (1938 en 1940) has shown by the theory of linguistic relativity that the way people think and observe the world, is being influenced by language and is therefore unique.

<sup>58</sup> Hastings, “*Personification*,” 796. Salus is seen here as partner of the old god Semo Sanctus dius Fidius. Inscriptions dedicated to Semo Sanctus are found in the part of the Quirinalis that first was named Collis Salutaris. The cult of Salus is therefore far than the foundation of her temple in 302 BC by dictator. C. Junius Bubulcus. Salus is viewed here as Salus Publica and cannot be seen as the Salus, who is later identified with Hygieia. For recent studies about Hygieia and Salus see Martin A. Marwood, *The Roman Cult of Salus* (Oxford: BAR International Series 465, 1988), 151–152 and Lorenz Winkler, *Salus. Vom Staatskult zur Politischen Idee. Eine archäologische Untersuchung* (Heidelberg: Verlag Archäologie und Geschichte, 1995), 142–155.

<sup>59</sup> L.R. Lind, “Roman Religion and Ethical Thought: Abstraction and Personification,” *The Classical Journal*, Vol. 69, No. 2 (Dec., 1973 – Jan., 1974): 108; Anna J. Clark, *Divine Qualities. Cult and Community in Republican Rome* (Oxford: Oxford University Press,

Lind puts the origin of Roman abstract thoughts within religion and specific to the personification of abstractions and mentions a chronological order of Roman personified abstractions, in which Salus is the counterpart of Hygieia.<sup>60</sup> This conclusion of Salus is consistent with the fact that Asklepios and Hygieia were moved to Rome in 293 BC, because of a plague epidemic.<sup>61</sup> Deubner posits that Hygieia has strongly affected Salus which explains the fusion of Hygieia and Salus which eventually took place.<sup>62</sup> Clark also discusses Salus, but here as divine quality that in the last three centuries of the Roman Republic is used as a self-reflection to understand their own society.<sup>63</sup> Clark says that the examined “qualities” are recognized as real deities and so are also honoured in temples during festivals.<sup>64</sup> Clark refers to Hygieia who was recognized by Deubner as a complete personalized deity.<sup>65</sup> Burkert, Stafford, Smith, Borg and Kranz consider that personification stems from anthropomorphism, which tends to envisage (nature) phenomena, situations, things, places and abstractions as human. The grammatical gender of nouns results in male and female figures, which are human, divine or mythical.<sup>66</sup> Stafford analyses the concept of personification, which descends from the Latin *persona* and *facere* and says that no Latin term exactly corresponds to “personification”.<sup>67</sup> Borg, Shapiro and Stafford view personification as the presentation of an inanimate subject or abstract concept in the form of the animated figure, usually in human form. The outcome is a fictional person and for everyone recognizable as such.<sup>68</sup> Stafford cites

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2007), vii; Jonathan Williams, “Religion and Roman Coins,” in Jörg Rüpke, *A Companion to Roman Religion* (Oxford: Blackwell Publishing, 2007), 143–163, there 156.

<sup>60</sup> This Salus has to be a completely different goddess than the Salus described by Hastings and thus of later date.

<sup>61</sup> Livy 10.47.6–7

<sup>62</sup> Deubner, “Personifikationen abstrakter Begriffe,” 2070.

<sup>63</sup> Clark, *Divine Qualities*, vii.

<sup>64</sup> *Ibid.*, 13.

<sup>65</sup> *Ibid.*, 35.

<sup>66</sup> Walter Burkert, *Greek Religion: Archaic and Classical* (Singapore: Ho Printing Singapore Pte Ltd, 1985), 185; Smith, *Polis and Personification*, 2; Stafford, *Worshipping Virtues*, 3–4); Borg, *Der Logos der Mythos*, 49; Emma Stafford, “‘Without you no one is happy’: the cult of health in ancient Greece,” in Helen King, ed., *Health in Antiquity* (London and New York: Routledge, 2005, 126; Kranz, *Hygieia – Die Frau an Asklepios’ Seite*, 48.

<sup>67</sup> Emma Stafford and Judith Herrin, *Personification in the Greek World. From Antiquity to Byzantium* (Ashgate: Ashgate Publishing, 2005), 3.

<sup>68</sup> Borg, *Der Logos der Mythos*, 49; Stafford, *Worshipping Virtues*, 4; Shapiro, *Personifications in Greek Art*, 12.

Martin Persson Nilsson who argued that thanks to Homerization, archaic Greek personifications “come to assume their distinctive character in that they mediate between the individual gods and their spheres of reality”. He sees a progression from the appearance of personifications in poetry to their representation in visual arts, when they finally obtain their own cults towards the end of the archaic period.<sup>69</sup> At the same time, a new period of re-demonization of the Olympian gods occurred, which allowed deeper layers to surface.<sup>70</sup> Shapiro criticizes Nilsson, because Homer did not tell us *how* he visualized them with few exceptions.<sup>71</sup>

Stafford next discusses other types of personification. The first is *literary personification* within the context of poetry and drama which is problematic due its definition. Because the Greek language does not make a distinction between animate and inanimate, and which has no such convention as the initial capital for a proper name, Stafford asks where the line can be drawn between an abstract noun and its personification. At the least explicit end of the scale, a noun can be described as personified if it is qualified by a verb or adjective denoting human action, feeling or status, a use of personifying language which might be termed “light personification”.<sup>72</sup> A second stage is represented by statements which explicitly attribute abstract ideas to a deity, like Hygieia to Athena.<sup>73</sup> Concerning visual arts, Stafford observes the problem that here is no room for ambiguity between personification and abstract: the artist either represents an abstract in human incarnation, or the idea must be expressed without recourse to anthropomorphism at all. Degrees of “personifiedness” are not in question. Rather, the major problem with visual representations is that of identification: how do we recognize a personified abstraction in sculpture or painting? The figures familiar to us from the Classical tradition are identifiable by their armoury of attributes or particular style of (un)dress, but few of these attributes, however, were in fact acquired before the Hellenistic period. Stafford finds the striking thing about the figures of the period 600–400 BC catalogued in Shapiro’s *Personification in Greek Art* to be their similarity – the vast majority appear in the form of idealized young women with no distinguishing aspects, only identifiable if accompanied by an inscription. In addition to the problem of identification, the status of visual representations on the scale of scale of “artistic device-cult figure” is not more definitionally secure than that of their literary counterparts. Some figures may be inspired by a narrative known from literary sources, so any allegorical significance

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<sup>69</sup> Stafford, *Worshipping Virtues*, 25.

<sup>70</sup> Reinhardt, *Vermächtnis der Antike*, 13.

<sup>71</sup> Shapiro, *Personifications in Greek Art*, 20.

<sup>72</sup> Stafford, *Worshipping Virtues*, 9.

<sup>73</sup> *Ibid.*, 10.

is already built into the narrative context, as in the case of Sleep and Death carrying Sarpedon off the battlefield. Others may have an explanatory function, expressing ideas that are not easily portrayed in visual form. Shapiro argues that the personality of the artist is perhaps a more decisive factor than practical considerations, such as intelligibility.<sup>74</sup> Stafford then points to various methodological problems of various visual arts, when it comes to their use of evidence for cult of potential figures. Many possible identifications of personifications in free-standing sculpture and architecture remain speculative because of the absence of the kind of narrative context available to help identification in vase painting or relief sculpture. Even where identity can be established, however, it is a debatable point whether the existence of a statue of a personification is indicative of her cult, since the notions of survival mean that adequate information about a work's original context is often not available. According to Stafford, more often literary sources can allow us to identify the subject of a statue and its sculptor, but not further to determine the status of the figure: if a statue is not specifically the cult image of a shrine, then the question arises of whether it embodies the divine. Stafford argues that the relationship between the gods and their representations was a matter of discussion even in Antiquity. Common sense would suggest that different observers would have had differing opinions on the subject, but even a single person's response to a particular statue is likely to be beyond the reach of modern scholarship to reconstruct.<sup>75</sup>

Personifications in the poetic literature and visual arts, then, present considerable identification problems and are not necessarily indicative of actual worship of a figure. For more direct attestation of cult, we need to turn to other forms of material evidence and to various genres of prose literature written in the Roman period. Usually, it is rather the case that a personification has some subsidiary representation in the sanctuary of a major deity – as Hygieia has statues, and occasionally altars, in shrines of Asklepios. But the main problem with archaeological sources is again that of identification, since we need almost every time literary sources to confirm the archaeological data. Stafford argues that there is one kind of evidence that is reliable for determining the cult of a figure, namely epigraphy, especially dedicatory inscriptions that describe cult personnel like priestesses. There are also a few financial inscriptions which helps us to identify certain cults.<sup>76</sup> Finally, Stafford discusses the question why so many personifications are female, which is caused by their linguistic gender, but this does not satisfy Stafford. She also examines the sociological and iconographic context in which these personified abstracts are developed. Why

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<sup>74</sup> Stafford, *Worshipping Virtues*, 14; Shapiro, *Personifications in Greek Art*, 16.

<sup>75</sup> Stafford, *Worshipping Virtues*, 14–15.

<sup>76</sup> *Ibid.*, 16–17.



personifications should be predominantly female is still an unsolved matter and Stafford argues that it's more than just an accident of grammatical gender due to cultural influences.<sup>77</sup> Despite all these problems, Stafford argues that worshipping figures like Hygieia is the best evidence that people believed in the real divine power of personifications. Walter Burkert views the relationship between deity and abstract as a two-way process in which the boundary between concept and name is fluid and agrees with Nilsson that only the process of Homerization can clear up the demarcation here. Further, Cicero stated that people not only could worship “those who have always lived in heaven”, but also “those qualities through which an ascent to heaven is granted to man: Intellect, Virtue, Piety, Faith (*Laws* 2.19.9)”<sup>78</sup>

## Models of personification

It is clear that there are many angles that connect personification to each other. Shapiro discusses three models of Thomas Bertram Lonsdale Webster, Edmond Pottier and Vasiliki Papadaki-Angelidou to determine if a figure is a personification or not.<sup>79</sup> The models are now viewed more closely. Shapiro repeats that it's difficult to identify personifications, since by definition, the name must still be in current usage as a simple noun. How do we know if the poet thought of an abstraction as personified or not? When a personified deity had an established cult, we are sure to label them as personification. When there is no cult, Webster offers three other criteria: 1. A figure may have been given a genealogy; 2. The personified figure may be coupled with a known individual or divinity; 3. A verb or adjective denoting human activity or feeling may be used for the abstraction. This criterion fits perfectly with Stafford's concept of “light personification”. Shapiro then adds a fourth criterion, namely that a figure who is represented in the visual arts we may presume was recognized as a personification and had probably been personified first by the poets. Hygieia meets all the criteria. Her mythological parents are Asklepios and Epione or Eros and Peitho and she has Panakeia, Iaso, Podaleirios and Machaon as siblings.<sup>80</sup> The daughters of Asklepios would be a later addition of Asklepios' elevation to deity, in which Hygieia is understood as a representation of the benefits

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<sup>77</sup> Ibid., 28.

<sup>78</sup> Ibid., 2, 20, 23.

<sup>79</sup> Shapiro, *Personifications in Greek Art*, 26–27.

<sup>80</sup> F. Croissant, “Hygieia,” In *Lexicon Iconographicum Mythologiae Classicae*, vol. 5.1, Herakles-Kenchrias et addenda Epona, Galateia, Helios, Helios (in peripheria orientali), Helios/Usil. (Artemis-Verlag, 1990), 554. For Eros en Peitho see Apostolos N. Athanassakis,

that Asklepios brings in a context, where he is absent. Compton sees Hygieia as well as deity and extension of characteristics and as representation.<sup>81</sup> Mikalson views the daughters of Asklepios as personifications of Asklepios' qualities, all integrated into the cult of Asklepios and receiving sacrifices, hymns, invocations and ceremonies.<sup>82</sup> Second, Hygieia is foremost coupled with Asklepios with whom she shared temples and was also depicted. Third, Hygieia means health and healthy as an adjective form and fourth, Hygieia was painted by the Meidias painters on Greek vases.

Then, Edmond Pottier distinguishes ten categories of personifications that fall partly within the format of Shapiro:

1. Physical conditions: e.g. Hygieia, Geras.
2. Social goods: e.g. Eunomia, Eirene.
3. Ethical and moral qualities, e.g. Harmonia, Eris, Eudaimonia.
4. Metaphysical ideas: e.g. Themis, Ananke.
5. Geographical features: e.g. Nemea, Arethusa.
6. Natural phenomena: e.g. Helios, Eos, Nephelai.
7. Products of the earth: e.g. Oinos, Opora.
8. Types of individuals: e.g. Neanias, Komarchos.
9. Collective groups: e.g. Nymphai, Horai.
10. Social enjoyments: e.g. Komos, Pandaisia, Dithyrambos.<sup>83</sup>

This model shows many weaknesses. First, the categories are not well defined. Hygieia (health) can also be a social good. In addition, not all examples are as abstract as claimed by Shapiro. Man has seen sun, wine and water and these are not *per se* "intangible" Shapiro says: "To the early Greeks, these and other natural phenomena were in some sense animate beings, and to represent them in human guise was a natural transformation". If these natural phenomena are all living things, there is no need to add more personality, and personification is therefore no longer needed. Shapiro claims for abstractions that the criteria of invisibility and elusiveness in the field of anthropomorphism can be applied to this concept.<sup>84</sup> This is the

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and Benjamin M. Wolkow, *The Orphic Hymns. Text, Translation and Notes* (Baltimore: Johns Hopkins University Press, 2013), 54.

<sup>81</sup> Michael T. Compton, "The Association of Hygieia with Asklepios in Graeco-Roman Asklepieion Medicine," *Journal of the History of Medicine and Allied Sciences*, Vol. 57(2002): 312–29.

<sup>82</sup> Jon D. Mikalson, *Ancient Greek Religion. Second Edition* (Oxford: Wiley Blackwell, 2010, 46; IG XII 4, 1, 286; IG XII 4, 1, 287; IG XII 4, 1, 344; IG XII 4, 1, 71.

<sup>83</sup> Shapiro, *Personifications in Greek Art*, 26

<sup>84</sup> *Ibid.*, 26–27.

question in health matters. Although health is not tangible, the person or a doctor determines whether the patient is sick or not through diagnosis.

Papadaki-Angelidou offers a different model for personification. She distinguishes twelve categories, which makes clear as with Pottier how subjective such categorization is.<sup>85</sup>

1. Cities and places.
2. Political life: e.g. Boule, Demokratia.
3. Agonistic: e.g. Agon, Olympia, Eutaxia.
4. Intellectual activities: e.g. Tragodia, Ilias, Sophia.
5. Ethical ideas: e.g. Dike, Arete.
6. Psychological affects: e.g. Aidos, Metanoia, Lyssa
7. Relations between people: e.g. Eris, Philia.
8. Well-being or its absence: e.g. Chrysos, Limos.
9. Time: e.g. Aion, Nyx, Kairos.
10. Members of the circle of Aphrodite: e.g. Eunomia, Eukleia.
11. Members of the circle of Dionysos: e.g. Methe, Opora.
12. All others (Miscellaneous): e.g. Athanasia, Geras.

The model is limited because it cites obvious examples. Sophia is a striking choice, as Sophia (wisdom) is more synonymous with the category name, whereas Iliad and Tragodia are the results of the process of writing a poem or play. Numbers 10, 11 and 12 are strange choices. Hygieia fits under “8. Well-being”, but it is mentioned together with Chrysos (gold) and Limos (famine). The presence of gold is strange, since the link between health and famine is more obvious. In conclusion, these models of personification are not static instruments, because its categorization can differ.<sup>86</sup> Remembering Lehmann, who argued that these figures are no longer personifications when they received cult, prayers and offerings and became full deities, Hygieia can be viewed as a full deity which concept, I now will explore.

## Hygieia as a deity

The debate about the concept of deity is far less complex and shows more consensus. I agree with the concept of Greek deities<sup>87</sup> as immortal beings and are depicted as male (god) or female (goddess). They feed on nectar, ambrosia and smoke

<sup>85</sup> Shapiro, *Personifications in Greek Art*, 26, footnote 47.

<sup>86</sup> *Ibid.*, 126.

<sup>87</sup> Deities are also described as synonyms with gods which I will follow here.

(incense), while observing mankind as invisible but omnipresent beings and can share functions with other gods which can overlap, because gods don't have a monopoly on certain qualities.<sup>88</sup> Further, gods need a cult, prayers, offerings and are able to fulfill expectations from their worshippers, otherwise they are "empty" gods.<sup>89</sup> Mythology is not required. I further distinguish between Greek and Olympian gods, because not all deities live on Mount Olympos.<sup>90</sup> Also, the Olympians consists of twelve more or less the same gods.<sup>91</sup> Reinhardt sees that when the Olympians had risen above that which is restricted in terms of location and have achieved canonical validity, they begin to combine themselves in a new way, in which they are bound to time and space.<sup>92</sup> Especially Sonder/Augenblicksgötter take their place and purpose between the already existing gods.<sup>93</sup> Hygieia can on the one hand be viewed as Sonder/Augenblicksgöttin and on the other hand she cannot, since her worship did not cease to exist after 420 BC.<sup>94</sup> Although Hygieia has no mythological narratives, she is connected with gods like Apollo, Asklepios and Athena. Reinhardt views the appearance of Athena Hygieia as re-demonization/deification.<sup>95</sup> According to Robert Parker and others, the fifth century BC was a century of religious renewal. This century is characterized by the introduction of new cults, where "new gods" were imported into Athens. There are three changes that can be observed in the fifth century BC: first, the introduction of minor cults, second the addition of new epithets to ancient deities and third, the introduction of "foreign divinities".<sup>96</sup>

<sup>88</sup> Sarah Iles Johnston, ed., *Ancient Religions* (Cambridge, Massachusetts, and London: The Belknap Press of Harvard University Press, 2007), 19–20.

<sup>89</sup> I follow here ecological anthropologist Roy Rappaport, who distinguishes between Ultimate Sacred Postulates (the divine) which are in essence "empty" which identify the intangible and immaterial cause of the palpable happenings that create Dominant Symbols (knowable, tangible, and specific events). See Roy Rappaport, *Ritual and Religion in the Making of Humanity* (Cambridge: Cambridge University Press, 1999), 272–73; Paul Cassell, "Rappaport, Revisited," *Method & Theory in the Study of Religion*, Vol. 26, No. 4/5 (2014): 417–21.

<sup>90</sup> Louise Brut Zaidman and Pauline Schmitt Pantel, *Religion in the Ancient Greek City* (New York: Cambridge University, 1992), 177.

<sup>91</sup> For a discussion see Charlotte R. Long, *The Twelve Gods of Greece and Rome* (Leiden/ New York: Brill, 1987), 139–143.

<sup>92</sup> Reinhardt, *Vermächtnis der Antike*, 19.

<sup>93</sup> *Ibid.*, 19.

<sup>94</sup> *Ibid.*, 20.

<sup>95</sup> *Ibid.*, 21.

<sup>96</sup> Robert Parker, *Athenian Religion. A History* (Oxford: Clarendon Press, 1996), 153–158.

An example of the expansion of minor cults is the cult of Athena Nike, whose altar has adorned the Akropolis since the mid-sixth century BC. However, this cult only emerged around 450 BC, in celebration of beating the Delish-Attic Sea Alliance in Persia. Other examples of religious renewal are the building of temples to Poseidon in Sounion and the Nemesis of Rhamnous between approximately 450 and 430 BC.<sup>97</sup> The second innovation is characterized by adding new epithets to existing gods, because the Athenians found it quite common for deities to unite them with abstractions. Examples are deities such as Artemis Aristoboule, Artemis Eukleia and Zeus Eleutherios. Finally, “foreign divinities” were introduced, which the Greeks called *xenikoi theoi*. This term cannot simply be translated as “foreign divinities”, along with the modern understanding of the term “foreign” because for an Athenian, a man of Epidauros was also a *xenikos*. The crucial division is not between non-Greek and Greek deities, but between the deities traditionally honoured in public cults and the rest. According to Herodotos, the gods are the same everywhere, just with different names. Examples of such deities are Dionysos, Bendis, Pan and Asklepios.<sup>98</sup>

In addition, Hygieia has several healing goddesses as equivalents in other cultures, like the Egyptian Isis Medica, Isis Salutaris and Isis-Hygieia whose functions correspond to those of Asklepios and Hygieia.<sup>99</sup> Next, the Babylonian Gula can be equated to Hygieia regarding her iconography and healing capacity.<sup>100</sup> Then, we have several Roman goddesses like Bona Dea who was worshipped as Bonae Daea Hygiae, due to her healing functions.<sup>101</sup> Second, there is a connection with Minerva, the Roman counterpart of Athena who was worshipped as Minerva Medica and is the equivalent

<sup>97</sup> Parker, *Athenian Religion*, 154.

<sup>98</sup> Zaidman and Schmitt Pantel, *Religion*, 88–89, 128–132, 197–207; Carl Kerényi, *Dionysos. Archetypal Image of Indestructible Life* (Princeton, New Jersey: Princeton University Press, 1996), 160–175; Simon Price, *Religions of the Ancient Greeks* (Cambridge: Cambridge University Press, 2004) 52–53, 77–78, 168–169.

<sup>99</sup> Ferdinand Peter Moog, “Zum Kampf der frühen Christenheit gegen die Isis Medica – Bruch und Kontinuität von Traditionen im Übergangsfeld von Heil und Heilung,” *Würzburger Medizinhistorische Mitteilungen*, Band 28 (2009): 256–275; Walter Burkert, *Ancient Mystery Cults* (Cambridge, Massachusetts and London: Harvard University Press, 1987), 15–16; R.E. Witt, *Isis in the Graeco-Roman world* (London: Thames and Hudson, 1971), 192; Renberg, *Where Dreams May Come*, 344, 367.

<sup>100</sup> Barbara Böck, *The Healing Goddess Gula Towards an Understanding of Ancient Babylonian Medicine* (Leiden/Boston: Brill, 2013), especially the second chapter “The Healing Goddess Gula: A Portrait,” 7–44.

