Dental Terms in Julius Pollux's *The Onomasticon*

Dimitrios Chr. Koutroumpas, MA, PhD
Historian of Science, Postdoctoral Research Fellow
Ioannis A. Vrotsos, DDS, PhD
Professor, Deptartment Chair of Periodontology
National & Kapodistrian Dental School, University of Athens
Greece

Julius Pollux's *The Onomasticon*, a lexicographical work, contains a large number of terms on dental and oral issues; through them, we can see people's perceptions about the dental arch and the oral cavity in the 2nd century CE. The dental arch is presented thoroughly, naming the groups of teeth and presenting their characteristics. Special mention is made of the wisdom teeth. Pollux also gives a brief description of the tooth in general, the alveolar process and the gingiva. He also refers to dental anomalies and diseases.

Introduction

Julius Pollux was a sophist, grammarian and lexicographer of the 2nd century CE. Little is known about his life; most information is drawn from either the 10th-century dictionary of Suda (or Souda)[1] or from Lucius Flavius Philostratus' work, *The Lives of the Sophists*. Born in Naukratis of Egypt, Pollux learned his letters and practiced in oration and rhetoric under the guardianship of his father.[2] He continued his studies in Athens, near the orator Hadrian, who held the chair of rhetoric in Athens.[3,4] During the reign of the emperor Marcus Aurelius, Pollux travelled to Rome, where it is believed that he was a teacher of Commodus. According to Philostratus, Commodus was fascinated by Pollux's melodious voice, and appointed him professor of rhetoric in Athens around 178-180 CE.[5] However, it is more likely that Pollux received that distinguished position as a gift in return for his work entitled *Epithalamium to Caesar Commodus,* which was dedicated on the occasion of Commodus' marriage to Bruttia Crispina in 177 CE.[6] Pollux died at the age of 58, leaving a son.

According to Suda, Pollux was the author of a number of works, such as *Roman Speech*, *Trumpet* or *Musical Contest*, *Against Socrates*, *Against the People of Sinope*, *Panellenic Speech*, *Arcadian Speech*, etc. The only work that has survived—and only in incomplete form—is the lexicographical work entitled *The Onomasticon*.

Correspondence:
Dimitrios Koutroumpas
8 Dim. Lioumi str.
19001 Keratea
Greece
Phone: 00306947689353
Fax: 00302299069988
dkoutroumpas@gmail.com

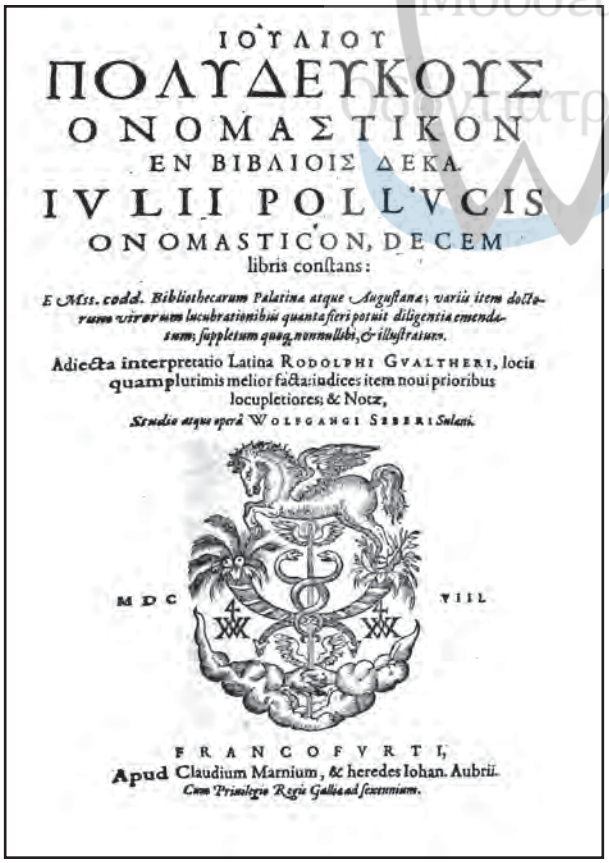
The Onomasticon

It is estimated that *The Onomasticon* was written during the reign of Commodus (180–192 CE). It is possible that Pollux started writing when he was Commodus' teacher, but completed it later. According to the Greek historian of natural sciences M. Stefanidis, every introduction to the books of *The Onomasticon*, and especially those of the 4th and 6th books, show the teacher-student relationship which existed between Pollux and Commodus.[7] In addition to this, Pollux always addresses Commodus in exactly the same way: [Julius Pollux is greeting Caesar Commodus]. He addresses Commodus as Caesar, a title which he held from the age of five; he took the name 'August' at the age of 16, when he became co-emperor with Marcus Aurelius in 177 CE.