<sup>101</sup> H.H.J. Brouwer, *Bona Dea. The sources and a description of the cult* (Leiden: Brill, 1989), 346–348.

of Athena Hygieia.<sup>102</sup> Finally, Salus and Valetudo are closely related to Hygieia within Roman religion. I will elaborate on Athena and Salus, because they are the most discussed figures in relation to Hygieia. Plutarch mentions Athena Hygieia who told Perikles in a dream to heal his workman, who fell from the Propylaia:

“A strange accident happened in the course of building, which showed that the goddess was not averse to the work, but was aiding and co-operating to bring it to perfection. One of the artificers, the quickest and the handiest workman among them all, with a slip of his foot fell down from a great height, and lay in a miserable condition, the physicians having no hope of his recovery. When Pericles was in distress about this, the goddess appeared to him at night in a dream, and ordered a course of treatment, which he applied, and in a short time and with great ease cured the man. And upon this occasion it was that he set up a brass statue of Athena Hygieia, in the citadel near the altar, which they say was there before. But it was Phidias who wrought the goddess’s image in gold, and he has his name inscribed on the pedestal as the workman of it.”<sup>103</sup>

The shrine of Athena Hygieia on the west side of the Akropolis is very important in the celebration of the Panathenaia. According to Aristeides, the altar of Athena Hygieia was set up by the very first Athenians.<sup>104</sup> Robert Garland argues that the most important healing sanctuary belonged to Athena Hygieia until Asklepios made his appearance in Athens.<sup>105</sup> A further explanation is that the Homeric gods were no longer sufficient and that they are unable to satisfy the population, so that new deities have to appear.<sup>106</sup> Hygieia is occasionally associated with Amphiaraos, specifically in Oropos, his principal place of worship. She appears several times alone

<sup>102</sup> Susan Deacy and Alexandra Villing, (ed.), *Athena in the Classical World* (Leiden, Boston and Cologne: Brill, 2001), 138–139.

<sup>103</sup> Plutarch, *Pericles* 13.8 in Bernadotte Perrin, *Plutarch’s Lives. With an English Translation by Bernadotte Perrin*. The Loeb Classical Library, vol. III (Cambridge: Harvard University Press, 1967), 45.

<sup>104</sup> Jennifer Neils, *Worshipping Athena. Panathenaia and Parthenon* (Madison, Wisconsin: University of Wisconsin Press, 1996), 29, 47–48.

<sup>105</sup> Garland, *Introducing New Gods. The Politics of Athenian Religion* (Ithaca, New York: Cornell University Press, 1991), 132.

<sup>106</sup> Robin Mitchell-Boyask, “The Athenian Asklepieion and the End of the ‘Philoctetes,’” *Transactions of the American Philological Association* Vol. 137, No. 1 (Spring, 2007), 94; Sobel, *Hygieia*, 9–10; Jane Ellen Harrison, *Prolegomena to the study of Greek Religion* (Cambridge: Cambridge University, 1961), 343.

or together with this hero.<sup>107</sup> Hygieia as daughter of Asklepios is sometimes also depicted together with Hypnos and Oneiros within incubation cults.<sup>108</sup> Pausanias says that the fourth part of the great altar of the Amphiareion was shared with Aphrodite, Panakeia, Iaso, Hygieia and Athena Hygieia.<sup>109</sup> Stafford claims that the sharing of the altar by Hygieia affects the Athenian cult after Amphiaraos was transferred from Oropos to Athens after the Battle of Chaironeia and where Hygieia would have a place in the Athenian Amphiareion in 330 BC and beyond.<sup>110</sup> Deities indeed could displace each other. Another example is Apollo displacing Gaia as an oracle deity.

Another context which is relevant, explains that people could stay healthy by living sensibly.<sup>111</sup> Athena is also the goddess of wisdom and thus a logical connection. Robert E. Bell adds that Hygieia is mainly the goddess of physical health, but that her function also includes mental health and that she also can be associated with Athena Hygieia.<sup>112</sup> A third idea is according to James D. Warren, who argues that it is Athena who learns Asklepios has brought back the dead to life.<sup>113</sup> Finally, Michael T. Compton offers a fourth explanation, namely that ancient conceptions of health and illness do not distinguish between mental and physical ailments.<sup>114</sup> Thus, Athena Hygieia and Hygieia easily can be associated with each other. Previous ideas go against the concept that the relationship between Athena Hygieia and Hygieia is merely coincidental, because Asklepios cult has not been introduced before the end of the fifth century BC and Hygieia did not appear previously as a separate figure in literature or art.<sup>115</sup> Wroth indicates that Athena was given the epithet “Hygieia” to strengthen her medical skills. This would be a correct assumption when the declining satisfaction about deities is considered. The goddesses could exist separately from one another. Stafford gave more convincing argument for a clearer distinction between Athena Hygieia and Hygieia, when she quoted Lewis Richard Farnell.

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<sup>107</sup> Stafford, *Worshipping Virtues*, 157.

<sup>108</sup> Renberg, *Where Dreams May Come*, 677–688.

<sup>109</sup> Pausanias 1.34.3. (Quoted in: Stafford, *Worshipping Virtues*, 157.

<sup>110</sup> Stafford, *Worshipping Virtues*, 157.

<sup>111</sup> Ferdinand Sturmans, *Asklepios en Hygieia* (inaugurele rede, Katholieke University Nijmegen, 1979), 5. This is of course an anachronistic modern concept of health.

<sup>112</sup> Robert E. Bell, *Women of Classical Mythology. A Biographical Dictionary* (Santa Barbara, California: ABC-CLIO, 1991), 249.

<sup>113</sup> James D. Warren, “Classical pathways to western medicine,” *BC Medical Journal*, Vol. 48, No. 8, (Oct. 2006), 382.

<sup>114</sup> Michael T. Compton, “The Union of Religion and Health in Ancient Asklepieia,” *Journal of Religion and Health*, Vol. 37, No. 4. (Winter 1998), 305.

<sup>115</sup> H.B. Walters, “Athena Hygieia,” *The Journal of Hellenic Studies*, Vol. 19. (1899), 167.

Farnell posits that around 330 BC, sacrifices still were offered to Athena Hygieia. This contradicts the claim that the Hygieia from the Telemachos monument is a development of Athena Hygieia<sup>116</sup> and that after 420 BC no further mention is made of Athena Hygieia, as previously argued by Robin Mitchell Boyask.<sup>117</sup> Farnell himself does not mention the year 330 BC. It appears that his position is based on the celebration of the Panathenaia. It is indicated that all the dedications to Athena date from a later period after 420 BC, but he does not give a clear argument.<sup>118</sup> Stafford qualifies this with the fact that in 330 BC offerings to Athena Hygieia were made during the *Lesser Panathenaia* as attested by an inscription recording the tax levied on the newly recovered territory of Oropos.<sup>119</sup>

Now we look at the Roman Salus. Martin A. Marwood distinguishes four aspects of Salus. First, there is the quality of Salus as a state deity with a major sanctuary on the Quirinal Hill, which was later worshipped as Salus Publica. Second, there could have been a personal Salus. Third, we have Salus as the Romanized form of Hygieia. Salus as Hygieia owned a Latin equivalent, both as a simple condition and, though rarely located, as a goddess in Valetudo. Finally, there is the quality reflected in literary sources, which was at first not identified as a cult, namely *salus* as equivalent of the Greek term *soter* (saviour). This aspect has been evidenced throughout the ruler cult of Julius Caesar, although the evidence for this argument is shaky. Marwood argues that it is more likely that this meaning of *salus* played a pivotal role in later imperial ideology and was part of propaganda concerning Salus Augusti. All these aspects are interrelated to each other.<sup>120</sup> Marwood also describes Latin dedications to the syncretic goddess Salus-Hygieia, in which she is revered together with Aesculapius.<sup>121</sup> Lorenz Winkler examines Salus as goddess of the overall condition concerning the Roman state, focusing on the well-being. The general concept of salvation or well-being, which also played a major role in relation to individuals, was transferred to the state and worshiped as a deity in a personified form. Winkler argues that Salus' iconography is either hard to grasp or in the range of Hygieia, because the mutual identification is insecure. Still, Winkler examines Hygieia in her Greek and Latin form as Hygia in relation to her equivalent Valetudo. Of course,

<sup>116</sup> Stafford, *Worshipping Virtues*, 155. Stafford refers to Lewis Richard Farnell, *The Cults of the Greek States*, 5 vols. (Oxford: Clarendon Press, 1896–1909), I 317–318.

<sup>117</sup> Mitchell-Boyask, “The Athenian Asklepieion,” 94.

<sup>118</sup> Lewis Richard Farnell, *The Cults of the Greek States*, vol. 1 (Oxford: Clarendon Press, 1896), 317.

<sup>119</sup> IG II<sup>2</sup> 334.8–10; Stafford, “Without you no one is happy” 124.

<sup>120</sup> Marwood, *The Roman Cult*, 1–2.

<sup>121</sup> *Ibid.*, 71–73.



Winkler looks also into the concept of *salus*, which as goddess was connected to several values and personifications, but the latter is uncertain.<sup>122</sup> Next, Winkler examines the new image of *Salus* under Vespasian, who was emperor between 69 to 79 AD. In the second century AD, *Salus Augusta* was replaced by *Salus Augusti*, who developed her own imagery on coins due to the civil war in 69. Here, she is depicted holding in her left hand a patera which feeds a snake. This element is adopted from the Greek *Hygieia*. This image was also struck on coins during the republic by *Acilius Glabrio*, who had depicted *Valetudo* with a snake. *Hygieia* was associated with *Valetudo* in the republic as *Hygia* in its meaning as personification, but was adjusted to *Salus Augusti* who was revered as a goddess.<sup>123</sup> Next to *Salus Publica*, who was responsible for the general well-being of the state, stood *Salus* as personal goddess, which coincides with *Marwood*. Here, *Salus* represented the physical and mental state, to which *Valetudo* represented the pure physical health.<sup>124</sup> Before the Flavian dynasty (69–96 AD), there was no relation between *Asklepios* and *Hygieia* and *Salus Publica*, because the well-being of the state had its own content and representation with *Salus Augusta* who had no relation with *Hygieia*. Only from the first century AD onwards do we spot a gradual substantive and iconographic equivalence between *Hygieia* and *Salus Augusti*. This affected the relationship with *Asklepios*, because for example, *Vitruvius* and *Livy* could speak of *Aesculapius* and *Salus*, when others recognized *Asklepios* and *Hygieia*. During the Flavian dynasty, it was not possible to distinguish between *Salus Publica* or *Salus Augusta* and *Hygieia/Hygia*, nor between the private worship of *Salus* and *Hygieia*, who were only worshipped together with *Asklepios*. From 69 AD onwards, we see a more ritual dynamic of the process in which both figures blend into each other or syncretization. This ritual dynamic between *Hygieia* and *Salus* was for now a one-way street, where the private *Salus* could not affect *Hygieia*. *Salus* herself would eventually transform into a pure health goddess herself. The only distinction is that *Salus* was still worshipped independently from *Asklepios*. A more dominant level of ritual dynamic is located between *Hygieia* and *Salus Augusti* and *Salus Publica*, which worked both ways from *Hygieia* to *Salus Augusti/Publica* and reversed. Also, before the Flavian dynasty, the distinction between the state-oriented *Salus* and the Greek *Hygieia* was clearly understood in the Greek East. Two inscriptions from Pergamon and Corinth attest to that.<sup>125</sup> Contrasted to the state cult of *Salus Publica* and the propaganda concerning imperial health, was the worship of *Asklepios* and *Hygieia*, which mostly were

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<sup>122</sup> Winkler, *Salus*, 11–13.

<sup>123</sup> Clark, *Divine Qualities*, 153; Winkler, *Salus*, 90, 142.

<sup>124</sup> Winkler, *Salus*, 90–91.

<sup>125</sup> *Ibid.*, 142–144.

never worshipped separately and had a specific political significance. This changed in the first two centuries of the Roman Empire, when the Asklepios cult became more and more popular, due to the desire for more personal contact with the gods and the quest for healing cults. This trend accelerated in the second century with a visit of the emperor Hadrian to Pergamon. Before, the cult of Asklepios/Aesculapius and Hygieia/Hygia versus the state cult of Salus in the Roman Republic and the Principate (27 BC – 284 AD) were still opposite to each other. The cult of Salus was part of the state polity, whereas the cult of Asklepios and Hygieia gave room for emotions and religious needs, where the gods accepted the personal sufferings of their worshippers, without having to fulfill a political role. The Aesculapius/Hygia cult and the Salus cult were performed separately from another until the third century AD. Still, as argued, their iconography changed from the Flavian dynasty onwards. Aesculapius and Hygia gained more political importance, when they were depicted on the reverse of coins depicting Vespasian. Hygia appeared as Salus Augusti, and after the second century AD, the depiction of Aesculapius and Hygieia on coins increased, and were more and more depicted together alone on coins and medallions. Their political position was further enhanced when statues of Aesculapius and Hygia were placed within the Capitoline temple of Jupiter in Rome which showed a close connection to the Capitoline Trias (Jupiter, Juno and Minerva). In this temple, votives for the salvation of Augustus were offered and which were addressed to the Capitoline Trias and Salus Publica. People prayed for the health of the emperor, where Hygia/Salus Augusti and Aesculapius were also portrayed. During the reign of Trajan (98–117 AD), Hygia, Salus Augusti and Salus Publica were depicted. The Flavian dynasty can truly be viewed as a turning point from where the production of coins and medallions increased on which Aesculapius and Salus-Hygia were depicted. Ultimately, the identity of imperial health – Salus Augusti – with the well-being of all – Salus Publica – which formed the main content of the Salus ideology in the second and third century AD, has been equated with Hygieia/Hygia and with Salus as well as the dominant equivalents of Hygia which integrated into the Salus ideology together with Aesculapius.<sup>126</sup>

Personally, I follow the argument that Hygieia obtained her own regional cult in the seventh and sixth centuries BC, but that Hygieia really became famous when she was brought to Athens around 420 BC. The Telemachos Monument from the early fourth century BC, as mentioned above, confirms this theory. Furthermore, Hygieia is appointed her own altar in the Asklepieion next to Asklepios. In addition, there is already a cult of Athena Hygieia in 420 BC that would fade after the arrival of Asklepios and Hygieia, but there is still a small revival, when in 330 BC during

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<sup>126</sup> Ibid., 144, 149–155.

the *Lesser Panathenaia*, people still sacrificed to her. The cults of Hygieia and Athena Hygieia may have overlapped each other, so that Athena Hygieia as a separate figure was no longer needed. The introduction and development of the cult of Hygieia can be placed in the idea that the fifth century BC was a century of religious innovation, where old gods getting new epithets, minor cults became more important and “new” deities entered Greek religion. In 293 BC, Hygieia and Asklepios were introduced into Roman due to a plague. Here, as discussed above, she was thus eventually equated with Salus in her different forms as abstraction and personification of health and well-being of the state and Valetudo, but also can be seen as equivalent to healing goddesses as Gula, Isis Medica, Isis Hygieia, Bona Dea, and Minerva Medica. I therefore accept Hygieia as the Greek goddess of physical and mental Health and as Olympian goddess, when speaking about Athena Hygieia. Now we have established her status as goddess, I will now examine the concept of health.

## Health in Antiquity

In Antiquity, health (ὑγίεια) was understood as a multi-layered concept. First, there is the biomedical meaning of health, which explains ὑγίεια as a healthy body and mind, a medical product and a kind of cake that was sacrificed.<sup>127</sup> In Hippocratic medicine, ὑγίεια has a double meaning as adaptation between the personal and the components that create the composite and adaptation between the personal and the external environment of which it is part. Within the *De natura Hominis*, ὑγίεια consists of a harmonious mixture (κρῆσις) of the humores (black bile, yellow bile, blood and phlegm).<sup>128</sup> The modern term which comes best near is “homeostasis”, which has the function of keeping internal balance. This mixture works best when opposing forces, such as cold/warm and moist/dry, are combined in a fixed combination with mucus and bile. Although Galen’s contribution to Hippocratic medicine in regard to the active properties of matter, hot, cold, wet, and dry matter, is generally recognized, his work is at the same time not undisputed.<sup>129</sup> He has

<sup>127</sup> Maria Pantelia (project director), LSJ (*The Online Liddell-Scott-Jones Greek-English Lexicon*) s.v. ὑγίεια, 1842. <http://stephanus.tlg.uci.edu/ljs/#eid=109154> (visited, 1 July 2021).

<sup>128</sup> Helen King, *Hippocrates Now. The ‘Father of Medicine’ in the Internet Age* (London: Bloomsbury Academic, 2020), 23–24.

<sup>129</sup> Vivian Nutton, *Galen. A Thinking Doctor in Imperial Rome* (London and New York: Routledge, 2020), 1, 16, 83, 119, 130; Rajkumari Ajita, “Galen and his Contribution to Anatomy: A Review,” *Journal of Evolution of Medical and Dental Sciences*, Vol. 4, Issue 26 (2015): 4511–4513.

often been criticised for his logic mistakes and for the casual, some might say untrustworthy way in which he could slide from plausibility to certainty. For example, he admits his own debts to others (except Hippocrates) much less often than his differences of opinion. As a result, it is not always clear what exactly can or cannot be attributed to Galen.<sup>130</sup> Second, he persisted in the Hippocratic misconception that the body fluids were composed of an equilibrium of four humors and the rationale of medicine was to restore any disease-causing imbalance.<sup>131</sup> A final example concerns Galen's over-optimistic position that he over-estimates the aptitude of empirical experience and testing to verify theories, since he falsely supposes that they have verified his own false theories.<sup>132</sup> The Pythagorean physician Alkmaion of Kroton (ca 500 BC) conceptualized *ὑγίεια* as political metaphor, which combines two concepts: *isonomia* (ἰσονομία) and *monarchia* (μοναρχία). *Isonomia* represents the uniformity of various forces in the body, especially *monarchia*, where one of those forces in the body predominates. In this case, gods do not yet play a role in any intervention, unlike Hippocratic medicine.<sup>133</sup> Second, there is the mathematical understanding of *ὑγίεια* by Pythagoras as synonym for the number six.<sup>134</sup> Third, there is the political dimension, in which *ὑγίεια* is connected to warfare. Hector, in the Iliad, speaks to his troops after a long day fighting: Let it be thus, highhearted men of Troy. Let that word (μῦθος) that has been spoken now be a strong (ὑγυῆς) one." This view is connected to Plato, who spoke about the healthy polis. Finally, there is a philosophical view on *ὑγυῆς*, where Presocrats in the sixth century BC described health as a theory of micro- and macro cosmos. This theory holds that man consists of the same components as the macrocosm. There is a balance between these components that must be shielded from an imbalance, the basis of non-traumatic disorders. Man is therefore dependent on his diet, but also on external factors, as a result of which he can become ill or die.<sup>135</sup> In conclusion, I connect primarily the biomedical and mental dimension of *ὑγίεια* to Hygieia, but is clear that the ancient

<sup>130</sup> Nutton, *Galen*, 3, 107.

<sup>131</sup> Ajita, "Galen and his Contribution to Anatomy," 4513.

<sup>132</sup> R.J. Hankinson, "Epistemology," in R.J. Hankinson, ed., *The Cambridge Companion to Galen* (Cambridge: Cambridge University Press, 2008), 178.

<sup>133</sup> Helen King, "Women's Health and Recovery in the Hippocratic Corpus," in Helen King, ed., *Health in Antiquity* (London and New York: Routledge, 2005), 150–151; Nicholas Vlahogiannis, "Curing' Disability," in Helen King, ed., *Health in Antiquity* (London and New York: Routledge, 2005), 180.

<sup>134</sup> LSJ s.v. *ὑγίεια*, 1842.

<sup>135</sup> James Longrigg, "Presocratic Philosophy and Hippocratic Medicine," *History of Science*, volume 27, number 1 (1989): 1–39.

concept of health comprises more than just body and mind. Therefore, she represents a broad spectrum of different meanings, portraying and protecting health in the Graeco-Roman world.

## Hygieia in incubation scenes

After this long analysis, we can argue that Hygieia can be viewed as the Greek goddess of physical and mental health who has her own cult and was recognized as Asklepios' most important daughter and companion. Together they were brought into Athens to fight the epidemic in the fifth century BC, after which they were transported to Rome to combat the plague in 293 BC. From that moment on, their cult grew gradually into a very popular cult, especially after the first two centuries of the Roman Empire, where they eventually were equated with Salus and Valetudo and found their counterparts in Aesculapius and other healing goddesses. Central to their cult was the healing ritual incubation or temple sleep, in which patients were cured by healing gods in their dreams. Although Hygieia didn't heal patients herself, she is often depicted besides or behind Asklepios on votive reliefs, touching his shoulder. This would suggest her secondary position, which can be strengthened by her role as goddess of health. Still, I argue that we should interpret these depictions on a different way, namely that she supported her father's role as healing deity, restoring their state of health. Since Hygieia's role in incubation has not been studied enough in my opinion, I offer here a small exposition of votive reliefs depicting incubation scenes which depict Hygieia. I will use the Leventi and Renberg catalogues to select the relevant votives.

First, we have a votive relief of pentelic marble (ca. 400 BC), found behind the theatre of Piraeus, which could have been the location of the Asklepieion at Piraeus.<sup>136</sup> We see Asklepios bending over a lying woman, which is covered by a skin. On the left, we see adorants with a child, possible relatives of the woman. Leventi argues, that on the right, we see Hygieia resting on her left leg, although this figure could also be identified as Epione or Iaso. Leventi identifies this scene as an incubation scene.<sup>137</sup> Renberg disagrees with Leventi, keeping this question unanswered.<sup>138</sup> The second example is a votive relief of pentelic marble (390–380 BC)

<sup>136</sup> For a discussion on the Piraeus Asklepieion, see Renberg, *When Dreams May Come*, 183–189, there 186, footnote 168.

<sup>137</sup> R 13. Piraeus Museum 405 (Plate 15) in Leventi., *Hygieia*, 131–132.

<sup>138</sup> Figure 29 Cat. No. Ask.-Peir.1 (Peiraeus Mus. 405) in Renberg, *Where Dreams May Come*, 635.

found near the church of Agia Triada in the Kerameikos area. On the left, we see two figures, possibly the patient's wife and a temple servant, who helped the male patient wrapped in his himation lie on a couch with a piece of cloth or on animal skin. Next to the couch, we observe Asklepios extending his right hand over the patient's hand. Next to Asklepios, we see Hygieia resting on her right leg. Her arm is at her side. This scene is identified as an incubation scene where Asklepios is about to cure the patient by touch.<sup>139</sup> Finally, we observe a votive relief from the Athenian Asklepieion made of pentelic marble (ca. middle fourth century BC). Unfortunately, most heads are broken off or weathered. In this temple depicted with the Ionian column, we see Asklepios at the front and next to him Hygieia, facing left and touching the left shoulder of Asklepios. In front of the left column, we see Epione on a cult table. The temple and the stoa possibly allude to the main buildings on the South Slope of the Akropolis, namely the temple of Asklepios and the Doric Stoa, functioning as an incubation hall.<sup>140</sup> When we combine these votive reliefs with the aforementioned texts which mention Hygieia, we may conclude that indeed Hygieia played a very important role in Greek religion and medicine and was the everlasting support of Asklepios, when curing patients. Because without Hygieia there would be no health to restore and protect. They are dependent on each other. They share each other's functions.

## Conclusions

In conclusion, we can argue that modern scholarship shows personification as an anachronism when the concept is applied to Greek religion. In the general definition of personification, religion and ritual are not mentioned, and it is therefore strange that personification is applied to figures such as Hygieia. In addition, the models outlined above are open-ended and highly subjective, with the exception of Webster. The problem is that a post-medieval understanding and antique religion do not go together. In addition, the concepts of *prosōpopoiia* and *ēthopoiia* cannot be applied (with exception of Hermogenes). Further, Hygieia can be regarded as (light) personification for several reasons. First, the noun ὑγίεια means health and is female in gender. Second, ὑγίεια as Hygieia is depicted as a young woman. Third, health can be described as adjective, for example "healthy people". Fourth, Hygieia must be a weak personification since she has no mythology. Next, I follow the arguments of Lehmann and Stafford and others that when a personification receives

<sup>139</sup> R 19. Athens, NM 2373 (Plate 18) in Leventi., *Hygieia*, 137; Figure 33 Cat. No. Ask.-Ath.2 (Athens NM 2373) in Renberg, *Where Dreams May Come*, 638.

<sup>140</sup> R 37. Athens, NM 1377 (Plate 27) in Leventi., *Hygieia*, 143.

a cult with prayers, sacrifices, cult statues, altars, hope and fear of suppliants, this is a real deity like other deities. This means that the distinction between personifications and deities is no longer valid. The worship of personifications was therefore not a problem in Antiquity. At that time people already made a distinction between gods and personifications, and they knew well what this meant for the worshiper and for the worshiped figure himself. Not only did the deities who lived in heaven deserve worship, but also those who could ascend to heaven. Then, the significant role of religion and ritual has to be reintroduced, since Hygieia is worshipped within the Asklepios cult. When figures like Hygieia are recognizable within a religious or ritual context, they must certainly be viewed as deities. The Hygieia cult played thus a very important role in Greek religion and medicine and as partner to her mythological father Asklepios, to protect the health of the Greeks, first in Titane, then Athens which continued in Rome and the rest of the Graeco-Roman world. Her connection with Asklepios strengthens her position and vice versa. She has a place within the most important triad of healing gods, together with Apollo and Asklepios. As Athena Hygieia she had to protect the Athenians against a terrible epidemic and had counterparts in Salus, Valetudo, Minerva Medica, Gula, Isis Hygieia, Isis Salutaris, and Bona Dea Hygieae, which confirmed her role as goddess. She became more important when she was identified and associated with Valetudo and Salus as Salus-Hygia or Hygia within Roman religion together with Aesculapius. The cult of Salus elevated her status and rapidly increased her popularity in Roman Antiquity. She was worshipped from the seventh century BC until the fifth century AD and even today we have inherited her name in our word hygiene and preventive medicine. Health in Antiquity was as important as it is today. It is the gentle touch of this friendly goddess that inspired Asklepios and the people to worship her, also when she entered the Roman world as Hygia. She represents a broad concept of health, primarily from a biomedical perspective, but also with a political, mathematical and philosophical dimension. I therefore conclude that Hygieia became as important as Asklepios in their communal cult, especially within Roman religion where they are mutually dependent on each other in exercising their profession as healing deities. This has been shown by ancient texts, epigraphy, comparative mythology, and votive reliefs, which were created after a successful incubation experience.

#### *Correspondence*

*Mark Beumer, M.A.*

*Institute for History of Medicine and Foreign Languages*

*First Faculty of Medicine, Charles University*

*U Nemocnice 4*

*CZ-12108, Prague 2*

*Czech Republic*

*ghmmbeumer@gmail.com*

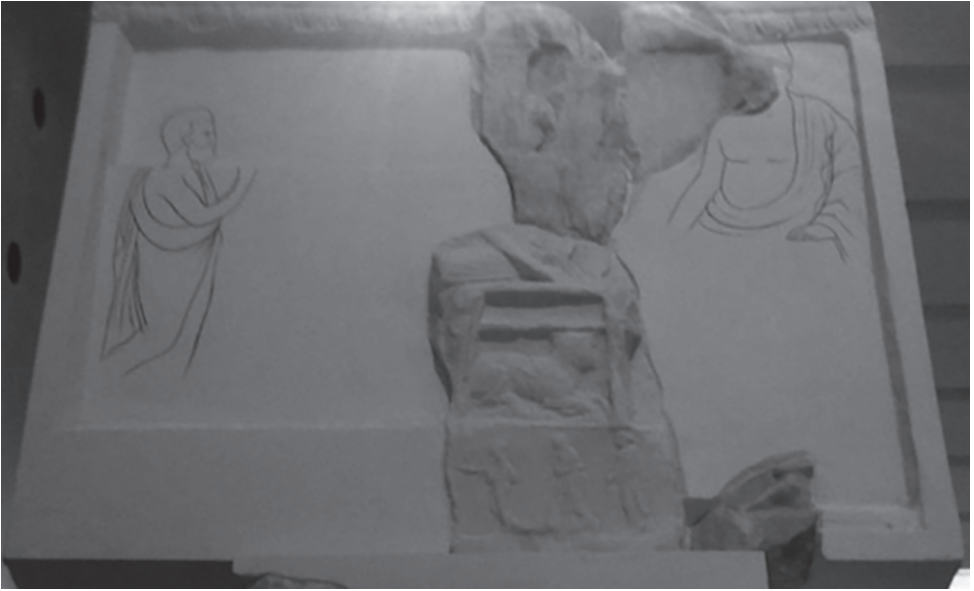


Fig. 1. Telemachos Monument. Athens, Acropolis Museum, ref. no. 5611. Photo by author.



# An analysis of terms “physician” and “medical” in the context of La Tène period and Roman Age

Lucie Burešová

Researchers in archaeology have used various terms of the similar instruments from different geographical areas in their catalogues. The opinions of current medical professionals also cause an issue. There is no consensus on the fundamental question, namely the correct use of the term “medical” for the tools used for the diagnosis and treatment of diseases in periods that do not fulfil the image of modern medicine in terms of information or practices. This paper presents the results of the analysis of the terms “physician” and “medical”, their origin and legitimacy of use for artefacts from the La Tène period and Roman Age, for which the original purpose for diagnosis and treatment is assumed. Special attention is paid to the use of these terms for artefacts originating in the areas of Europe.

**Keywords:** medicine; medical; surgical; archaeology of medicine; history of medicine

## Introduction

Medical terms reflect the degree of development in the field at the time of their creation. Therefore, the etymology, analysis, or synthesis of these terms should not be performed without incorporating the historical perspective (Kábrt – Kábrt 2004, 7). Traditionally, communities use conventional features to assign specific terms to various concepts. In this context, a concept is represented by natural symbolism and enables the communities to recognise the true form of the matter (Spitzer 1975; Stodola 2010). The multidisciplinary nature of the history of medicine requires a consideration of the arguments of archaeologists, but also of the medical historians and physicians. Knowledge of all these fields is applied in this research. For the purposes of this article, the main area of interest is specified as Central Europe (the La Tène period can be dated from 480 to 40 BC and the Roman era can be dated from 40/45 BC to 400 AD).

## Investigated problem and methods

There is no agreement amongst researchers in the fields of archaeology and the history of medicine and the contemporary medical specialists. Philosophy (namely the philosophy of medicine, the philosophy of science and the history of philosophy) also brings fundamental insight into this problem. The main research questions

are: Using the philosophical, historical and modern medicine angles, is it appropriate to call the organised therapeutic practices, observed since the development of the first paradigms in Europe, “medicine” (in this context, medicine is understood as the science and art)? Is it appropriate to call the instruments found in Central Europe, originating from the era since the development of the first paradigms in Europe, medical instruments?

To answer these questions, a literary research is being undertaken. The aim of this research is to determine from which historical period it is appropriate to use the term medical science. The data have been extracted from the original and transcribed written sources, together with contemporary resources, dealing with the history of medicine and the archaeology of medicine. The conceptual framework is based on philosophical resources.

## Concept analysis

Isidor of Seville states that “*medicine is what protects or restores physical health; its purpose is to deal with illnesses and injuries*”, while definition of the purpose of medicine by Soranus of Ephesus is “*to provide, to indulge the health*” (Isidor of Seville 1998, 49). Researchers find three important milestones of development in the history of medicine. Various researchers started to use the term “*medicine*”, to describe the field, from the moment that they consider to be the true beginning of medicine as a field of science. According to Jiří Stodola (2015, 22), science can be defined, using the philosophy of information, as “*an area of human knowledge that is unified by the object of research, the perspective of the object of research, and the methodology*”. Based on the archaeological findings and the Hippocratic works (referring to texts inspired or written by Hippocrates of Kos<sup>1</sup> living around 460–370 BC and by his followers in the broad sense), researchers consider the era from the 5<sup>th</sup> to the 4<sup>th</sup> century BC as a fundamental moment from which medicine could be treated and referred to as a science. It is a moment (the first milestone) in which it is possible to notice the unification of the subject of research and the beginnings of a methodological approach. The beginnings of the early science in the 17<sup>th</sup> century can be described as the second

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<sup>1</sup> The second Hippocrates (he is primarily mentioned in the following text, only in the case of ambiguity is added the number II) is known as the “*founder of Western medicine*”. He was believed to be the grandson of the first known Hippocrates. The collection of works known as Corpus Hippocraticum likely originated from various authors. The possibility that none of the texts came from Hippocrates of Kos himself cannot be ruled out completely. This assumption contrasts with the original approach of attributing some of the texts directly to Hippocrates (e.g. Jouanna 1999).

milestone. Both milestones are characterized by critical re-evaluation of previous practices and by efforts for unification of the current approaches (Sakai 2007).

Sakai (2007) assumes that the fundamental transformation of Western medicine, into the form that continues to today (the third milestone), took place in the 19<sup>th</sup> century. The Hippocratic school stood at the beginning of the development of European (Western) medicine, but the words “*medicine*” or “*medical instruments*” can be tracked back to scholarly texts researching even the previous periods and other territories around the world. Emily K. Teall, in her research of resources of the situation in Mesopotamia since 3000 BC, even uses the word “*doctoring*” (Teall 2014), in addition to the term “*medicine*”. Diagnostic and treatment tools, such as gold, silver or bronze chisels, knives, and obsidian lancets (for example from Peru – Inca Empire; Rifkinson–Mann 1988), have been found and described as “*medical*” by modern researchers. However, other artefacts, with similarities to the current concept of medical devices, were also described by scholars. Examples of these include splints (Egypt ca 2100 BC; Smith – Dawson 1924), dental prostheses (Etruria, Badisches Landesmuseum Karlsruhe 2017, 311; Phénicia and Egypt, Johnson 1959), lower limb prosthesis (China, 3rd–2nd century BC; Li et al. 2013), and lower limb finger prosthesis (Egypt 1550–700 BC, Nerlich et al. 2000). However, the sole finding of individual artefacts, without further evidence of their use by a specialist in an organised scientific practice, does not provide sufficient basis for determining these as activities of medical science. Science arises from the gradual discovery of causal connections, from experience and through systematisation. Abstract concepts are then defined on this basis (Stodola 2019). Epistemology is applied and specialised sciences are formed (Boon – van Baalen 2019). The requirement of measurability, or verifiability of the results of medical science, its repeatability and reproducibility, seems to be problematic to achieve due to the nature of medicine itself. It is necessary to accept the fact that medicine itself does not fulfil the image of exact science, even in its present form. To assess a human in the contemporary medicine, we must follow certain standards, established by analysing statistical data obtained from a large population sample. However, the significant individuality of each subject makes it often impossible to find the same solution, for seemingly the same problem, affecting all patients.

### *Recognition by comparison*

The recognition of medicine, and its contrast to alternative healing practices, is one of the approaches used by researchers to identify medical science in history. For example, the authors of the exhibition “The History of Medicine and Healing in the Czech Lands from the Middle Ages to the Beginning of the 20th Century”, which was held in Prague in 2010 (Kašpar 2010), and presented a large number of artefacts stored in the *Medical Museum of the National Medical Library in Prague*, compared medicine and alternative healing practices.

They used artefacts dating back to the 17<sup>th</sup> century, when the practices of in field were already defined by teachings at University, but there was still no uniformed international terminology. For the purposes of the exhibition, the question of defining medicine was bypassed by presenting a fairly organised field and comparing it with folk practices. The authors focused on the contrast of the two approaches, rather than their separation by precise definition. A similar contrast can be found in Greece in the 5<sup>th</sup> century BC. The existence of alternative practices was described by Hippocratic authors, who condemned enchanting and quackery, but who were generally accepting of the so-called “temple medicine” (Hippocrates 1923a; Bartoš – Fischerová 2012, 22). A number of written sources, from the period before the 5<sup>th</sup> century BC, makes a link between the solution of health problems and deity (Alušík 2018, 53). The question of contrast also arose between Roman surgical practices, probably performed by Roman army surgeons, and the unknown practices of the barbarian population, which can be evidenced only by discoveries of tools, for which there have been no exact analogies (but which show some basic similarities) within the Greek and Roman instrumentarium.

### *Material culture*

Archaeology of medicine in Central Europe (mainly due to the natural conditions and the preservation of artefacts in them) relies primarily on the discoveries of metal artefacts. Also due to the unavailability of written sources from the territory of, what is known today as, the Czech Republic from the Iron Age and the Roman Age, artefacts are limited only to metal tools often used for invasive procedures, which can be described as surgical. Surgery (along with obstetrics) is considered to be the oldest branch of medicine, i.e. medicine as we understand it today (Duda – Niederle 2000, 21). It is not possible to claim that surgery works solely with invasive procedures and medicine deals only with non-invasive practices (moreover, we cannot make this claim even when referring to the current practices). It is important to understand the connection between surgery and the provision of care to the wounded on the battlefield. Although the provision of care on the battlefield was only a part of the surgical field, it is an important reminder of the essence of surgery which is the treatment of health issues, that are often clearly visible to the surgeon, in not necessarily an invasive way. This helps researchers to distinguish surgery from medicine in the broader context. This is in a stark contrast to the idea of medicine.

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<sup>2</sup> There is not enough information about the so-called “*temple medicine*” to assess its relation to medicine. Its representatives are thought to be the priests of Asclepius. The temples provided, among other things, long stay facilities for patients, therefore the temples can be also considered important for their role of removing patients from the places where they might have contracted the disease (Isidor of Seville 1998, 32).

Hippocratic medicine treated conditions and illnesses which were often hidden, and their causes were unclear (according to *On Ancient Medicine*, Hippocrates 1923b; Bartoš – Fischerová 2012, 366). The principle of “not using a knife” has been enshrined in the Hippocratic oath for physicians (Hippocrates 1923b; Bartoš – Fischerová 2012, 152). The ban on physicians practicing surgery was a complicated issue. It is highly likely that the ban was often violated as the surgical texts have been part of the *Corpus Hippocraticum* (e.g. *On fractures*, *On Wounds in the Head* etc.). This was confirmed by Plato, who wrote that drugs and incisions were part of Asclepius medicine (Plato, *Resp.* 407d; Bartoš – Fischerová 2012, 172).

Surgery is characterised by open procedures (disrupting the skin cover of the body or mucous membranes), or so-called bloody procedures (Duda – Niederle 2000, 21). Inseparable part of the surgical field is also formed by bloodless procedures and processes, which often cannot be archaeologically proven. The necessary instruments for these procedures are usually made of non-metallic materials and have been preserved only in rare situations. Examples of preservation of non-metallic equipment can be found in the form of drug box of Pompeii (Bliquez 2014, 432) or leather bags and wooden boxes from the Acropolis of Athens (Bliquez 2014, 17). However, there are also written sources referring to bandage material or wooden urological catheters and probes (Bliquez 2014, 35).

Due to the separate development and different practices in *surgery* and *medicine* (in written sources, it is possible to see references to the divided surgical and medical fields; when referring to medicine, we assume that the practices were close to the contemporary internal medicine), the term “*surgical*” seems to be more appropriate for majority of found artefacts. The word χειρουργία (ή χείρ means hand and εργαειν means clutch or separate) existed in the 5<sup>th</sup> century BC’s Greek language (Bliquez 2014, 6) and indicated manual work, dexterity, or workmanship (Prach 1942, 224, 567). Hippocratic authors, Galen and Erotianus described surgical instruments in Greek with the word ἄρμενον (Bliquez 2014, 6), Hippocrates, Plato and Galen with the word ὄργανον (tool, device; Prach 1942, 374; Bliquez 2014, 6) and Aëtius with the word ἐργαλεῖον (tool; Prach 1942, 223; Bliquez 2014, 6), Celsus in Latin with the word *ferramentum* (Celsus 1938, 494; Bliquez 2014, 6). All terms generally refer to “*a tool*”, but without specification of the field. The Scottish physician and author of the first catalogue of antique instruments (including data obtained mainly by researching cities destroyed by the Vesuvius explosion in the year 79) J. S. Milne (1907) also described the artefacts as “*surgical tools*”<sup>3</sup>. Archaeologist Lawrence J. Bliquez followed Milne’s catalogue. In his works, he has also chosen the designation “*surgical tools*” for

<sup>3</sup> Although the terms “*instrument*” and “*nástroj*” are perceived as synonyms in the Czech language, the English-speaking reader understands an instrument as a specialised object, and tool as a more primitive object.

the Greek instrumentation used from the 5<sup>th</sup> to the 4<sup>th</sup> century BC and subsequently (Bliquez 2003). However, his catalogue has been expanded to include finds from the graves of Colophon, Bingen, Asia Minor, Cyprus, Italy, but also artefacts from the House of Surgeon in Rimini and the Alliano complex. Bliquez considers Milne to be highly qualified to define terms in the English language, primarily for his education and long-term medical practice, but also for his excellent knowledge of Latin and Ancient Greek (Bliquez 2014, 2). It confirms the importance of a cooperation between archaeology and contemporary medicine. The divide between medicine and surgery did not conclude in the Classical period. In Europe, since the 12<sup>th</sup> century, this division (especially through organisations and communities) has led to a number of conflicts. The situation during this period was even more complicated because, along with university-educated physicians and surgeons educated at the college for surgeons, the so-called *barbers* performed selected procedures, such as *bloodletting* (Bagwell 2005).

#### *Current perception comes from the current environment*

Regardless of whether or not it is possible to compare medicine and surgery from the 5<sup>th</sup> century BC with today's medical science, we cannot ignore the view of the modern society on the medical instruments when analysing the topic. The contemporary understating of medical science and legal regulations is influencing the thought processes of researchers and their approach to research of the state of medicine in the past. In terms of the current legislation in the Czech Republic (Act No. 268/2014 Coll. on Medical Devices), a medical device (the term used in the Act) is understood to be *an instrument... (designed) by its manufacturer for a specific use in diagnostic or therapeutic purposes* (Act No. 268/2014 Coll., § 2). The definition of a medical device from today's perspective influences the researchers, primarily because artefacts considered by archaeologists as "*medical instruments*" are analysed using the contemporary criteria. For example, contemporary medical devices include replacements of anatomical structures, therefore archaeologists are tempted to call them "*medical tools*" even when they date back to different historical periods.

The legal definition highlights the requirement for the specific use of an instruments. Thus, for example, a knife, which is presumed to have served more than just surgical purposes, would not comply with that wording. In that case, it is hardly possible to talk about a surgical knife, but instead simply a knife or a multipurpose knife. Although it is necessary to take the different understanding of instruments in the past into consideration, a pure existence of a multi-purpose instrument does not prove the performance of a specific activity. Yet the versatility of instruments is being included in some archaeological works, dealing with the identification of instruments.

At the same time, today's approach even allows custom-made tools, that meet the criteria stated above, to be described as a medical device. The evidence of production

of individual and non-series tools can be found in written sources (for example *On fractures*, Hippocrates 1928; or *Avoiding distress* by Galen in 2<sup>nd</sup> century AD, Singer 2014). Most products were not usually associated with specific workshops, but, at the same time, there were also well-known workshops producing a common range of tools, for example in Pompeii (Bliquez 2014, 15). Even today in the Czech Republic, a serial mass-produced instrumentation is not a requirement for the legitimate functioning of the field of medicine. The instrumentation of the Iron Age and Roman Age in the archaeological discoveries, different from the Roman or Greek tools in other parts of Europe (presumably barbarian parts), does not necessarily clarify that the usual procedures of ancient medicine in that period were not followed in that specific area. However, questions about their producers also arise. Galen wrote about his own designing and manufacturing of new prototypes of tools (from wax), which were afterward produced from the required metals by blacksmiths (Bliquez 2014, 16). It can be assumed that it was not possible to produce instruments, that were equal to Greeks, in the areas where the tool manufacturers were not active. Geographical reach of the activities of Greek medicine in the 5<sup>th</sup> century BC can only be estimated, but in a later period, there was a written request<sup>4</sup>, by an Egyptian “physician”, for sending some instruments from Greece, to be used as templates for further production (Singer 2014, 79; Bliquez 2014, 16). Similar communication could exist in other areas. As Jan Bouzek and Iva Ondřejová (1990, 22) point out, the relationship between inhabitants of the barbarian areas and ancient cities had existed since the Hallstatt period. Ancient documents helped to form our understanding of the inhabitants of Central Europe during the La Tène period and Roman Age and about their relations with Rome. Both Caesar and Tacitus distinguished the tribes of Great Germania, but considered them to represent one unit, while describing the land as rough and desolate (Pečírka – Nováková 1961). The perception of Central Europe by ancient authors, as a wooded and mountainous environment, could have had more than just a geographical significance. The idea of living in a place with difficult accessibility, and in a non-cultivated environment, could have given the impression that the inhabitants of the lands are also uncivilised and have difficulties to access news and ancient knowledge. And yet, an important part of the relationship seems to be the access to education and training, by some individuals from the barbarian lands, in Rome<sup>5</sup> (Pečírka – Nováková 1961).

<sup>4</sup> This information originates from an Egyptian “physician” in Oxyrhynchus Papyrus LIX 4001 and was interpreted as his request to send instruments to him.

<sup>5</sup> For example, Maroboduus spent his youth in Rome near Augustus. He knew the environment and was educated locally. At the same time, information about the military leader Arminius, who also acquired his knowledge in Rome, appears for the first time.

### *Healing versus medicine*

Reportedly, there are about one thousand cuneiform tablets and their fragments that have been related to Mesopotamian healing practices since 3000 BC (Majno 1975, 36). The oldest preserved surgical text in the world, the so-called *Papyrus of Edwin Smith* (Breasted 1991), was written at around 1600 BC (the text was likely based on materials thousands of years older) and is seen by some researchers as a predecessor of the textbooks of traumatology (Dobanovački et al. 2012). In the papyrus, complicated surgical procedures were described, but religious practices, exorcism and astronomy were still important elements in the treatment of patients at that time (Edwin Smith Papyrus also recommended religious practices to address certain cases, van Middendorp – Sanchez – Burrige 2010; e.g. XVIII 18, Breasted 1991). Unlike in Egypt, the new concepts of medicine, which separate activities of the clergy from the organised medicine, began to emerge in Greece. The *founders of medicine* were still worshiped at that time, but the field was able to break free from that practice soon after (Kábrt – Kábrt 2004, 12). The Knoss tablets (15<sup>th</sup> century BC; Bartoněk 1961) and the Pylos tablets (13<sup>th</sup> century BC; Bartoněk 1964) provide evidence of the existence of a specialised activity known as medicine<sup>6</sup> (Ventris – Chadwick 2015). Tablet *PYEq 146* (Aurora 2015) bears the inscription *i-ja-te* (Arnott 2014, 45), which is remarkably similar to the word “physician” used in Greek to this day, i.e. *ιατήρ* or *ή ιατρός* (Prach 1942, 263). They probably belonged to the craftsmen or the so-called *δημιουργός* (*dēmiurgos*; Kábrt – Kábrt 2004, 11).

<sup>6</sup> Among the others, the words *a-ke-ti-ra* (Pylos tablet Aa 815, Aurora 2015; Arnott 1996, 267) and *a-ke-ti-ri-ja* (Knoss tablets KN Ak 7001, KN Ai 739, Aurora 2015) have also been recorded. The words were associated with a physician’s assistant and interpreted as a nurse by some authors, although the word is more often associated with a completely different meaning – a seamstress (Olsen 2018, 84). According to some authors, the word *a-ze-ti-ri-ja* (KN M 683, Aurora 2015) is also referring to nurses (Ventris – Chadwick 1973, 214), or wool processors (Olsen 2018, 174). Hippocrates used the word *ἀκεστρίς* for a midwife, but the tablets probably refer to textile workers (Arnott 1996, 267). The term *re-wo-to-ro-ko-wo* could refer to women treating and washing the wounded (Tritsch 1958), but it may be a name for the workers of water transport, water heating and washing (Carlier 1983). The existence of assistants in the performance of medical interventions is documented by iconographic sources (for example the relief of the tomb of the 2<sup>nd</sup> century AD on Isola Sacra, Bliquez 2014, 431). There is not enough evidence in pre-Christian history to call nursing an organised activity. The origin of the organised practice is usually associated with the early Middle Ages, and the beginnings of nursing education in the 19<sup>th</sup> century (in 1836 a teaching facility for evangelical nurses was established) the first metaparadigms were published in 1859, nursing has been described as a scientific discipline as of the 1950s (Kutnohorská 2010, 13–39).



According to the preserved sources, we can describe the scientific organisation of therapeutic activities in Greece from the 6<sup>th</sup> century BC. The subsequent organisation of the field is related to the creation of Hippocratic texts. However, knowledge about treatment procedures was disseminated without an excessive dependence on mysticism and the supernatural even before Hippocratic text (Kábrt – Kábrt 2004, 12). It should be noted that even the contemporary medicine is not completely free from spirituality. Modern holistic practices focus on the biological, psychological, social and spiritual aspects of the individual (Hawks 2004).

The Hippocratic paradigm<sup>7</sup> included treatment based on observational knowledge and empirical knowledge, but also a causal synthesis that forms the scientific basis (*On Ancient Medicine*; Hippocrates 1923b). Many of the texts by Greek (and later Roman) authors, written primarily in Greek language, provide an insight into the history of the field (Sakai 2007). Hippocratic works summarise many of the principles applied in medicine to the present time (Bartoš – Fischerová 2012). However, it should be noted, that a number of texts have been disputed by some followers of Hippocratic scholars as early as in the 3<sup>rd</sup> and 2<sup>nd</sup> centuries BC. The texts could have been altered by transcripts immediately after the death of its authors (Staden 2006). Later, Galen himself doubted the correctness and authenticity of transcripts of some of the documents (Staden 2006). Despite that, based on these documents, the term “*medical instruments*” has been routinely used by contemporary historians and archaeologists, to describe Greek and Roman artefacts dating back to the 5<sup>th</sup> century BC. The recognition of Hippocrates as a physician and the founder of Western medicine is accepted by the current medical community without any major reservations (e.g. Hanák – Ivanová – Potomková 2015), but the fundamental question is the level of development of science in his time.

### *The beginnings of science*

The text *Περὶ ἀρχαίας ἰατρικῆς* (*On Ancient Medicine*; Hippocrates 1923b) is the first known attempt in the history of Greek thought to give a detailed description (in the form of observation and experience) of the evolution of science from the starting point. It discusses medical methods, as well as questions of the history of scientific methodology in general (Schiefky 2005, 1). Researchers examining Hippocrates’ work deal with three main issues, namely (1) the identification of works from Corpus Hippocraticum, which were written directly by Hippocrates (II) and the identification of Hippocratic works, (2) the primary influence of philosophy on medicine, or medicine on philosophy, and (3) identifying an opposition in

<sup>7</sup> The paradigm is defined by Jiří Stodola (2015, 23) as: “*a framework of thought that forms the boundaries of a certain theory*”.

Hippocratic works<sup>8</sup> (Schiefsky 2005, 2). The different nature of the various writings within Corpus Hippocraticum, and the contradicting information within, raise doubts that there was in fact a unified consensus. The Hippocratic doctrine may have been artificially constructed by modern researchers (Bartoš – Fischerová 2012, 19). However, the heterogeneity of the texts may also be a result of the diverse approaches. Therefore, Corpus Hippocraticum could be a set of unorganised writings of two or more different, and inconsistent, directions of the medicine at the time.

The situation in the 5<sup>th</sup> – 4<sup>th</sup> centuries BC appears to show signs of a scientific revolution and thus the moment of transition to a new paradigm. The paradigm represents a generally accepted research result, that is applied as a template for solving issues of the same matter (Viceník 1997). The text *On Ancient Medicine* (Hippocrates 1923b) points to an increasing number of anomalies, questioning the paradigm and formulating a new one.

According to T. S. Kuhn, if the protoscience (i.e. the science of the pre-paradigmatic period, often characterised by participation of multiple competing schools) develops into normal science, a cycle of science development applies (Kuhn 1982). In this cycle of development, science experiences a crisis, to which it reacts with the scientific revolution and then creates a new science (Viceník 1997). It is the paradigm that establishes science, but even propaganda plays a crucial (if not the only) role in the choice of the winning paradigm, and the number of supporters of the paradigm determines further development of the field (de Paula Assis 1993). In practice, the winning paradigm (the school defining that paradigm) gains widespread acceptance and becomes the foundation for new studies within the field (Kuhn 1982). This will allow a development of a specialisation within the paradigm (the new science), which means that different groups of scientists can devote their research to a certain set of phenomena (de Paula Assis 1993).

In the 5<sup>th</sup> century BC, the concept of τέχνη was applied. We can translate and explain the term as *art*, *science*, or *craft*. It was probably first applied in medicine and was also adopted by Plato and Aristotle. It was a set of procedures organised in a highly systematic way and based on a knowledge of the nature of the subject (Schiefsky 2005, 5). The word ἐπιστήμη (knowledge/science/understanding) takes on the meaning of “*science*”. However, knowledge is a broader term than science. Aristotle laid the foundation of science, in today’s sense of the word, by referring to

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<sup>8</sup> The opposition may be seen in advocates of the hypothesis that medicine should be systematised based on the interaction of one or more contradictions of hot, cold, wet and dry factors. The author of *On Ancient Medicine* (Hippocrates 1923b) explicitly opposes this hypothesis, but his criticism is aimed at defining hypotheses in general. He seeks to emphasise the importance of experience and knowledge (Schiefsky 2005, 2).

the perceivable world (as opposed to Plato, which refers only to eternal and immutable ideas) using the term ἐπιστήμη (Aristotle 1933; Hobza – Zielina 2013, 81–82). According to the author of the text *On Ancient Medicine* (Hippocrates 1923b), medicine was already well established at the time of drafting the work. In Chapter 1, the author even stated that practitioners have the skills to achieve certain results in a reliable way (Hippocrates 1923b; Schiefsky 2005, 5). The field fulfilled the definition of science and, at the same time, demonstrated its history (as an integral part of the scientific field) and development. Philosophy and history of science are interdependent and cannot exist without each other (Smart 1972). However, the development of the instrumentation, which began in the Hellenistic world, does not fully appear until it reaches the Roman world (Bliquez 2014, 6).

To explore the history of treatment practices before the 5<sup>th</sup> century BC, it is necessary to take into account the original meaning of the word myth (μῦθος), where myth means a “word”, and it is generally related to a spoken transmission (compared to the term λόγος, means a “word”, but related to prose and logical reasoning; Hobza – Zielina 2013, 56). It is suggested by the myths that Asclepius, from his position as *the founder of the field*, passed his legacy in the research, theory and experiment to his “sons”, who might have been descendants or followers in a broad sense (Hiliopoulos et al. 2013), in an activity that seems like a protoscience. His followers then established the practice, so it gained fame, not only in ancient countries, but apparently also in the barbarian lands (Künzl 1995). However, the situation in barbarian lands is very difficult to trace.

The designation “*Celtic medicine*” (e.g. Künzl, E. 1987; Künzl, E. 1995; Podborský 1994, 101, 116) appears to be inappropriate for several reasons. There is no evidence that in the barbarian countries during the La Tène period (with which the Celtic ethnic group is associated) the therapeutic and diagnostic practices were conducted in accordance with certain paradigms, with unifying ideas, or that they somehow fulfilled the definition of science. Similarly, the material culture cannot be primarily associated with ethnicity (Hubinger 1988, 47), and it is questionable whether we can designate all La Tène period artefacts, allegedly produced locally, as “Celtic”. Moreover, it is often difficult to establish the place of production of the artefacts found in Central Europe, dated from 500 BC (i.e. the period that is considered to be the beginning of the paradigms application in Greece) to year 0. Furthermore, there is no local written evidence of medical activities in Central Europe, there are also no specific references to these activities in written resources made outside Central Europe.<sup>9</sup> The descriptions made by ancient authors emphasize the magical side of

<sup>9</sup> In the following period (Roman period), the artefacts (in the area under investigation) determined to be “medical instruments”, were often found in rich graves (e.g. Tejral 1970),

the treatment practice in barbarian countries (Plinius, NH, 30, 4; Bostock – Riley 1855) and it is not appropriate to consider these descriptions as objective. This does not mean that therapeutic activities were not carried out, but paradigms of this field of activities cannot be reconstructed based on the artefacts alone. It is possible to deduce the ways in which tools were used and, in combination with anthropological data, it is also possible to estimate the success of certain therapeutic procedures. However, the fundamental thoughts of the field cannot be based on these assumptions. The connection between the local people and their practices in Central Europe and in Greece is not clear, although it is suggested by E. Künzl (1995), based on his research of some artefacts. He assumed that the transfer of information about medicine, between the Greeks and the Celts, took place from the 4th century BC (Künzl 1995, 221). However, contact with the Greek practice could have taken place even earlier, as other elite imported artefacts from the Hallstatt period have been documented (Golec 2015, 125). Combining Central European activities with practices of the ancient world is problematic, as the imported artefacts do not demonstrate the same structure in their approach to solve health issues.

### *Growth and crises*

The field continued to develop in 4<sup>th</sup> century BC and followed Alexander the Great to Asia. Following that, Diocles of Carystus made significant advances in surgery and the design of new instruments (Eijk 2000, vii), Praxagoras focused on the study of anatomy (Tsoucalas et al. 2019), and Herophilus moved the field to Rome (Wiltse – Pait 1998). In the 2<sup>nd</sup> century BC a terminology was developed. Galen's main contribution to the field lies in the creation of an extensive synthesis of ancient medical knowledge and its interpretation into an accessible terminology, thus providing a basic framework for a coherent scientific system (Kábrt – Kábrt 2004, 13).

However, it is very difficult to estimate the level of accuracy with which the original practices have been followed. Cassius Dio wrote in his Roman history that “*he clearly heard that Antoninus (note: means Markus Aurelius) died, not because of illness, but because of the physicians who wanted to please Commodus*”<sup>10</sup> (Dio – Foster 1914, 72.21.1,

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Roman-style villas (e.g. Elschek 2017) and places of Roman permanent, or temporary, military camps (e.g. Fojtík – Jílek – Popelka 2015).

<sup>10</sup> ὅτι καὶ Ναρισταὶ τάλαιπυρῆσαντες τρισχίλιοι ἄμα ἠϋτομόλησαν καὶ γῆν ἐν τῇ ἡμετέρᾳ ἔλαβον (Dio – Foster 1914, 412, Exc. UG 66, 72.21.1). καὶ εἶγε πλέον ἐβεβιώκει, πάντα τὰ ἐκεῖ ἂν ἐκεχειρώτο: νῦν δὲ τῇ ἑπτακαϊδεκάτῃ τοῦ Μαρτίου μετέλλαξεν, οὐχ ὑπὸ τῆς νόσου ἦν καὶ τότε ἐνόσησεν, ἀλλ’ ὑπὸ τῶν ἱατρῶν, ὡς ἐγὼ σαφῶς ἤκουσα (Dio – Foster 1914, 412, 72.21.2), τῷ Κομμόδῳ χαριζομένων (Dio – Foster 1914, 62, Xiph. 267, 4–14 R. St., 72.34.1).

72.21.2, 72.34.1). This statement may be expressing the author's consternation that physicians have acted against the Hippocratic doctrine (and the oath of a physician, by killing the patient), it may also be addressing a situation in which physicians have been unable to cure the patient's disease. The situation of intentional killing would be contrary to the already determined principle of *nil nocere*, or "at least not to hurt" (Isidor of Seville 1998, 12). It would also contradict the original wording of the so-called Hippocratic Oath (Hippocrates 1923b), which enshrined the practice of eliminating any actions, that could be harmful to the patient.

Another important point in history, in which medicine achieved a high degree of development, is the 7<sup>th</sup> century in Asia. Arab physicians translated Greek classics and also presented their own works. Avicenna's *Canon of Medicine* (Avicenna 1999) codified Arabic-Greek medicine (Kábrt – Kábrt 2004, 13). This was the most important step in the development of the field, until the first universities were established in Europe, however, the university masters drew information mainly from Galen's works. Some literature suggests that the development on the European continent, between the collapse of the Western Roman Empire and the establishment of the Salerno medical school around 1100 AD, represents the decline in the field (for example Porter 2001, 129).

Researchers, who promote the idea that medicine can be identified as a science only in the modern history, support their argument not only by significant advances made in the modern era, but also by the lack of systematic approach and terminology used in previous periods. However, documents already from the 12<sup>th</sup>-century university in Salerno illustrate a well-advanced system of teaching and scientific work (e.g. Ferraris – Ferraris 1997).

Even the term "*modern medicine*" is not accepted unilaterally. Some scholars consider the works of Jacob Berengar (1460–1530; Kachlík et al. 2008) to be an act of modern medicine. Within the territory of today's Czech Republic, the University of Prague was established, together with the works of its masters, for example Master Klaret who contributed fundamentally to the development of the terminology (the term *lékařstvo cirologia* appears in his dictionary; *cirologia* is most likely a word used to denote surgery; at the same time the "Old Czech" language used the term *lékařstvie ranné*; Michálek 1989, 62). Several important milestones in the development of medicine, led by Jan Jessenius' first public autopsy in our country, had been achieved. However, anatomical autopsy was performed even earlier. There are well known cases of the application of the procedure by Herophilus (330–250 BC) and Erasistratus (304–250 BC) dating back to ancient Alexandria. However, most of the ancient anatomical treatises were lost, with the exception of Galen's works, when the medieval medical university education rose to prominence (Sakai 2007). The autopsies in Europe were supervised by university educated physicians but performed by surgeons (this is an example of a separation of labour and authority between the

different fields). Since 1516, the profession of barbers disappeared in many countries (but barber-surgeons still existed in Germany and England), and autopsies were routinely performed by master physicians (Bagwell 2005).

### *Modern medicine*

The end of the 19<sup>th</sup> century is perceived as a period of fundamental changes in Western medicine. This is also reflected by Bliquez (2014). Progress was so rapid (in terms of the formation and standardisation of the field), that previous conditions were being marked as inadequate and the term “medicine” was reserved for the practices of the new period only. The first binding anatomical nomenclature in Latin has been in place since 1895 (Kachlík et al. 2008). The orchestration of the field can be performed using only the uniformed terminology and nomenclature<sup>11</sup>, which is necessary for the flawless communication between experts. The orchestration of the field is a crucial step (and Galen’s writings was also a good example of that; Singer 1956). Anatomical descriptions can exist without specific terminology, but these descriptions may hinder the dissemination of information to recipients. They are comprehensible only to some specialists with the knowledge of anatomy and allow differing interpretations, without the possibility of verifying the accuracy of information (Sakai 2007). Thus, without the generally applicable anatomical nomenclature, it was not possible to continue the development of anatomical science and medicine as such.

The development of the anatomical nomenclature can also be investigated. T. Sakai (2007) has found a total of five stages in the historical development of anatomical terminology since antiquity. The Galen’s oldest anatomical treatises represent the initial phase. However, Sakai points out that they contain only a limited number of anatomical terms, which were essentially colloquial expressions in the Greek language of the period (Sakai 2007). This anatomical nomenclature is based on the Hippocratic works, as well as works of Herophilos and Erasistratus (Kachlík et al. 2008). Sakai puts the second phase of anatomical terminology to the beginning of the 16<sup>th</sup> century (mainly referring to Vesalius’ *Fabrica*<sup>12</sup> from 1543), the third phase stands at the end of the 16<sup>th</sup> century (the main representatives were Sylvius in Paris and Bauhin in Basel), the fourth phase is based on the anatomical textbooks written in Latin in the 17<sup>th</sup> century, and in modern languages in the 18<sup>th</sup> and

<sup>11</sup> Nowadays, the nomenclature plays an important role primarily in anatomy, histology and embryology (Kachlík et al. 2008). Codes and terms from the International Classification of Diseases, the so-called ICD 10 (i.e. the 10<sup>th</sup> revision of this classification), are used for diagnostics in all medical disciplines.

<sup>12</sup> Vesalius’ illustrations circumvent the need for terminology in his work, yet they cannot replace exact concepts in everyday practice.

19<sup>th</sup> centuries, the fifth phase is dated from the late 19<sup>th</sup> century to the current revision of anatomical terminology (Sakai 2007). This division into phases reflects the important milestones in the development of medicine, with the last (fifth) phase encompassing the period from the 19<sup>th</sup> century to the present. However, in addition to the widespread development of recognised methods, the fifth phase is also associated with several theories identified as pseudoscience (e.g. *phrenology*) or with vociferously rejected practices (e.g. *eugenics*). The interest of contemporary medicine in practices known since the 5<sup>th</sup> century BC (Bliquez 2014, 1) and with an older instrumentarium, such as obsidian scalpels, is notable (Disa – Vossoughi – Goldberg 1993). The roots of this enthusiasm can be found in the 18<sup>th</sup> century, when surgical instruments were being discovered in Herculaneum (1738) and subsequently in Pompeii (1748; Bliquez 2014, 2; **Fig. 1**). It should also be noted that the interest in this issue led to counterfeiting of archaeological artefacts (mainly from famous places like Pompeii, but also from areas like Stradonice domestically), which peaked at the turn of the 20<sup>th</sup> century.

## Synthesis and conclusion

Since the 13<sup>th</sup> century BC there has been a provable continuity in the use of the term “physician” in Greek language, but the concept of medicine has changed over time. Evidence of the scientific approach couldn’t be found before the Hippocratic texts. Medicine is now considered an applied science. However, the occurrence of practices that do not correspond with today’s idea of medicine, or the decline of the field at certain times in history, does not disprove the existence or continuity of medical science. Logically and philosophically, the periods of decline can be identified as a crisis preceding the scientific revolution. A research into the historical background of the field, and numerous rewritten sources, suggest that medicine can be viewed as a science and an art (i.e. as specialisation/craft/expertise), since its first scientific revolution (the moments of development of protoscience into science). The deciding argument for identifying concrete terms for description of instruments (typically archaeological artefacts), is the separation in the development of medicine and surgery. If an artefact is indicative of the instruments used in surgery, and it is dated to the period in which the disciplines were separated, it should be referred to as a surgical tool rather than medical tool.

The fundamental argument for answering the question of correct use of terms in the archaeology of medicine must be searched for in history, and in factual content from the individual historical periods within the field. The practice from the Hippocratic period can be compared to medicine from today’s perspective because, it showed elements of science, and the cycle of development of science

was applied. Surgery has experienced a separate development. Its relationship to medicine has changed over time. The description of surgery (separate from medicine) was established by documented discoveries of instruments and also written resources dating from before 5<sup>th</sup> century BC. The field of surgery has continued to develop to the present day. However, it is no longer an independent discipline. It has lost its individuality and has become a part of a new field which, in accordance with a holistic approach, strives to comprehensively solve all problems of an individual as a human being. By reference to the written resource, the metal artefacts found in the area of interest, including scalpels, knives, spatulas, tweezers, needles and saws, can be considered instruments used for surgical procedures.

The designation of instruments in written resources and the organisation of the field in the particular period (mainly because of the division between medicine and surgery, with different forms of acquiring knowledge and experience) must be also taken into consideration. The identification of instruments as surgical should be taken into account when describing them in catalogues of archaeological findings.

The situation in the 16<sup>th</sup> century can be viewed as the first steps in the pursuit to unravel the complexity of medicine, rather than simply as a union of the two disciplines (medicine and surgery). It was another step in the development towards the current state. Pre-16<sup>th</sup> century, medicine was still adopting new practices.

In order to understand the historical developments, it is necessary to break away from the current perception of medicine and accept this seemingly ambiguous picture. The fundamental criteria for recognising the maturity and structure of the field is often not dependent on the level of knowledge or the perceived complexity of the scientific methods, but upon the overall concept and its primary focus.

An understandable argument for using the term “*medical tool/instrument*” (although inaccurately), even when in conjunction with periods that do not meet the criteria for the definition of science and modern form of medicine, is the consistency, ease of access to information and its transfer among researchers. The term is frequently used and directs readers straight to the contemporary concept of medicine and thus the search results may include information covered by the current medical device characterisation. However, as stated, precise terminology is a fundamental requirement for the functioning and development of science and the term *medical* should therefore only be used in conjunction with a discipline that fulfils the definition of science or is part of the history of medical science. Therefore, it should be avoided to associate the term with artefacts for which this connection is demonstrably non-existent, or with *surgical instruments*. It is therefore inappropriate to use the term “*Celtic medicine*”. It is also necessary to exercise caution when describing tools that could serve multiple purposes. Their designation as *surgical* is questionable, as the discovery of an instrument alone does not necessarily prove the concurrent presence of a specialist.



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*Correspondence*

*Ing. Mgr. Bc. Lucie Burešová*

*Institute for History of Medicine and Foreign Languages*

*First Faculty of Medicine, Charles University*

*U Nemocnice 4*

*CZ-12108, Prague 2*

*Czech Republic*

*buresova.lucie@gmail.com*



Fig. 1: Surgical procedure pictured on a mural in Pompeii (Nass 1907, 6) identified as *Iapyx treats Aeneas* (Bliquez 2014, 439). After: Nass, L. (1907) "Blessés et avariés", *Le Correspondant médical* 306, 6–11.

# The Food of the Gods in the Empire of Man

## Mushrooms and their use in everyday life and medicine in classical antiquity

Martin Zázik – Miroslava Daňová<sup>1</sup>

In antiquity, references to a very specific type of food began to appear for the first time in literary works. This food had already been noticed by the Greeks, who remained very skeptical about its consumption. The Romans, on the contrary, highly valued it. It became very popular, especially with the wealthy class of Roman society. This food changed history at least once – when it became the tool for the murder of Emperor Claudius. And while Emperor Tiberius paid 200,000 sesterces to establish whether or not this was the best type of food, the Roman intelligent class warned ordinary people about it. We are talking about mushrooms, the food of the gods.

**Keywords:** Classical antiquity; mushrooms; medicine; diet; poisoning; toadstool; boletus; fungi; suillus; truffles.

### Mycophiles and mycophobes

Although people have been familiar with mushrooms since prehistoric times, the first brief references to them only occur in the 5<sup>th</sup> century BC in *Epidemicorum*, part of collection *Corpus Hippocraticum* (Hipp., *Epid.* VII, 102). They are described in more detail by Theophrastus of Eresos, a philosopher and founder of botany living at the turn of the 4<sup>th</sup> and 3<sup>rd</sup> century BC. In his ten-part study, *Περὶ φυτῶν ἱστορία* (Latin *Historia Plantarum*), he categorized them as plants, which did not change until the invention of the microscope in the 19<sup>th</sup> century. Theophrastus considered mushrooms to be an exception to the vegetable kingdom because they exist without characteristic organs such as roots, flowers, leaves, fruit or bark (Theoph., *Hist. Plant.*, I, 1.11).

At the beginning of the 2<sup>nd</sup> century BC, a new phenomenon called mycophobia appeared. The first person to signify it was the poet and physician Nikandros of Colophon. In his toxicological handbook, *Alexipharmaca*, he comments in a negative way about mushrooms. He calls them “the repulsive ferment of the earth,” claiming that “they cause health problems just to annoy man” (Nic., *Alexiph.*, 521–522). This approach was adopted by later authors and became very popular, especially in Roman works.

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A very mycophobic attitude was taken by the naturalist Pliny the Elder in his encyclopedic series *Naturalis Historia*, where he devoted three chapters to mushrooms (Plin., *NH.* XIX, 11; XXII, 46, 47)<sup>2</sup>. This author is also the main source of our knowledge of mushrooms from the period of the Roman Empire. His opinion was strongly influenced by older authors from whom he uncritically took up many myths and superstitions. The doctor Claudius Galenus was even more negative about mushrooms in his work *De Alimentorum Facultatibus*, in which he urges people to stay away from them and not to eat them, because all kinds of fungi indiscriminately cause health problems. He disgustedly added that “mushrooms, of all kinds of food, have the coldest, slimiest and thickest juice” (Gal., *De Alim. Facult.* II, 69).

In many cases, such hostility is understandable. For example, the Greek poet Euripides wrote about the oldest known case of poisoning in which a mother of three children died (Ath., *Deipn.* II, 61A). Cicero, in his letter to Marcus Fadius Gallus, complained that although he was not sick of oysters, mushrooms gave him stomach problems (Cic., *Ad Fam.* VII, 26). Plutarch condemned mushrooms because he believed they are an unnecessary whim and people consume them only because they are expensive (Plut., *De Tuen. San. Prae.* VI). Likewise, Juvenalis considered them as one of the pieces of evidence of Roman vanity and gluttony (Juv., *Sat.* XIV).

Mushrooms are mentioned by many other ancient figures: Dioscorides (Diosc., *De Mat. Med.* II, 175; III, 1; IV, 83)<sup>3</sup> and Ovid (Ov., *Fast.* IV, 697), Horace (Hor., *Epis.* I, 9.5–6), Seneca (Sen., *Quest. Nat.* IV, 13.9), Petronius (Petron., *Sat.* 38, 109), (Sat. Martialis (Mar., *Ep.* I, 20; III, 45, 60; VII, 20, 78; XI, 18, 31; XII, 17, 48; XIII, 48, 50; XIV, 101)<sup>4</sup> and Suetonius (Suet., *De Vit. Caes.* III, 42; V, 44), Celsus (Cels., *De Med.* V, 27.17) and Athenaeus of Naucratis (Ath., *Deipn.* II, 60.B–62.D). The cookbook *De Re Coquinaria*, known especially under its eponym *Apicius*, is irreplaceable due to it being a valuable source of contemporary recipes (**Fig. 1**). Its author believed to be Marcus Gavius Apicius, is one of the rare examples of an ancient mycophile. Another mycophiles we know mostly from epigrams of Martialis and work of Suetonius. The latter mentions examples of mycophiles in the Julio-Claudian dynasty, emperors Tiberius (Suet., *De Vit. Caes.* III, 42) and Claudius (Suet., *De Vit. Caes.* V, 44).

<sup>2</sup> Other information are mentioned by Pliny in short chapters (Plin., *Nat. Hist.* XIX, 12, 13, 14; XXV, 57) and notices (Plin., *Nat. Hist.* XIII, 50; XIV, 8, 13, 35, 77, 96). Chapters mentioning *agaricum* as part of method of medical treatment are not included in the list.

<sup>3</sup> Secondary notices in Diosc., *De Mat. Med.* I, 109, 168; II, 98, 137; III, 26, 118; IV, 84, 108; V, 11, 21, 114, 126, 131, 135, 136, 142.

<sup>4</sup> Also supposititious epigram XXII *To Macrinus*: „You used to say, Macrinus, that men never died of mushrooms. But mushrooms have at last been the cause of your death.“



The youngest and equally valuable is the *Geoponica*, a Byzantine collection of ancient works about agriculture, compiled in the 10<sup>th</sup> century. Its main source is Pliny the Elder and, in addition to dealing with antidotes and the prevention of fungal poisoning, it also mentions otherwise unexemplified method of mushroom growing. Remarkably, Roman authors dealing primarily with agriculture (e.g. Cato and Columella) do not mention fungi at all.

## The mushroom guide of antiquity

Ancient man, usually living in the countryside, undoubtedly came into contact with mushrooms throughout his whole life. Although he may have initially had one common name for them, over time he assigned individual names to each species he recognized.

In the Greek world, they recognized fungi under the term *mykés* (μύκης). Hippocrates (Hipp., *Epid.* VII, 102) and Euripides (Ath., *Deipn.* II, 61B), and later Theophrastus (Theoph., *Hist. Plant.* I, 1.11, 5.3, 6.5; *De Od.* I, 3), Nikandros (Nic., *Alexiph.* 521–538)<sup>5</sup> and Dioscorides (Diosc., *De Mat. Med.* IV, 83), used this term for them in the 5<sup>th</sup> century. This term did not change, even during later periods. In Latin literature there is a different term – *fungus*. It is quite rare in the singular, and the most common form is the plural *fungi*. This term, like *mykés*, is a general name for mushrooms and does not refer to any particular species. However, this can be done by adding an adjective that specifies a substantial detail or feature characteristic for a particular mushroom species. We can use *fungi farnei* as an example, which only appears in Apicius (Apic., *De Re Coq.* VII, 15). The term “*farnei*” may be etymologically related to “*fraxinei*”, which would refer to mushrooms growing next to ash trees (Houghton 1885, 47)<sup>6</sup>. The most famous and the best kind, growing close to these trees, is the common morel (*Morchella esculenta*) (**Fig. 2**). Currently, this interpretation is generally accepted, and in *De Re Coquinaria* translations from J. D. Vehling and later, *fungi farnei* are translated as morels.

On the contrary, there are collocations that are unlikely to refer to a particular type of a mushroom. Among them is Ovid’s *fungos albos*, literally meaning “white

<sup>5</sup> Athenaios also quotes the Nikandros’ lost work *Georgica* (Ath., *Deipn.* II, 60F; IX, 372E).

<sup>6</sup> The study of W. M. A. Houghton from 1885 appears to be most influential of all for later authors. Number of them accepted his opinion without further critical study (for example Rolfe, Rolfe 1925). Some of the opinions appear to be outperformed, but as D. Benjamin says „it would take the persistence of another classical scholar to discover if he missed or misrepresented anything“ (Benjamin 1995, 30. Jaeger 2011, 15).

mushrooms” (Ov., *Fast.* IV, 697). Although within the context it can be merely identified as the field mushroom (*Agaricus campestris*), it is unlikely to be used as a common name. Several other types of mushrooms documented by the Romans were known under the similar description.

In addition to *mykés* and *fungi*, we have preserved many specific terms. One of the oldest is *pezis* (πέζις), referred to by Theophrastus when he mentions it along with truffles and *mykés* as being rootless plants (Theoph., *Hist. Plant.* I, 6.5). Houghton (Houghton 1885, 35) and his contemporaries assumed it is the mosaic puffball (*Handkea utriformis*) or another kind of puffball (*Bovista sp.*). However, this interpretation relies on Athenaeus’ (Ath., *Deipn.* II, 61E) and Pliny’s (Plin., *NH.* XIX, 14) transcripts of Theophrastus’ work. They contain information (e.g. the absence of stipe or the smooth surface of the pileus), which are not mentioned in the original. However, most modern authors, despite the contradictory sources, continue to consider *pezicae* as puffballs (Dugan 2008, 20; Rogers 2012, 77; Kiple – Ornelas 2000, 316. Also Merriam-Webster Dictionary, see notes for an etymology of the word “pezograph” (Pezograph)).

A little clearer is the *agarikon* (ἀγαρικόν), which was first mentioned by Dioscorides (Diosc., *De Mat. Med.* III, 1). Pliny very often writes about it under the term *agaricum* (Plin., *NH.* XIII, 57). They both describe it as a mushroom that grows abundantly on trees in different Mediterranean territories, usually in Anatolia and the Gallic provinces. It got its name after the cape Agarum in the Black Sea Sarmatia, which Dioscorides also mentions in connection with its occurrence (Diosc., *De Mat. Med.* III, 1). Because of its significant use in ancient medicine, this term is usually interpreted as quinine conk (*Laricifomes officinalis*), but we can assume that it could have referred to several species of Polyporales mushrooms.

Both *Pezicae* and *Agaricum* are Latinized Greek names. A different case is *boletus*, which first appears in the 1<sup>st</sup> century AD in the writings of Pliny (Plin., *NH.* XXII, 46), Seneca (Sen., *Quest. Nat.* IV, 13.9) and Petronius (Petron., *Sat.* 38), and later in the Greek form *bolités* (βολίτης) at Galen (Gal., *De Alim. Facult.* II, 69). It was mentioned multiple times by Martialis (Mar., *Ep.* III, 60; XII, 48; XIV, 101), Apicius mentioned it in several recipes (Ap., *De Re Coq.* VII, 15) and Juvenalis mentioned it once briefly (Juv., *Sat.* XIV.8). Thanks to Pliny’s description, we can safely claim that it is primarily a Caesar’s mushroom (*Amanita caesarea*), which became a highly valued type of food in the Roman environment (Fig 3). However, he also mentions poisonous kinds, so *boletus* may have represented toadstools in general (Plin., *NH.* XXII, 46).

The mushrooms that are very popular these days in the Central and Eastern Europe area were known by the Romans under the name *suillus*. This name is first mentioned by Pliny (Plin., *NH.* XXII, 47). Pliny’s description of *suilli* is quite confusing but contains some crucial information. However, the most important clue is the etymology. The basis of the word points to the association with swine

(*sus* = pig; *suillus* = swine, belonging to swine). Today in Italy, the term *porcino* (i.e. “swine fungi”) refers to penny buns (*Boletus edulis*) and *porcinello* refers to scaber stalks (*Leccinum scabrum*) (Houghton 1885, 32), both of which match Pliny’s descriptions. However, it should be kept in mind that *suillus* probably served to designate several kinds of mushrooms of genus *Boletus*, not just penny buns.

Ancient authors paid a great deal of attention to truffles. These, like *mykés* and *agarikon*, are mentioned by Theophrastus under several names (Theoph., *Hist. Plant.* I, 1.11). The basic term was *hydnon* (ὑδνον). This word is also briefly mentioned by Dioscorides (Diosc., *De Mat. Med.* II, 175); however, Galen (Gal., *De Alim. Facult.* II, 68), Plutarch (Plut., *Symp.* IV, 2) and Athenaeus (Ath., *Deipn.* II, 62A–D) mentioned it more often. There is no doubt that these preserved descriptions are of truffles. The Roman equivalent of the word *hydnon* is *tuber* (plural *tubera*), sometimes used in its extended form of *tubera terrae*.

Other names alternately appear to have been used by Theophrastus, Pliny and Athenaeus. Theophrastus first mentioned the names *keranion* (κεράνιον), *iton* (ἶτον) and *aschion* (ἀσχίον) (Theoph., *Hist. Plant.* I 6.5).<sup>7</sup> He claimed that *aschion* (Theoph., *Hist. Plant.* I, 6.9) and *geraneion* are synonyms of the word *hydnon*, while *iton* is a Thracian name (Theoph., *Hist. Plant.* I, 6.13). With Athenaeus, *geraneion* appears in the altered form of *geraneion* (γεράνειον) (Ath., *Deipn.* II, 62A) and with Pliny as *geranion* (Plin., *NH.* XIX, 12). The etymology of all three versions is clearly derived from the word *keranion* (κεράνιον), or “storm”, which is undoubtedly related to the myths about the origin of truffles.

Pliny, however, considers *iton* and *geranion* to be synonyms of another species (Plin., *NH.* XIX, 12), which Theophrastus calls *misý* (μίσην). According to Pliny’s description in a separate short chapter, it seems to be most likely that they are fruiting bodies of the genus *Terfezia* (*Terfezia* sp.), also referred to as false or desert truffles.

Many other very unclear names appear in ancient literature, but they are virtually impossible to identify due to the absence of any descriptions or context. One of them is the *helvella* which Cicero mentions, along with mushrooms and truffles, as one of the “gifts of earth”, which was becoming more and more popular (Cic., *Ad Fam.* VII, 26). Others are *amanitai* (ἀμανίται), which Galen considers to be the second safest species, right after *boleti* (Gal., *De Alim. Facult.* II, 69). Athenaeus also briefly mentioned it (Ath., *Deipn.* II, 61A). It is a pity that there is no detailed description of it, as it could have been an important species in Greece. Houghton interprets it as meadow waxcap (*Cuphophyllus pratensis*), but this has no basis (Houghton 1885, 48).

<sup>7</sup> Note: Once he also mentions with them οὐγγον (Theoph., *Hist. Plant.* I 6.9), but further explains that this plant also has leaves and its bulb is very tasty (Theoph., *Hist. Plant.* I 6.11), so it is certainly not a mushroom, but some kind of a root crop.

## Snakes, storms and rusty nails

Ancient scientists made many relevant observations. For example, that some mushroom species grow on particular kinds of trees and that they appear more often after rain. Pliny even describes in detail the entire process of *boleti* growing (Plin., *NH.* XXII, 46). However, empirical experience was limited by technology, as many aspects of mushrooms are exclusively observable at a microscopic level. In such cases facts were replaced by folklore.

In antiquity, the idea that mushrooms grow from rotten, decomposed material prevailed. They called them the ferment of the earth. Dioscorides claimed that they cannot be stored because they already grow rotting (Diosc., *De Mat. Med.* IV, 83). Pliny mentioned that the fruiting body of *boleti* first appears in the form of a sticky foam before it becomes solid (Plin., *NH.* XXII, 46). It is possible that they considered mycelium as mold or rot since some authors emphasize that mushrooms are plants without roots (Theoph., *Hist. Plant.* I, 1.11, 6.5; Plin., *NH.* XIX, 14).

According to ancient authors, the poisonous character is not indicated by the type of mushroom, but the circumstances of its growth. Nikandros claims that poisonous mushrooms, “due to snakes’ poison and breath grow in the deep furrows after they slither there” (Nic., *Alexiph.*, 523–524). It is possible that Nikandros did not think of this explanation himself, but it had already been part of Greek folklore. The idea of snake poison affecting the mushrooms’ edibility continues later – according to Dioscorides, poisonous mushrooms grow close to snake burrows (Diosc., *De Mat. Med.* IV, 83).

This Greek superstition gradually got to the Romans, exclusively in connection with *boleti*. They already knew that young toadstools are initially wrapped in a universal veil that tears over time as the fruiting body gradually emerges. Pliny considered this moment decisive in determining whether the *boletus* would be edible or poisonous. He writes that “if there is a snake’s nest near them and the snake breathes on them as they open, and because they are naturally related to poisonous substances, they tend to absorb such poison” (Plin., *NH.* XXII, 46).

This tendency for the absorption of poisonous substances appears to be Pliny’s explanation of everything written about mushrooms by older authors. They claimed a variety of factors affected the toxicity of mushrooms. Dioscorides warns of mushrooms growing near rusty iron and rotten cloths. The toxicity was also believed to be affected by the trees near which the mushrooms grow. If their fruits are harmful, the mushrooms absorb their juice (Diosc., *De Mat. Med.* IV, 83).

Truffles were a big mystery, which seemingly randomly appeared anywhere under the ground. According to Theophrastus, they grow during the autumn rains. He mentions people, according to whom they reproduce with seeds, because in Mytilene on the island of Lesbos, they mainly appear after the floods when the water brings

them from the rivers down to the beach (Theoph., *Hist. Plant.* I, 6.13). However, he considers the main reason for their growth to be storms. This idea became an integral part of Greek folklore, as evidenced by one of the Greek names for truffles – *geraneion*.

The Romans took this superstition from Greeks. Pliny at first considered them to be clusters of earth and argued whether or not they are alive because they rot like wood (Plin., *NH.* XIX, 11). However, he added that they mostly grow in the autumn during the rains and storms because thunder is beneficial to their growth (Plin., *NH.* XIX, 13).

## The food of the gods

The most important and most common way of using mushrooms was, of course, eating them. The rejective attitude of the Roman intelligent class had little influence on the whims of the wealthier part of society. Mushrooms became a form of presentation, and by serving them at receptions and banquets, hosts were not only able to show their wealth, but also their generosity. Martialis, in one of his epigrams, gives severe criticism of Caecilian, who at a banquet only served *boleti* to himself so the guests would have to look at him and watch him eat them (Mar., *Ep.* I, 20). Plutarch talks about the absurdity of indulging in some types of food and drink simply due to their high prices. As examples, he includes swine udders, Italian mushrooms, cakes from Samos and snow from Egypt (Plut., *De Tuen. San. Prae.* VI).

This trend was not present in Rome since its origin. In the Republican period, mushrooms did not receive any special attention. Cicero changed this when he wrote in a letter to Fadius Gallus that “the Epicurians are trying to popularize the fruits of the earth, which are not prohibited by law”, listing among them mushrooms (Cic., *Ad Fam.* VII, 26). The law is probably *Lex Aemilia sumptuaria* from 115 BC, which prohibits exceeding a certain financial limit when organizing banquets and explicitly forbids the consumption of certain luxurious ingredients such as mice, rats, dormice, mussels and exotic birds.<sup>8</sup>

Due to the ban on luxury food, wealthy Romans most likely began to look for new foods. The inspiration could have come from the countryside where mushrooms had been known for a long time. Perhaps that is why Pliny calls *boleti*

<sup>8</sup> Note: Dating of *Lex Aemilia Sumptuaria* is questionable. Gellius accredits the introduction of this law to Marcus Aemilius Lepidus in 78 BC (Gell., *Noc. Att.* II, 24.). However, Pliny the Elder considers Aemilius Scaurus to be its author and dates it back to 115 BC (Plin., *Nat. Hist.* VIII, 82). It is possible that these are two interrelated laws adopted in both years.

and *suilli* “only recently discovered delicacies” (Plin., *NH.* XVI, 8). The law, which was supposed to prevent mammonism, was most likely one of the reasons behind the birth of Roman gluttony.

Over time, mushrooms became a very popular food. Some species were imported into Rome while others were exported. Plutarch, for example, mentioned that the Greeks were increasingly indulging in Italian mushrooms (Plut., *De Tuen. San. Prae.* VI). In the end, even the emperors themselves fell under their spell. Suetonius writes that the Emperor Tiberius entrusted a man named Asellius Sabinus with an unusual task – to write a dialogue in which *boleti*, *beccafici*<sup>9</sup>, thrushes and oysters competed for the right to be considered the best food by the emperor. He was allegedly rewarded with 200,000 sesterces (Suet., *De Vit. Caes.* III, 42).

### A menu for those who are demanding

The Romans’ favorite mushrooms were *boleti*. Pliny the Elder mentioned them for the first time. He dedicated a whole chapter to them, describing the process of their growth and trying to distinguish the edible species from the poisonous ones (Plin., *NH.* XXII, 46). Based on its description, it can be quite reliably determined that the Romans knew the Caesar’s mushroom (*Amanita caesarea*) as *boletus* (Fig. 4). It is a thermophilic species characteristic of the Italian Peninsula that gradually disappears with increasing latitude. Martialis (Mart., *Ep.* I, 21; *Ep.* III, 60; *Ep.* XIII, 48; *Ep.* XIV, 101), Juvenal (Juv., *Sat.* V, 146; *Sat.* VI, 619) and Apicius (Apic., *De Re Coq.* VII, 13) also mention it, and in Greek literature the mention of this species does not appear before Galen (Gal., *De Alim. Facult.* II, 69). Along with truffles, they were probably the most valued mushrooms. No mention of export is known from ancient sources, although it is possible that when Plutarch uses the title “Italian mushrooms”, he just means *boleti*. Exporting would also prove the common occurrence of Caesar’s mushroom north of the Alps, near the original Roman roads. Growth in these conditions has been linked to the Roman legions that supposedly brought spores north of Italy (Gminder – Böhning 2009, 121), but it is unlikely that so many spores would be caught in the clothing and armament of the Roman troops. More likely, shipments of mushrooms traveled to the area that would spread spores at regular intervals.

Under the name *suillus*, the Romans probably knew different kinds of mushrooms, and as mentioned above, they are associated, from an etymological point of view,

<sup>9</sup> Note: The species of a small bird, Western Orphean warbler (*Sylvia hortensis*) or Garden warbler (*Sylvia borin*).

mainly with the penny bun (*Boletus edulis*) and the scaber stalk (*Leccinum scabrum*). Pliny does not trust this kind. He considers it “poisonous” and criticizes people for finding pleasure in such a dubious kind of food (Plin., *NH.* XXII, 47). He adds, however, that “*suilli* should be dried, stringed and immediately hanged, as we see with those from Bithynia”. Apparently, they were importing them from Bithynia, although they grew also in Italy and other parts of the Roman Empire.

In addition to *boleti* and *suilli*, Pliny lists three other edible species. He says that “the safest ones are those with red skin but a darker tint than *boleti*” (Plin., *NH.* XXII, 47). Houghton has identified this species as *Russula alutacea* (Houghton 1885, 32). The second is “a white species, with hats remarkable for their resemblance to the conical caps of Flamens” (Plin., *NH.* XXII, 47). The *apex*, the head cover used by the religious order of Flamens, is very similar to the hat of the shaggy ink cap (*Coprinus comatus*; **Fig. 5**) (Houghton 1885, 32). Regarding poplars, Houghton mentions *fungi populi*, therefore the poplar fungi, thanks to which this kind of tree was reportedly so valued (Plin., *Nat. His.* XVI, 35). It was probably a black poplar mushroom (*Agrocybe aegerita*), which grows almost exclusively in symbiosis with the black poplar (Gminder – Böhning 2009, 161).

Other species can be identified in other sources. Apicius often writes about *fungi farnei* (Apic., *De Re Coq.* VII, 15), which are etymologically associated with morel mushrooms (*Morchella esculenta*). A specific case is the field mushroom (*Agaricus campestris*). This kind simply could not be missed in the ancient period. It grows in fields, meadows, pastures and slightly fertilized areas, making the Italian countryside an ideal setting for it. Despite that, we only know about one case when this kind may be mentioned. In *Fasti*, Ovid describes a woman with a family who collects *fungos albos* – white fungi – in a meadow (Ov., *Fast.* IV, 697). The late antiquity mosaic of Toragnola (**Fig. 6**) could also be depicting a variation of the field mushroom, a white mushroom (*Agaricus bisporus*). Finally, we need to mention the saffron milk cap (*Lactarius deliciosus*), which is probably depicted in a fresco in Herculaneum (**Fig. 7**).

After *boleti*, the most popular and expensive were truffles. Pliny collectively refers to all of them as *tuber*, but in some cases adds a closer characteristic. Under the name *tuber* is probably meant white truffle (*Tuber magnatum*). “*Tuber colore rufo*” is probably the red truffle (*Tuber rufum*) and “*tuber colore nigro*” is almost certainly the black truffle (*Tuber melanosporum*) (Plin., *NH.* XIX, 11). As *misy*, he refers to an herbal product “which characteristically has a particularly sweet aroma and taste, but is more fleshy than a *tuber*” (Plin., *NH.* XIX, 12). These are believed to be mushrooms of the genus *Terfezia sp.*, also called desert or false truffles (first mention by Tulasne 1851, 175).

We know several regions from which truffles were imported. Pliny said that the most valued were the ones from Africa (Plin., *NH.* XIX, 11), the best Asia Minor

truffles come from Lampsakos and Alopekonnos and the best Greek ones from Elis (Plin., *NH.* XIX, 13). For false truffles, he mentions the North African province of Cyrenaica (Plin., *NH.* XIX, 12). For Pliny, truffles were no more than a lump of clay, justifying the experience of Lartius Licinius, a praetor of Hispanic Carthage, who allegedly, when eating a truffle bit into a denarius that had grown into it and broke his front teeth (Plin., *NH.* XIX, 11).

## Growing and the production of mushrooms

Given the strong popularity of mushrooms, it is certainly necessary to take into consideration attempts to grow them. For a man who could learn to reproduce and breed mushrooms would find a huge source of income in ancient Rome.

The earliest noted mention of mushroom cultivation is found in Dioscorides' *De Materia Medica*: "Some people say that the logs of white and black poplar cut into small pieces, scattered throughout a fertilized area, will produce edible *mykétas* in all seasons" (Diosc., *De Mat. Med.* I, 109). It is certainly the same kind of mushrooms mentioned by Pliny when he says that certain poplar species are valued mainly because of the *fungi populi* that grow on them (Plin., *Nat. His.* XVI, 35). The cultivation of poplar mushrooms therefore certainly did not start later than the 1<sup>st</sup> century AD.

This procedure may even have older roots. It had already been mentioned by Athenaeus in *Deipnosophistae*, citing Nikandros' *Georgica*: "In order to grow the mushrooms artificially, the log of a fig tree must be buried under the ground with manure and sprinkled with spring water; harmless mushrooms start to grow at the bottom, but nothing of inferior quality can be cut off" (Ath., *Deipn.* II, 59). Although the procedure is the same, it does not necessarily have to be the same kind. It can also be oyster mushrooms (*Pleurotus ostreatus*) or other tree mushrooms growing in clusters. However, a reference to Nikandros proves that they already knew this procedure in the 2<sup>nd</sup> century BC.

The last work that mentions the technique of mushroom cultivation is *Geoponica*, a compilation of ancient works from the 10<sup>th</sup> century. It again speaks of the production of the poplar mushroom, but changes the details of the procedure: "In order to grow mushrooms, a black poplar stump must be cut off and dough dissolved in water should be poured onto the cut pieces of the trunk. Black poplar mushrooms will soon emerge" (Geop. XII, 41).

In *Geoponica*, there is also another process of mushroom growing mentioned: "If you want mushrooms to grow from the ground, you have to pick out an area of light soil on a cane-covered hill; there it is necessary to collect twigs and other combustible material and burn it all shortly before it starts raining. If the rain does not come, it is necessary to sprinkle the area with clean water. The mushrooms,



however, will be of much lower quality” (Geop. XII, 41). Whether this technique was used in earlier periods is unknown, since no preserved ancient source mentions it. It is questionable whether this procedure can be historically considered the first attempt at the cultivation of field mushrooms.

## When it comes to life

The distrust of ancient authors has not always been unfounded. Even though many times they exaggerated or even made up the bad properties of mushrooms, their respect is understandable according to the preserved documents. What was a delicacy for someone could become someone else’s last meal. The most common way of death caused by mushrooms was reportedly suffocation. Nikandros (Nic., *Alexiph.*, 521–522), Dioscorides (Diosc., *De Mat. Med.* I, 168; II, 137; III, 26; IV, 83–84.), Galen (Gal., *De Alim. Facult.* II, 69) and Athenaeus (Ath., *Deipn.* II, 59) reported that throat contraction occurs after eating bad mushrooms. Even edible mushrooms are said to be harmful, especially in larger quantities, causing flatulence, digestion and gallbladder problems. Cicero complained that although he was not sick of oysters, he was sick of mushrooms (Cic., *Ad Fam.* VII, 26). Dioscorides claimed that mushrooms were difficult to digest and come out whole along with excrement (Diosc., *De Mat. Med.* IV, 83; also III, 118; V, 21). Galen also emphasized the bad influence on the stomach and described other numerous symptoms experienced by people poisoned by mushrooms – such as difficulty breathing, fainting and cold sweat (Gal., *De Alim. Facult.* II, 69).

Ancient authors pay particular attention to antidotes and the prevention of poisoning because of this risk. Honey, vinegar, wine, water, salt and combinations thereof are most often repeated in their works as active ingredients. However, many other antidotes also appear. For example, Nikandros mentioned cabbage (Nic., *Alexiph.*, 525–526), and almost a thousand years later, cabbage juice was also mentioned in *Geoponica* (Geop. XII, 17). Pliny and Dioscorides said it is good to eat pears after eating poisonous mushrooms (Plin., *NH.* XXII, 47; Diosc., *De Mat. Med.* I, 168). Herbal medicines were very popular – in combination with wine, vinegar or honey, common rue (*Ruta graveolens*), traveller’s joy (*Clematis*), feverfew (*Tanacetum parthenium*), garden cress (*Lepidium sativum*), radishes (*Raphanus sativus*), grand wormwood (*Artemisia absinthium*), bastard balm (*Melittis melissophyllum*), oregano (*Origanum vulgare*) and hyssop (*Hyssopus officinalis*) are recommended. Paradoxically, the only substances that could be of real help in the case of mushroom poisoning were, at the same time, the most bizarre ones – wine sediments, saltpeter, natron, lead acetate and chicken droppings. All of them in combination with vinegar or wine can evoke vomiting, causing the mushrooms to leave the stomach (Houghton 1885, 28).

Most of the poisoning in antiquity was probably unintentional and caused by poor knowledge of mushrooms. Many species are difficult to distinguish from each other – for example, in the presence of the field mushroom, there is often the poisonous dung roundhead (*Stropharia semiglobata*). If rain washes off the spots from a fly agaric cap, it may resemble a Caesar’s mushroom. The strongly poisonous death cap (*Amanita phalloides*) can resemble several edible fungi to an inexperienced person. The oldest case of death caused by such circumstances is documented by Euripides, when a mother with two sons and a young daughter died from an unknown species of fungi (Ath., *Deipn.* II, 59).

The young fruiting bodies of the shaggy ink cap (*Coprinus comatus*) are very tasty, but as the mushroom grows older, it gradually turns black and diffluents. The consumption of such specimens may lead to poisoning. The author’s mention of “dark, slimy, rotting fungi harmful to health” could theoretically refer to such fruiting bodies, as Pliny says the shaggy ink cap was a commonly eaten species (Plin., *NH.* XXII, 47). The Romans also may not have known the difference between a shaggy ink cap and a common ink cap (*Coprinus atramentarius*), which in combination with alcohol, causes an allergic reaction. It is accompanied by redness of the face, a strong heart beat and impaired blood circulation (Gminder – Böhning 2009, 145). Since the Romans regularly consumed mushrooms with wine, it is possible that such a situation often occurred.

There are, however, cases of poisoning that were not accidental at all. This is, for example, the case of Emperor Claudius, who on October 13<sup>th</sup>, 54 AD, died of poisoning after eating a bowl of *boleti*. Many authors, including Pliny, agree that this was not an unintentional poisoning as in other cases, but that it was done with the knowledge of the Emperor’s wife Agrippina, who this way ensured that her son Nero would take over the throne (Plin., *NH.* XXII, 47). The way of poisoning is still the subject of discussion. According to some versions, a poison from *Locusta* was added to the meal, perhaps through Claudius’ taster Halotus or Agrippina herself. Another option is that in addition to *boleti*, other poisonous species of fungi were added – for example, fly agaric (*Amanita muscaria*) (**Fig 8**) or panther cap (*Amanita pantherina*). It is unlikely that the meal was full of poisoned mushrooms because the taster himself would have been the first victim. Finally, there is also the possibility that the death was not caused by any toxins at all, but by health problems – e.g. cerebrovascular disease (Dugan 2008, 35).

The second case of targeted poisoning is also associated with Agrippina. Her victim was not only the prefect of Nero’s guard, Annaeus Serenus, but also the centurions, tribunes and their families present at the banquet. Pliny mentions *sullii* as the tool for their murders and therefore considers it a very dangerous food suitable for poisoning (Plin., *NH.* XXII, 47).

Although poisoning became a truly powerful political tool in Rome, mushrooms probably played a rare role in it. Plants (e.g. of the genus *Aconitum*) and the sea slug of the species *Aplysia depilans* were used much more frequently (Pitschmann 2010, 125–126).

### Only by medical prescription

Mushrooms in antiquity not only helped to take lives, but also to save them. Their first use in medicine was documented in the 5<sup>th</sup> century BC by Hippocratic author, who mainly used them to disinfect wounds by burning them (Hipp., *Epid.* VII, 102). Mushrooms in connection with fire are also mentioned by Pliny, but without any connection to medicine (Plin., *Nat. His.* XVI, 77, 96). In both cases, it is undoubtedly polyporus, in particular, tinder fungus (*Fomes fomentarius*). This mushroom (**Fig. 9**) has been used throughout human history to preserve and transmit fire because it can smolder for several days. The earliest use of the tinder fungus is documented in the Eneolithic period – a piece of this kind of mushroom was stored in Ötzi's birch bark case (Halpern 2002, 17).

Pliny the Elder talks about other species with healing effects. He writes that *boleti* are good for the stomach (Plin., *NH.* XXII, 47), which is also in direct contradiction with other authors such as Galen, who claims that *boleti* can, on the contrary, cause stomachaches and digestive problems (Gal., *De Alim. Facult.* II, 69). Pliny is the only author who speaks of the medical use of this species. Also, no one else attributed *suillus* with healing effects. He writes that “they are good as a medicine for catarrh and hemorrhoids, which they shrink and over time completely remove. They are also used for freckles and blemishes on female faces. They are also made into a healing solution, similar to that from lead acetate that is used for eye problems. Soaked in water, they are currently being used against ulcers, headaches and dog bites” (Plin., *NH.* XXII, 47).

However, the characteristic medical fungi are not tinder fungi, *boletus* or *suillus*. Since Dioscorides, *agaricum* has been considered to be a “panacea” (Diosc., *De Mat. Med.* III, 1). Pliny the Elder also wrote about *agarica*, even devoting two shorter chapters to it. He distinguished two species. The first one grows around the Bosporus; it is white and is served in combination with vinegar and honey. The male of the species is firmer and bitter. The female is softer and has a sweet taste, which, however, over time becomes bitter (Plin., *NH.* XXV, 57). The second kind comes from Gaul and grows on oak trees. It has a very strong aroma and is particularly effective against poisons, but is generally considered less effective than the Bosporus *agaricum*. It grows under the tops of trees and allegedly emits light at night, allowing it to be found and harvested (Plin., *NH.* XVI, 13). However, this information is

very dubious and raises several questions. *Agaricum* has been interpreted since the 19<sup>th</sup> century as quinine conk (*Laricifomes officinalis*) (Houghton 1885, 27). Bioluminescence is unknown in this species, as in any other species of the genus *Laricifomes sp.* Theoretically, light could be caused by saprophytic mushrooms – decomposers, present on rotting wood. Based on the mention of the night collection of mushrooms, however, it is possible that this information was second-hand to Pliny and he had no personal experience with it. It is unknown whether *agaricum* was also imported from Gaul.

Respect for the food of the gods was a determining attitude in ancient Rome. It meant the careful popularity of mushrooms that bordered extravagance for the elite class, stories of poisoning, important use in medicine, but also the popularity of a few species (truffles, Caesar's mushrooms). Despite the theories of mushroom cultivation which have been used to date, the authors of this article only managed to prove the cultivation of one species from the works of ancient authors. In other cases, the inhabitants of the Roman Empire were probably dependent on seasonal harvests.

Different types of mushrooms could have had different names among different authors, and the aim of this paper was to identify, summarize and, if possible, assign them to known species. The use and popularity of mushrooms in Central Europe today is incomparable to what we know from the works of ancient authors. Nevertheless, antiquity's knowledge and culinary art can be interesting inspiration for the present.

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*Correspondence*

Bc. Martin Zázik

Department of Classical Archaeology

Faculty of Philosophy and Arts

Trnava University, Hornopotočná 23

Trnava 918 43, Slovak Republic

[martin.zazik@tvu.sk](mailto:martin.zazik@tvu.sk)

Doc. Mgr. Miroslava Daňová, PhD.

Department of Classical Archaeology

Faculty of Philosophy and Arts

Trnava University, Hornopotočná 23

Trnava 918 43, Slovak Republic

[miroslava.danova@truni.sk](mailto:miroslava.danova@truni.sk)



Fig. 1. *Marcus Gavius Apicius* included mushrooms in his recipes. Author: Carole Raddato. Wikimedia Commons (CC BY-SA 2.0).

[https://upload.wikimedia.org/wikipedia/commons/a/a5/Apicius\\_Honeyred\\_mushrooms%2C\\_Ingredients\\_%2815168854543%29.jpg](https://upload.wikimedia.org/wikipedia/commons/a/a5/Apicius_Honeyred_mushrooms%2C_Ingredients_%2815168854543%29.jpg) (20.4.2020)



Fig. 2. *Morchella esculenta*. Author: Miroslava Daňová.



Fig. 3. *Amanita Caesarea* – Caesar's Mushroom. Author: Archenzo. Wikimedia Commons (CC BY-SA 3.0). [https://commons.wikimedia.org/wiki/File:Amanita\\_caesarea.JPG](https://commons.wikimedia.org/wiki/File:Amanita_caesarea.JPG) (20.4.2020)





Fig. 4. Mosaic with *Amanita Caesarea* (?). Aquileia, Basilica di Santa Maria Assunta, early 4<sup>th</sup> century AD. Author: Carole Raddato from FRANKFURT. Wikimedia Commons (CC BY-SA 2.0).

[https://commons.wikimedia.org/wiki/File:A\\_detail\\_from\\_part\\_of\\_an\\_early\\_4th\\_century\\_AD\\_mosaic\\_depicting\\_a\\_basket\\_of\\_mushrooms\\_belonging\\_to\\_the\\_floor\\_of\\_the\\_Theodorian\\_transversal\\_hall,\\_Basilica\\_di\\_Santa\\_Maria\\_Assunta,\\_Aquileia,\\_Italy\\_\(21409510664\).jpg](https://commons.wikimedia.org/wiki/File:A_detail_from_part_of_an_early_4th_century_AD_mosaic_depicting_a_basket_of_mushrooms_belonging_to_the_floor_of_the_Theodorian_transversal_hall,_Basilica_di_Santa_Maria_Assunta,_Aquileia,_Italy_(21409510664).jpg) (20.4.2020)



Fig. 5. *Coprinus comatus*. Author: Jerzy Opiola. Wikimedia Commons (CC BY-SA 3.0). [https://upload.wikimedia.org/wikipedia/commons/b/b0/Coprinus\\_comatus\\_G4.JPG](https://upload.wikimedia.org/wikipedia/commons/b/b0/Coprinus_comatus_G4.JPG) (20.4.2020)



Fig. 6. Mosaic with variation of the field mushroom. Toragnola, late antiquity. Author: Mark Cartwright, Wild Boar, Roman Mosaic. Ancient History Encyclopedia (CC BY-SA 4.0). Retrieved from <https://www.ancient.eu/image/2615/> (20.4.2020)



Fig. 7. Fresco with *Lactarius deliciosus*. Herculaneum, 1<sup>st</sup> century AD. Author: Matthias Kabel. Wikimedia Commons (CC BY-SA); modified by Miroslava Daňová [https://commons.wikimedia.org/wiki/File:Chicken\\_MAN\\_Napoli\\_inv\\_8647\\_Inv\\_8735.jpg](https://commons.wikimedia.org/wiki/File:Chicken_MAN_Napoli_inv_8647_Inv_8735.jpg) (20.4.2020)



Fig. 8. *Amanita muscaria*. Author: Miroslava Daňová.



Fig. 9. *Fomes fomentarius*. Author: Miroslava Daňová.

# An Archaeobotanical Evaluation of Ibn al Baitar's Herbal Remedies in the Archaeological Record of Near Eastern and Eastern Mediterranean Sites

Mandy Bertram

Archaeobotany today is foremost used to examine dietary practices or changing patterns in exploitation of the environment. For the prehistory of medicine it could give an exclusive insight into the life of our ancestors, coping with their diseases. The collection of over 400 sites at the archaeobotanical database ADEMNES provides an excellent opportunity to combine the knowledge that has survived until today in the ancient medical literature with the existing archaeological record. When it comes to archaeological debris aspects like taphonomy needs to be taken into account attentively. However, several plants, appreciated for their healing properties by well known scholars and physicians of the ancient world, have been found regularly in the archaeobotanical record of these sites.

**Keywords:** medicinal plants; crops; ancient medicine; ancient pharmacology; archaeobotany; Near East; Mediterranean; ADEMNES database; Ibn al Baitar; herbals

## 1. Introduction

Due to its crucial role in the development of ancient societies, the Near East has long been a subject of interest for archaeologists. Database-management has gained more importance during the last decades and the compiling of archaeological debris from broader regional scales is giving opportunities to address interesting questions. When it comes to ancient herbal medicine our knowledge about the used plant species is foremost built upon literary sources, mostly descended from ancient Mediterranean or Egyptian scholars. Cuneiform texts provide detailed information from Near Eastern medical systems, but mostly the identification of plant species in use is not possible. With the aid of the archaeobotanical database ADEMNES a comparison can be made between plants from archaeological contexts and the medical lore. Ibn al Baitar, a medieval herbalist, has collected medicinal knowledge from around 150 of the most influential medical entities dating back to c.400 BC. This study compares the archaeological record with Ibn al Baitar's 1637 medicinal substances, derived from plants, animals and minerals to deliver a list of plants which may have been important for a community, because of their medicinal potential. It will discuss some of the taxa observed, give the literary record with ancient uses, the overall abundance of sites, where these species have

been found and recent knowledge about pharmacologically relevant constituents. Taphonomy shall be highlighted for a better understanding of the find-category medicinal plants.

### 1.1 *Archaeobotanical Database of Eastern Mediterranean and Near Eastern Sites*

As part of the research project “Climate, Agriculture and Society – On the sustainability of Ancient Agricultural Systems” ADEMNES was made by the universities of Freiburg and Tübingen under the supervision of Simone Riehl. It is accessible online as a free, public service (Riehl – Kümmel 2005) and lists archaeobotanically excavated sites with their dated findings, recovery methods and preservation types, from research literature (Fig. 1). ADEMNES covers Greece, Turkey, western Iran, Iraq, Syria, Lebanon, Israel, Jordan and northern Egypt from Epipalaeolithic to Medieval Periods, with an emphasis on Bronze and Iron Age sites (Riehl – Kümmel 2005). Archaeobotanical reports from 363 sites are listed at this day<sup>1</sup>, the entering of data is still ongoing.

### 1.2 *Ibn al Baitar’s Kitab Al Jami fi Al Adwiya Al Mufrada*

As source for remedies in ancient times, the german translation of الجامع لمفردات الأدوية والأغذية (*Kitab Al Jami fi Al Adwiya Al Mufrada*) from Abu Mohammed Abdallah Ibn Ahmed Ibn al Baitar Dhiya Al Din Al Malaqi by Sontheimer has been used. Ibn al Baitar lived from the end of the 12<sup>th</sup> century to 1248 AD (Gehani – Hammoudeh 2003, 1). According to Abulfeda he has travelled through the whole African and nearly the whole Asian continent (Sontheimer 1840, XII). In his Compendium he aimed to summarize all plants mentioned by accepted medical or botanical practitioners and to give an overview about everything written until his times, not without critically assessing and rectifying the knowledge that was recorded (Sontheimer 1840, XIII–XV).

Although his work is younger than most of the archaeobotanical data provided in ADEMNES, we can assume that a good amount of traditional knowledge has survived until his times. Big social and religious upheavals may perform better if new instances incorporate traditional perceptions and reinterpret them, fitting to their purposes. Still Yazid Ibn al-Hakam (c.1030 AD) wrote: “*wal-bagyu yasra`u ahlalu*”, meaning: “the wicked deed lets the perpetrator collapse in a heap” (Klein-Franke 1982, 10; translated). The Arabic word ‘*bagy*’ means a misdeed that is done, without

<sup>1</sup> 408 sites altogether, 111 sites with faunal (and often botanical) remains, 363 sites with botanical (and some faunal remains), 66 sites with both, botanical and faunal remains (Riehl – Kümmel 2005).

thinking about the consequences (of physical suffering) (Klein-Franke 1982, 10). These examples reflect aspects of much older medical conceptions that survived up to Islamic times. The extent of ancient ideas retained is difficult to assess, the same applies to changing patterns in medicinal plant usage. Since plants do not have to be linked to specific cultural ideas or concepts of body and health<sup>2</sup>, one might think their exploitation does not need to be changed much through cultural upheavals, but without further scientific assessment it is pointless to take it into account too much.

However, it has to be taken in mind that by the time of Ibn al Baitar a tremendous amount of the Greek medical system has been soaked up by the near eastern medicine, which might not have been existent at pre-Islamic sites.

## 2. Methodology

To avoid information loss, all medicinal substances listed by Ibn al Baitar have been checked against the Taxa found at ADEMNES. One modern and 45 sites with faunal remains have been excluded, overall 362 sites were examined. Every Taxon existent in both of the datasets has been noted with all background information available at ADEMNES. Following this information, every find was grouped according to its age into one of three groups, each spanning an arbitrary set time frame of roughly 1500 years, beginning at around 3000 BC and ending at around 1500 AD (Fig. 2). Older sites were excluded, because of their temporal distance to the literary basis. Due to the variety of sites, resulting in the use of different dating methods, some residues predate this classification (cf. finds from the early EBA phase of Kurban Höyük, dating '3100–2900 BC'), while others are younger (cf. Kaman Kalehöyük, populated until the 'Ottoman period'). In case of an overlap with two of the groups, the remains were categorized according to their cultural association.

For each Taxon the number of sites yielding it was recorded and a ranking was made to show frequent and rare Taxa. Here Taxa were sorted loosely into groups for certain characteristics (e.g. exploitation-types, ecological features, domesticated/wild plants or many/few seeded species) to get a better comparability and clearer impression on the most frequent Taxa throughout sites.

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<sup>2</sup> Compare for example the high similarity (64%) for medicinal uses of *Lamiaceae* in (Roman-Catholic dominated) eastern Andalusia and (Islamic dominated) eastern Morocco (Gharbaoui et al. 2017, 212) both regions that have been influenced by Ibn al Baitar's lore of herbal medicines.

### 2.1. Taphonomy

Taphonomic loss is an aspect, which unconditionally needs to be taken into account, when interpreting our results. When we think about the plant parts used for remedies, this becomes quite clear. According to an ethnobotanical study of medicinal plants used today at the Hezar Mountains in South East Iran proportions of plant parts in use differ vastly: in a total of 92 species the leaves of 32% of them are used as medicine. Seeds and roots follow with 13 % each, 11% is counted for aerial parts and fruits (8%), latex (6%), the whole plant (6%), Rhizome (4%), Stem (4%), bark (2%) and tuber (1%) (Rajaei – Mohamadi 2011, 1163) are used in a lesser, though taken together substantial amount as well. Similar, for the survival of botanic remains unfavourable results have been found at North Aegean islands ( leaves 22,8%, roots 12,78%, flowers 11,41%, essential oils 7,30%, fruits 6,84% and barks 5% (Axiotis et al. 2018, 2)) The Moroccan Riffians are using leafy parts in a way higher amount, than it was observed from Axiotis et al. or Rajaei and Mohamadi (Chaachouay et al. 2019, 6) when treating metabolic diseases. If we assume the most favourable proportions from the studies listed above for ancient times, only 13 % of the herbals used are more prone to be preserved at all. Moreover, herbs rarely enter the archaeological record, because they are used in carefully husbanded quantities. Such plant products are mostly found in exceptional contexts, like burnt levels or shipwrecks (Nesbitt 1995, 72). Additionally, as a result of the research area, botanical remains are mostly present in a carbonized state. Jacomet has impressively shown the discrimination of preservation chances in dry soils against waterlogged conditions and their effect on species richness. In European LBK sites with well-drained soils, wild plants in carbonized state are often only field weeds, Jacomet counts only 85 taxa from over 30 sites, whereas in waterlogged sites, there are usually over 140 “other” wild plant taxa per well (Jacomet 2013, 507). In Arbon Bleiche 3 4 carbonized seeds of wild strawberry (*Fragaria vesca*) were found, in contrast to 5.462 seeds in waterlogged conditions (Jacomet 2013, 508). Furthermore, for the Roman Iron Age, cereals are well represented in both contexts, while oil-containing seeds and condiments, two highly appreciated sources for herbal medicines, are much more numerous in waterlogged environments, compared to dry soils (Jacomet 2013, 509). For construing an adequate interpretation those aspects of taphonomy need to be considered attentively and plants more prone to degradation are in need of a special mindfulness especially in terms of expected quantities.

## 3. Results

We can expect people to carry their remedies with them, store them in their houses or would know where to find them in the nearer location. But as set out above,

some problems need to be considered. Since archaeobotany is a rather young field, a lot of sites are not evaluated in respect of botanical findings yet and older research often focused on agriculture, neglecting the identification of wild species. Furthermore some regions and time periods gained high interest, while others remained unobserved. In ADEMNES the number of Medieval sites (34) is significantly lower, than Bronze (128) and Iron Age sites (133), so this study is not able to show trends for the exploitation of plants through time. Quantities should not be taken as indicator for the importance of a species for a population as well. As it was shown earlier, various factors manipulate the chances of a plant for getting preserved, scientifically evaluated and published, resulting in a highly biased outcome of recorded plants. What these quantities can do, is to deliver a list of plants to the medical archaeologist, where a closer look onto the archaeological record of specific sites, regions or time-periods can be rewarding and to show, where a new set of interpretation for plant residues may be worth considering.

Another aspect needs to be noted for the following quantities: while most taxa listed in the Compendium are determined to species level, some entries are just given as genus (cf. e.g. *Vicia sp.* (Sontheimer 1840, 198–199; idem 1842, 367)). A reason for this can either be disagreement amongst scholars which plant specifically was meant by Ibn al Baitar (cf. e.g. *Vicia sp.* (Sontheimer 1840, 586)) a missing description of the used plant, or the usage of each plant belonging to that genus for healing purposes. The chance of identification through an archaeobotanist needs to be considered as well: Due to fragmentation-rates and the experience-level of a researcher macrorests often can just be determined on genus level, especially when it comes to the morphologically diverse group of wild plants.

186 Taxa on species – and 43 Taxa on genus level were found at archaeological sites in the dedicated timeframe. 337 sites yielded potential medicinal plants (Fig. 3). The plants have been grouped into three classes: field crops, trees & shrubs and herbs & weeds. For each category ten<sup>3</sup> of the most frequent taxa were chosen for illustration (Table 1). Some will be described in detail below; the knowledge from Authors quoted there was not derived from primary sources, but have been cited by Ibn al Baitar itself. For the sake of simplicity this is not termed at each time.

### 3.1 Plants

#### 3.1.1 *Pisum sativum* – Pea

The knowledge about peas as remedy seems to have been widespread, since Ibn al Baitar was able to collect information from 13 different sources. Mostly they highlight

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<sup>3</sup> For the class of field crops only 9 common Taxa have been found at archaeological sites from ADEMNES.



the bloaty and impelling properties, while its virtue for the male genitals is called out from at least seven of them (Sontheimer 1840, 322–324). Some of the authors make distinctions between different kinds of peas and their features, like Galen, who attributes a stronger effect of black peas on urine (Sontheimer 1840, 322), while Rhazes speaks about their good properties for cold diseases, humid joint pain and paralysis (Sontheimer 1840, 323). Al-Israili labels them to be hotter and less humid as white ones, with more bitterness, leading to a better effect on blockage of liver and spleen, helping with oedema, jaundice and abortion or removing worms and stones. In contrast, he ascribes a good impact on the secretion of sperm, milk and urine or beautifying effects on the skin to white peas (Sontheimer 1840, 323). Dioscorides is not dividing between black and white peas and adds, like Galenus, its driving force in menstruation, but is emphasizing another kind of pea, called ‘*Orobus*’, which needs to be cooked and whereof one can make a compress with honey that helps with inflammation of the testes, scaly leprosy, itch, humid ulcers of the head and other ferocious tumours (Sontheimer 1840, 322). Maserdschavia adds the usefulness of pea-meal cooked in milk for patients with lung-ulcerations and to strengthen appetite or sperm (Sontheimer 1840, 322). Ibn Masawayh explains the attribution of peas with male genitals and sexual intercourse insightfully: Three important things are needed for the coitus: heat, which causes passion, humidity, to moisten the body and increase sperm-secretion and bloaty nourishment that fills the vessels of the penis. All these features are united in peas (Sontheimer 1840, 322–323). He advises to soak them in water and eat them raw, while the liquid can be drunk with an empty stomach (Sontheimer 1840, 322). Rhazes recommends not drinking water directly after the ingestion of peas because of the wind, but to take a sip of pure wine, some caraway (cf. *Carum carvi*) and other spices – unless one aims to increase the erection (Sontheimer 1840, 324). Ibn al Baitar advises to lay still warm, cooked peas within a pouch onto the testes, to alleviate pain and inflammations on the very spot (Sontheimer 1840, 323).

A rather unusual testimony from Dioscorides shall be added here too, because it may be a relic of an older, magically based practice. Here one should fold a pea into a sheet of linen and place it onto a wart at the beginning of a month. Thereafter, one should throw it away over the shoulder (Sontheimer 1840, 322).

*Pisum sativum* was found at 28,13% of the early sites with a total amount of 36 sites. Later on it was documented for 16,54% (22 sites), while 23,53% (8 sites) were reached in the youngest phase. Seeds and pericarp contain starch, albuminoids, alkaloids, galactolipids, trigonelline, piplartine and essential oils, the stems include the phytoestrogens kaempferol-3-triglucoside and p-coumaric esters. In Bangladesh seeds of peas are traditionally used as appetizer, blood purifier, laxative, astringent and in treating wrinkled skin, phlegm and intestinal inflammation (Zilani et al. 2017, 2).

### 3.1.2 *Hordeum distichum* – Barley

Barley (*Hordeum distichum*) is a common cereal at archaeological sites. Like other cereals, the character of its seeds is said to be of an average admixture in terms of its features, leading to the usage for a whole range of different applications. Galen compares barley with (carrier-) substances like oil and wax (Sontheimer 1842, 97). An Example for this is given by Dioscorides: a mixture of linseeds (cf. *Linum usitatissimum*), seeds of *Foenum graecum* (cf. *Trigonella foenum graecum*) and rue (cf. *Ruta graveolens*) in barley meal against bloating (cf. Sontheimer 1842, 97). Ibn al Baitar adds its usefulness to reduce bad properties of added substances, without impairing other, desired qualities. He confers to the milk of spurges (*Euphorbia sp.*) whose destructive features are lessened significantly, when mixed together with meal of barley seeds. Usually its meal is used as compress to alleviate pain and to cool down (or warm up) a specific body part (Sontheimer 1842, 98). Dioscorides gives the meal with melilot (cf. *Melilotus officinalis*) and poppy seed capsules (cf. *Papaver sp.*) for soothing side stitch (Sontheimer 1842, 97) According to Ibn al Baitar one should mix it with cooling substances, like vinegar, purslane (cf. *Portulaca oleracea*) or the juice of duscle (cf. *Solanum nigrum*) for headaches or swellings of the eyes. Laid onto the forehead or eye it alleviates pain and inflammations, through the inhibited inflow of heating substances towards the eyes (Sontheimer 1842, 98).

For early times there is an amount of 32,81% and 42 sites yielding *Hordeum distichum* seeds, followed by a time with a lesser amount of only 18,80% and 25 sites. In younger sites percentages increase to 26,47% (9 sites) again.

### 3.1.3 *Avena sp.*, *Triticum monococcum* and *Triticum spelta* – Oat, Einkorn and Spelt

Uses of oat (*Avena sp.*), einkorn (*T.monococcum*) and spelt (*T.spelta*) are similar to that of barley (*Hordeum distichum*), according to Dioscorides and Galen (Sontheimer 1840, 362, idem 1842, 206). Dioscorides says for oat it is used as compress and will help with cough (Sontheimer 1840, 362) while spelt, can be cooked with water, mint and cream to alleviate cough and hoarseness (Sontheimer 1840, 335). Galenus explains for oat that, in a compress, it is drying and disaggregating, without causing sting (Sontheimer 1842, 362). While oat and einkorn are common cereals throughout archaeological sites (oat, with percentages of 32,81% (42 sites), 24,81% (33 sites), 17,65 (6 sites) and einkorn with 40,63% (52 sites), 18,80% (25 sites) and 11,76% (4 sites)) spelt is a fairly rare taxon. Its percentages range from 3,91% and 5 sites in early times to 5,97% and 8 sites, followed by 2,94% and 1 site in the youngest time frame.

When used as powder the starch of these crops can bind water that, through the bigger surface, is more prone to evaporation, thus operating desiccative and cooling. Wound secretion and skin fat can be bound (Teuscher et al. 2012, 107). Today

corn- as well as pea-starch is used in pharmaceutical applications e.g. as a basis for non-fatty balms (Teuscheret al. 2012, 107).

The above shown percentages do illustrate the reliability of quantities as indicator for the importance of a Taxon for medicinal purposes pretty well. This high amount of sites yielding medicinal usable Taxa certainly were not reached because of the importance of these species as remedy, but because of their extensive exploitation as common foodstuff. As a consequence higher quantities for dietary crops can obviously be expected, without implying a higher medicinal significance. For species with a narrow utilisation-range (e.g. poisonous plants) chances for their deposition in archaeological contexts are more limited, without implying lesser medicinal significance of this plant for an ancient population.

### 3.1.4 *Vitis vinifera* and *Vitis sylvestris* – Wine

*Vitis vinifera* and its wild form *V. sylvestris* may have belonged to the most important plants for medicinal purposes. In Ibn al Baitar's Compendium 681 recipes are listed with wine as ingredient and his chapter regarding *Vinum* spans 10 pages for itself (Sontheimer 1840, 383–393). He cites Dioscorides, specifying the effects of different varieties, places of origin or production methods of wines onto its medical characteristics. However some features do they all have in common if they are pure. They are astringent and warm, spread swiftly through the body, strengthen appetite and stomach, nourish and strengthen the body, provide a better look and induce sleep (Sontheimer 1840, 385). Drunken with olive oil they stimulate vomit, helping with poisoning through Meconium, Conium, Pharicum<sup>4</sup>, Toxicum<sup>5</sup>, and clotted Milk in the stomach as well as sting and ulcers in the urinary tract or kidneys (Sontheimer 1840, 384). It shall help with negative forces of coriander (cf. *Coriandrum sativum*) mercury, poisonous sponges and with all remedies, killing through coldness, as well as coldness inducing animal-poisons (Sontheimer 1840, 385). Dioscorides describes white wine as softening the body (Sontheimer 1840, 384) and most fitting for healthy or sick people (Sontheimer 1840, 383) while sweet wine is thick, bloating and good for urinary bladder and kidneys (Sontheimer 1840, 383). Astringent wine is strongly diuretic compared to other sorts, but causes headache and drunkenness as well. In contrast, mild wine is less intoxicating and diuretic, while rough wine is said to be more fitting when consumed with food, because it suppresses fluxes

<sup>4</sup> Berendes was not able to find out, exactly which poison Pharicum might be. According to him Dioscorides is characterizing its taste to be similar to *Nardus sylvestris* (Berendes 1891, 276).

<sup>5</sup> In his translation of Dioscorides *De Materia Medica* Berendes interprets this word as „Pfeilgift“ (arrow poison) (Berendes 1902, 482).

from the body (Sontheimer 1840, 383). Adding different ingredients into the wine changes its qualities too (Sontheimer 1840, 384). Furthermore he is not sparing with information about bad qualities and effects of extensive consume (Sontheimer 1840, 383–392).

But not only was the use of wine described in detail. The leaves of *V. vinifera* are recommended alone or with paste of barley as compress for the burning of hot swellings in the stomach (Sontheimer 1842, 356) and the ash of its branches shall heal the anus after a condylomata was destroyed (Sontheimer 1842, 357). Its resin used as a balm is recommended for healing flaky leprosy and ulcerous or non-ulcerous scab (Sontheimer 1842, 356) and warts (Sontheimer 1842, 357) but can also be drunk with wine, to carry off urinary calculi (Sontheimer 1842, 356). The juice of fresh leaves or vines soaked in water helps with dysentery, haemoptysis, afflictions of the stomach and in pregnancy. Crushed leaves and vines in a compress alleviate headache (Sontheimer 1842, 356). The ash of branches can be used to help with a pulled tendon or snakebites (Sontheimer 1842, 357). Some cautionary indications from Dioscorides are given for the resin of the plant: if one uses it together with olive oil as balm consistently, it promotes shedding of hair. He suggests washing the body with nitrum prior to the usage of resin on the skin (Sontheimer 1842, 356). Galen ascribes the same characteristics of the cultivated wine to the wild species (*V. sylvestris*), but with the restriction that domesticated wine is of a weaker quality as the wild one (Sontheimer 1842, 357). Dioscorides gives a recipe with the root of wild wine, cooked within two cups of wine and seawater, which is given to hydropic patients, because of its water purging features (Sontheimer 1842, 357). Both suggest using wild grapes to remove spots, blood and everything else appearing on the surface of the body (Sontheimer 1842, 357). In the archaeobotanical record *Vitis sp.* is exceptional frequent. Most of these finds consists of *V. vinifera*, only at two EBA sites, namely Arslantepe and Yenibademli Höyük *V. sylvestris* has been identified. At early sites *Vitis sp.* shows up in 60,16%, with a total of 68 sites, later on there is an abundance of 57,89% and 77 sites. In the youngest time frame there still is an amount of 55,88% and 19 sites. Next to the high amount of remnants left through activities of wine production, this increased numbers may partly be a result of the easy recognizable, sturdy seeds with its pyriform shape and the small beak, which are quite durable and often survive as charred specimen, but in mineralized form as well (White – Miller 2018, 211). Grape stem attachments, whole grapes and even fragments of its skin can be preserved (White – Miller 2018, 211). Through the interest in wine production and morphological and experimental studies (cf. e.g. Margaritis – Jones 2006) archaeobotanical remains of *V. vinifera* are relatively well understood and may be recognized in a sample, while other taxa have to be left unidentified.

### 3.1.5 *Fumaria* sp. – Fumewort

*Fumaria officinalis* is found in arable land as a character species of the Fumario-Euphorbion organisation (Oberdorfer 2001, 430), other sorts of fumewort are sprouting at the wayside or in wastelands, growing up to 30 cm high (Teuscher et al. 2012, 485). In Ibn al Baitars Compendium authors like al-Ghafiqi, Dioscorides, Rhazes or Ibn al Baitar itself does not seem to refer to just one species of fumewort, although Sontheimer (Sontheimer 1842, 75) is specifying the expression *Schâhtarradsch* to be *F. officinalis*. In a later chapter Ibn al Baitar is clearing up confusions regarding the term *Kammunbarri* (Sontheimer 1842, 396–397), which was – according to Ibn al Baitar wrongly – determined by Rhazes through the word *Kapnos* as “wilder Kümmel” (Sontheimer 1842, 396) probably meaning cumin (*Cuminum cyminum*) or perhaps wild caraway (*Carum carvi*) (Sontheimer 1842, 394), although he concedes that it is the species *Fumaria* for most of the splendid penmen (Sontheimer 1842, 396). Following Ibn al Baitar, it is clear in the description of Dioscorides, who as a side note, never connected the term *Kapnos* with the plant Rhazes meant (Sontheimer 1842, 396) that a sort of fumewort with a crimson red flower, a known remedy for every scholar, is described (Sontheimer 1842, 397).

Galenus describes the plant to be hot, bitter and somewhat astringent, leading to the urging of biliary urine (Sontheimer 1842, 75). He refers to a man, who was using the plant, to strengthen the stomach and open up the body. For this he dried and stored it, strewing it into honey water, if he wanted to purge a patient. When strengthening of the stomach was aimed, he strewed the powder into undiluted wine (Sontheimer 1842, 75–76). Al-Israili, Ibn Imran, and Elscherif recommend it for similar areas. According to al-Israili fumewort strengthens the stomach, stimulates appetite, purges burned bile and opens obstipations of the liver (Sontheimer 1842, 76). For this he recommends drinking its fresh juice uncooked, which will also help with pruritus and itchiness, coming from tainted blood, phlegm or burned bile (Sontheimer 1842, 76). Ibn Imran endorses this characterization, adding its usefulness to staunch vomit caused by phlegm, when dissolved in vinegar (Sontheimer 1842, 76). Elscherif gives, next to the strengthening of the stomach and the opening of liver obstipations, a different set of applications though. If the leaves of fumewort were soaked in water for a day, and afterwards head and beard are washed with this solution, it will help with lice and dandruff. The juice drunken with tamarind soaked in it helps with the itch. A decoction of the plant gargled in the mouth strengthens the gums and alleviates heat of mouth and tongue (Sontheimer 1842, 76). Galen and Dioscorides are both indicating its qualities for sharpening the sight when moving the eyes to tears through fume, leading to its Greek name *Kapnos* (Sontheimer 1842, 75–76). For a wild herb *Fumaria* sp. is quite common in archaeological deposits. Its percentages are ranging from 21,88% and 28 sites, to 19,55% with 26 sites and later on to 17,65% with a total number of 6 sites. *F. officinalis* was found at early and

middle Bronze Age Troy, Demircihöyük and Tell Mishrifeh or in LBA and IA phases of Troy, Ayios Dhemetrios, Emar and Samos Heraion. Through its habitat it often might have entered sites as a field weed that has to be painstakingly sorted out from dietary crops, because of its toxicity. Nevertheless, drying and storing of this herb would not be much of an effort, but instead of simply throwing it away, it would indeed provide people with a strongly effective remedy. The herb contains 0,4–1,2% Isochinolinalkaloids, prime-alkaloid is Protopin and para-alkaloids are among others Cryptopin and Stylopin, as well as Indenobenzazepin derivatives (Teuscher et al. 2012, 485). Protopin operates spasmolytic on muscles (Teuscher et al. 2012, 483) and today the leaves are used for spasmodic afflictions of the gallbladder, the biliary tract, the gastro-intestinal system or for nausea and vomit (Teuscher et al. 2012, 485).

### 3.1.6 *Heliotropium* sp. – Heliotrope

Heliotrope was known in Egypt as scorpion herb or *Scorpiurus*, referring to its rolled up inflorescence, similar to the tail of a scorpion. Dioscorides labels the plant *Heliotropium magnum* (Sontheimer 1842, 118), according to Berendes and Sontheimer *H. europaeum* is meant (Berendes 1902, 475; Sontheimer 1842, 118) a possible alternative candidate could also be *H. villosum* (Berendes 1902, 475) (syn. *H. hirsutissimum*). Following Dioscorides the seeds were said to help with fevers, four seeds of the plants in wine, an hour before the attack of the quartan fever, and three seeds, for the tertian fever (Sontheimer 1842, 199). The leaves of Heliotrope in a compress will help with inflammations of a child's brain, the gout or a distortion of the tendons. A handful of them cooked in water and drunken, purges phlegm and bile (Sontheimer 1842, 118) carried powdered (as a suppository (Berendes 1902, 475)) they further menstruation and abortion (Sontheimer 1842, 119). Some people are tying the roots to themselves to alleviate pain, coming from a scorpion-sting (Sontheimer 1842, 119). Likewise, it is useful to drink its leaves with wine, or make a compress for the sting (Sontheimer 1842, 118), which should also work for drying out warts (Sontheimer 1842, 119). The small Heliotrope has been interpreted as *Croton tinctorius* from early authors (cf. e.g. Sontheimer 1842, 119). Berendes however follows Fraas more fitting interpretation of *H. supinum* (Berendes 1902, 476). Dioscorides is recommending the fruit and leaves of the small Heliotrope mixed with nitrum, *Hyssopus* (cf. *Hyssopus officinalis*) and *Nasturtium* (cf. *Nasturtium officinale*) added into water, to cope with tape- or roundworms. Compresses with salt disperse corns and warts (Sontheimer 1842, 119). *Heliotropium* sp. was found at 14,84% (19 in total) of early dating archaeological sites. Later its presence was found at 9,77% (13 in total) and afterwards at 14,71% (5 in total) of the sites. *H. europaeum* was found at the EBA to MBA sites Hirbetez-Zeraqon, Tell Aphék, Tell Mishrifeh and Troy and at LBA to IA Jarma, Kinet Höyük, Tell Atchana, Troy and Ulu Burun, lateron at Yassi Ada and Serce Limani as well. Interestingly seeds of *H. europaeum*

have been found at the LBA shipwreck of Ulu Burun, the early Byzantine wreck of Yassi Ada, as well as the wreck of Serce Limani, dating 1025 A.D (cf. [www.ademnes.de/db/sites.php](http://www.ademnes.de/db/sites.php)). All were carrying trade goods through the Mediterranean. To have those finds in even three such exceptional contexts gives rise to the assumption that *Heliotropium*, perhaps coming from a specific region, may have been appreciated for its medical purposes. Today *H.subulatum* is used for the treatment of wounds caused by scorpion stings on the Deccan Peninsula, the leaves of the plant are used as stimulant and bitter tonic in Africa (Sing – Ram 2020, 545). *H. supinum* is rich in lupeol and  $\beta$ -sitosterol (Ramanpreet et al. 2019, 1). *H. indicum* contains the pyrrolizidine alkaloids heliotrine and lasiocarpine, its main alkaloid indicine shows effects against tumours (DeFillips et al. 2004, 59). In Guyana the boiled plant is drunk against heat rash, thrush, diarrhoea and frequent excretion of urine, the juice of the leaves is used to alleviate conjunctivitis pain (DeFillips et al. 2004, 59). In Tamil Nadu the juice mixed with hot water is used to treat snake bites or scorpion sting (Reza et al. 2018, 38). Other applications are known from Mali, Ghana, Senegal, Bangladesh, Taiwan, Indonesia, Jamaica and many other regions (cf. e.g. Reza et al. 2018, 38–39).

### 3.1.7 *Papaver sp.* – Poppy

The genus *Papaver* incorporates highly appreciated plants, nowadays and in ancient times, and the supplier for “one of the most important and powerful drugs for which we have evidence” (Arnott 1996, 268), the opium. Al Tamimi reports the real opium is neither known in the eastern nor in the western world, but only in Egypt, especially in upper Egypt, at a place called Asiut. Ibn al Baitar specifies opium to be the latex of black poppy (Sontheimer 1840, 64). Theophrastus reports people calling a variety of plants ‘poppy’, e.g. the black, horned, or herakleian poppy, or a poppy called rhoias (Megaloudi 2005, 77). Ibn al Baitar lists several of them too (Sontheimer 1840, 28, 64–65, 367–369, idem 1842, 546–547). Galen relates every sort of poppy to be cooling; garden-poppy has a gentle virtue to induce sleep, a second sort belongs to the strong remedies. The third kind should only be used in an admixture of drugs, because of its fierce, cooling strength, leading to numbness and death (Sontheimer 1840, 368). *P. argemone*, a plant described by Dioscorides to be similar to a poppy called *Rhoeas*, acts against ulcers, when its leaves are used as a compress and alleviates diseases of the eye, known as obscuratio or cloudlet (Sontheimer 1840, 28). For the *Rhoeas* called Poppy, Galenus reports the name *Elmanthur*, because of its easily falling off leaves. The seeds are acting cooling to a high degree and Dioscorides gives a recipe with 5 or 6 poppy heads given into three cups of wine and boiled down to two cups, which will induce sleep when drunken (Sontheimer 1840, 369). For the gum of opium poppy (*P. somniferum*) he states to take an amount of a pea to alleviate pain, a long-lasting cough or to induce sleep.

More will cause deep, frightening sleep, similar to a sleep called *Lethargus* (Sontheimer 1840, 64). Mixed with rose oil rubbed onto the head, it will alleviate headache, with almond oil, saffron and myrtle given into the ear earaches were treated, roasted until it is soft and reddish brown it was used for diseases of the eye and with roasted egg yolk and saffron it was used for wounds and erysipelas (Sontheimer 1840, 64). From Diagoras it is chronicled that Erasistratos does not use opium for diseases of the eyes or ears, as it weakens the face and causes anaesthesia; and that Andreas claims falsified opium leads to blindness, if used to heal illnesses of the eye. Ibn al Baitar rejects both of these statements (Sontheimer 1840, 64). Additionally he cites Dioscorides advices to identify falsified opium. These quotations support the assumption of a highly demanded and traded remedy as well as the respect with which it was treated. *P.somniferum* was found at EBA Kastanas and at LBA/IA Assiros Toumba, Jarma, Kalapodi, Kastanas, Tiryns and Samos Heraion. In the early archaeological samples *Papaver sp.* was present at 12,5 % of the sites with a total amount of 16 sites, thereafter the numbers lowered to 8,27 % with 11 sites and afterwards to 5,88% with 2 sites. These numbers may seem to be relatively low, to the high reputation assumed for this plant. However there is a diverging chance for seeds to get carbonized in an archaeological context. According to Märkle and Rösch for *P. somniferum* the temperature range in which carbonization appears is pretty small, resulting in a very limited chance to be preserved at all (Märkle – Rösch 2008, 257). Other, additional lines of evidence are highly needed to account for this problem and to get an adequate picture of the ancient situation. A pretty interesting study was conducted by Smith et al. for the detection of opium alkaloids in a Cypriot base-ring juglet in 2018. This, in the eastern Mediterranean during the LBA (1650–1350 BC) widely traded ceramic ware, have already been suggested to be linked with opium in 1962 by Merilles, because of its significant form, looking much alike poppy-capsules (Smith et al. 2018, 5127). Artificial ageing experiments have shown that morphine, the most abundant alkaloid of *P. Somniferum* does not survive well through time, but papaverine, thebaine and the breakdown products of noscapin are relatively resistant to degradation (Smith et al. 2018, 5127) with papaverine being the most stable alkaloid (Smith et al. 2018, 5134). In the examined juglet residues of papaverine and thebaine have been detected with concentrations of 0.4–2.6 pg mg<sup>-1</sup> and 2–12 pg mg<sup>-1</sup> (Smith et al. 2018, 5135) hence giving a positive result for opium alkaloids. Another interesting line of evidence was followed by Saul et al. in search for spices of prehistoric European cuisine. They tested carbonised food deposits on pottery from the western Baltic for phytoliths, finding *P. somniferum* at seven sites, dating from c. 5650 BP to c.3950 BP, in France, Germany, Poland, Spain and Switzerland (Saul et al. 2013, 2). Approaches like these are able to concrete our evidence and should be taken into account not only for taxa whose



seeds are more prone to degradation, but also for plants, where the nature of its use (e.g. preparations of leaves) is problematic for archaeological survival.

#### 4. Conclusion

337 of the 362 investigated sites yielded potential medicinal Taxa (in total 186 Taxa on species – and 43 Taxa on genus level). As expected, dietary crops were present at a higher frequency of sites than it was observed for wild plants. Some of the reasons for this will be a more regular or a broader utilisation plant and taphonomic agents. Although taphonomy is exclusively unfavourable when it comes to medicinal herbs, a notable amount of them is present at archaeological sites. Especially the frequencies of *Fumaria sp.* and *Heliotropium sp.* are noteworthy. Since a remedy should be easy accessible when it's needed, crops should not be ruled out as a possible source for pharmaceuticals. The collection of 13 different authors describing the medical qualities of peas does illustrate this pretty well. However abundances of medical plants in an archaeological context do not necessarily indicate their importance for a population and the above given percentages should not be interpreted as such. Additional lines of evidences are highly needed, on the one hand, to be able to find even those plants with a rather unfavourable fossil record (the family of *Lamiaceae* for instance is highly esteemed in modern ethnopharmacology, but severely underrepresented in the archaeological record) but on the other hand, to be able to verify the actual use of a plant as a remedy, since a lot of healing plants belong to spices, oil and fibre sources or dietary crops. Interesting approaches were made by Chaves and Reinhard (2003) who linked pollenfinds in coprolites with diseases that affected the studied population or by Berihuete-Azorin (2015) who proposed a form for the systematization of ethnobotanical information for archaeobotanical interpretation that could help to find markers on residues coming from specialized preparation procedures. Interdisciplinary research will be the key for an in-depth understanding of our medicinal prehistory.

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### Correspondence

B.A. Mandy Bertram

Eberhard Karls Universität Tübingen

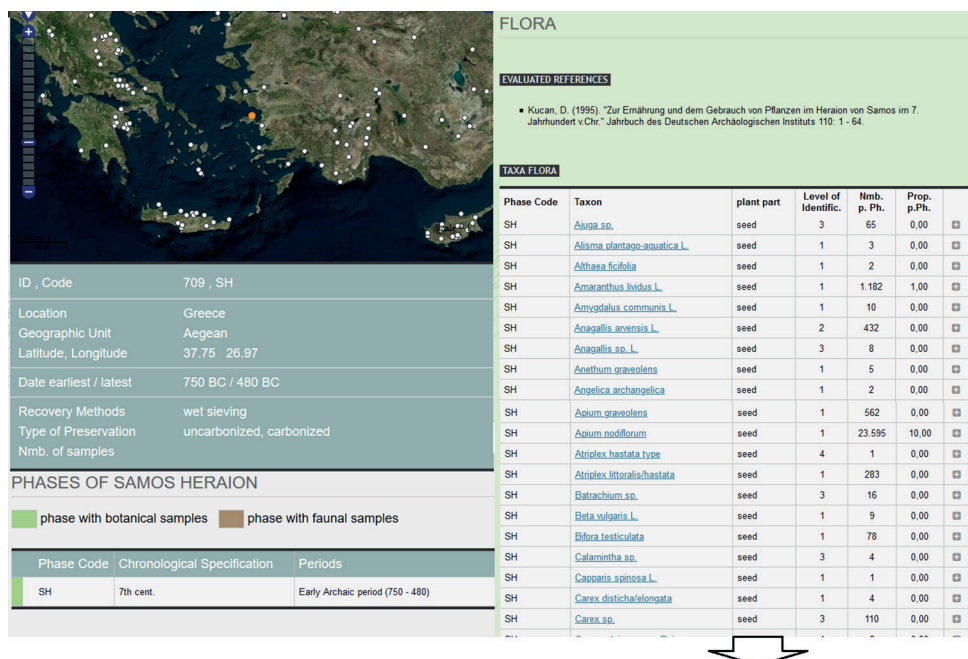
Institut für Naturwissenschaftliche Archäologie

Rümelinstr. 23

72070 Tübingen

mandy.bertram@fu-berlin.de

mandy.bertram@student.uni-tuebingen.de



**FLORA**

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**TAXA FLORA**

Phase Code	Taxon	plant part	Level of Identific.	Nmb. p. Ph.	Prop. p.Ph.
SH	<a href="#">Aegilops sp.</a>	seed	3	65	0,00
SH	<a href="#">Alisma plantago-aquatica L.</a>	seed	1	3	0,00
SH	<a href="#">Althaea ficifolia</a>	seed	1	2	0,00
SH	<a href="#">Amaranthus lividus L.</a>	seed	1	1.182	1,00
SH	<a href="#">Amygdalus communis L.</a>	seed	1	10	0,00
SH	<a href="#">Anagallis arvensis L.</a>	seed	2	432	0,00
SH	<a href="#">Anagallis sp. L.</a>	seed	3	8	0,00
SH	<a href="#">Anethum graveolens</a>	seed	1	5	0,00
SH	<a href="#">Angelica archangelica</a>	seed	1	2	0,00
SH	<a href="#">Apium graveolens</a>	seed	1	562	0,00
SH	<a href="#">Apium nodiflorum</a>	seed	1	23.595	10,00
SH	<a href="#">Atriplex hastata type</a>	seed	4	1	0,00
SH	<a href="#">Atriplex littoralis/hastata</a>	seed	1	283	0,00
SH	<a href="#">Batrachium sp.</a>	seed	3	16	0,00
SH	<a href="#">Beta vulgaris L.</a>	seed	1	9	0,00
SH	<a href="#">Bifora testiculata</a>	seed	1	78	0,00
SH	<a href="#">Calamintha sp.</a>	seed	3	4	0,00
SH	<a href="#">Capparis spinosa L.</a>	seed	1	1	0,00
SH	<a href="#">Carex disticha/elongata</a>	seed	1	4	0,00
SH	<a href="#">Carex sp.</a>	seed	3	110	0,00

**PHASES OF SAMOS HERAION**

phase with botanical samples    phase with faunal samples

Phase Code	Chronological Specification	Periods
SH	7th cent.	Early Archaic period (750 - 480)

Fig. 1: ADEMNES webpage for the site Samos Heraion (cf. Riehl and Kümmel 2005: <http://www.ademnes.de/db/site.php?s=709>). Copyright: ADEMNES webpage (screenshot created by the author).

Medicinal Taxa	Epoch Site	Bronze Age				Iron Age			Medieval			
		3500 BC	3000 BC	2500 BC	2000 BC	1500 BC	1000 BC	500 BC	0	500 AD	1000 AD	1500 AD
30	Tell Aphek 3200-840 BC	—————				—————						
27	Tell Mishrifeh 3200-500 BC	—————				—————						
33	Kastanas 3200-400 BC	—————				—————						
39	Troia 3200-323 BC	—————				—————						
24	Tell Mozan 2550-1700 BC		—————									
18	Kaman Kalehöyük 3200BC - 1923 AD	—————										
31	Tutankhamun tomb c. 1325 BC					x						
11	Ulu Burun c. 1310 BC					x						
28	Ashkelon 1000-500 BC						—————					
55	Samos Heraion 700-600 BC						———					
25	Garama 60 BC-800 AD								—————			
16	Qaryat Medad 750-1400 AD									—————		
13	Gritille 1000-1300 AD									—————		
13	Serce Limani 1025 AD									x		
12	Tell Guftan 1000-1400 AD									—————		
Number of Sites		128				133			34			

Fig. 2: An exemplary selection of sites used for this analysis. Finds were grouped according to their age. For display five sites per group have been chosen for their richness in medicinal taxa or their exceptional contexts. At the bottom you can see the total number of medicinal taxa yielding sites in the related timeframe. Note the small amount of sites in the latest group. Created by the author.

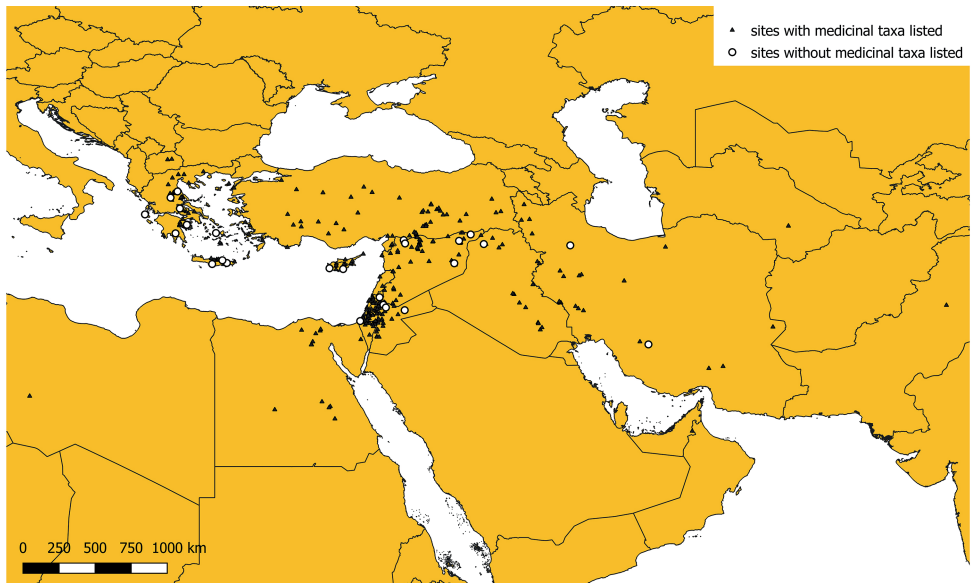


Table 1: Representation of medicinal taxa in the literature listed in Adennes. 362 Sites were included in the analysis. 25 of them didn't yielded any medicinal taxa. These sites are (from west to east): Kephallenia, Tsani, Menelaion, Marmariani, Drachmani, Synoro, Lilitana, Saliagos, Mallia, Gournia, Lemba-Lakkous, Kalavassos village, Kissufim road, Beth Saida, Tell Miqne, Tell el Fukhar, Dhuweila, Tell Ilbol, Tell Qaramel, Shheil 5, Tell Hwes, Tell Leilan, Yarim Tepe I, Susa and Tall e Mushki

Fig. 3: Medicinal Taxa yielding sites (337). Map made with QGIS by the author.

Field Crops						
	c.3000–1500 BC		c.1500–1 BC		c.1–1500 AD	
Taxon	%	sites	%	sites	%	sites
<i>Vicia</i> sp.	60,16	77	58,65	78	38,24	13
<i>Lens culinaris</i>	51,56	66	44,36	59	44,12	15
<i>Avena</i> sp.	32,81	42	24,81	33	17,65	6
<i>Triticum monococcum</i>	40,63	52	18,8	25	11,76	4
<i>Hordeum distichum</i>	32,81	42	18,8	25	26,47	9
<i>Pisum sativum</i>	28,13	36	16,54	22	23,53	8
<i>Linum usitatissimum</i>	23,44	30	15,04	20	11,76	4
<i>Panicum</i> sp.	7,81	10	10,53	14	35,29	12
<i>Triticum spelta</i>	3,91	5	5,97	8	2,94	1
Trees and Shrubs						
<i>Vitis</i> sp.	60,16	68	57,89	77	55,88	19
<i>Olea europaea</i>	35,94	46	46,62	62	20,59	7
<i>Ficus carica/sycomorus</i>	26,56	34	35,34	47	20,59	7
<i>Quercus</i> sp.	21,88	28	19,55	26	14,71	5
<i>Punica granatum</i>	7,03	9	19,55	26	14,71	5
<i>Phoenix dactylifera</i>	7,81	10	17,29	23	17,65	6
<i>Tamarix</i> sp.	11,72	15	15,79	21	0	0
<i>Amygdalus communis</i>	5,47	7	12,78	17	11,76	4
<i>Capparis spinosa</i>	5,47	7	6,02	8	0	0
<i>Cedrus</i> sp.	4,69	6	8,27	11	0	0
Herbs and Weeds						
<i>Fumaria</i> sp.	21,88	28	19,55	26	17,65	6
<i>Heliotropium</i> sp.	14,84	19	9,77	13	14,71	5
<i>Papaver</i> sp.	12,5	16	8,27	11	5,88	2
<i>Coriandrum sativum</i>	2,34	3	7,52	10	14,71	5
<i>Euphorbia</i> sp.	10,16	13	7,52	10	5,88	2
<i>Verbena</i> sp.	5,47	7	6,02	8	2,94	1
<i>Portulaca oleracea</i>	4,69	6	6,02	8	0	0
<i>Hyosciamus</i> sp.	8,59	11	5,26	7	2,94	1
<i>Lepidium</i> sp.	5,47	7	2,26	3	0	0
<i>Carthamus tinctorius</i>	7,81	10	1,5	2	0	0

Tab. 1: Most common medicinal plants. Created by the author.

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