The initial text of *The Onomasticon* possibly consisted of 10 or 17 books, according to differing accounts. Unfortunately, the only surviving copy is an epitome of the 9th century, which was in the possession of the Byzantine scholar Arethas, Archbishop of Caesarea. From that archetype were derived the four incomplete versions and, thereon, any surviving manuscript of *The Onomasticon*.[8]

Despite any changes, interferences or abbreviations in the original text, *The Onomasticon* still includes a significant volume of the original work—enough for the study and evaluation of it. It is a lexicographical work, which contains the words of the Attic dialect. The recording of the words is not done in alphabetical order, but by subject. This type of classification was used in organizing similar lexicographical works in early ancient Greek literature. That method was gradually replaced by alphabetical order.[9] To make it clearer, we will give some examples of the way by which Pollux recorded medical terms at the end of the 4th book. In this classification, he includes an adequate number of words which were then commonly used in medical practice, some of them surviving until the present.

This type of recording complies with the criterion of classification according to the subject:


ΙΟΥΛΙΟΥ
ΠΟΛΥΔΕΥΚΟΥΣ
ΟΝΟΜΑΣΤΙΚΟΝ
ΕΝ ΒΙΒΛΙΟΙΣ ΔΕΚΑ.
IVLII POLLVCIS
ONOMASTICON, DECEM
libris constans:
E Mss. codd. Bibliothecarum Palatina atque Augustana; variis item doctorum virorum lucubrationibus quanta fieri potuit diligentia emendatum; suppletum quoq; nonnullibi, & illustratum.
Adiecta interpretatio Latina RODOLPHI GVALTHERI, locis quamplurimis melior facta: indices item noui prioribus locupletiores; & Notæ,
Studio atque operâ WOLFGANGI SEBERI Sulani.
MDC VIII
FRANCOFVRTI,
Apud Claudium Marnium, & heredes Iohan. Aubrii.
Cum Priuilegio Regis Galliæ ad sexennium.

Title page, 1608 edition.

i) Of similar words, for example derivatives of the root word ἰατρική (medicine), e.g.: "Ἀπὸ δ' ἰατρικῆς ἰατρός ἰατρεία, ἴασις, ἰάσασθαι ἐξιάσασθαι, ἰώμενος, ἰάσιμος ἀνίατος, ἰάματα· καὶ ὁ μισθὸς ἰατρεῖα, καὶ τὸ ἐργαστήριον ἰατρεῖον…"[10] [From medicine, physician, medical treatment, healing, heal, cure thoroughly, curable, incurable, remedies· the medical fees, the medical laboratory…]

ii) related things, e.g.: "…καὶ ἐργαλεῖα μὲν ἰατρῶν σμίλη, ψαλίς, τομεύς, ὠτογλυφίς, μήλη, ὑπογραφίς, βελόνη, ξυστήρ, ὀδοντοξέστης, ὀδοντάγρα, εὐδίαιον…"[11] ["…the instruments of doctors are the chisel, scissors, carver, ear pick, probe, pencil, needle, scraper, tooth scraper, tooth forceps, clyster pipe…"]

With regard to the structure of the work, each one of the surviving ten books of *The Onomasticon* has an introduction with a short dedication letter to Commodus. The content varies among the books; however, broadly and from the view of the contemporary concept of science, we can consider that books 1, 3, 8 and 9 refer to terms and names of the theoretical sciences and that they include,

among others, the topics of theology (1); kinship and relationships (2); law and justice (8); and cities (9). However, in the 2nd he lists the nomenclature of the category of "science," for example: the parts of man; astronomy; geometry; numerics; metrology and medicine; and in the 4th book, names related to poetry; music; dancing and theatre.

In each book, he separately records the names, synonyms and derivatives which are relative to the issue at hand. For example, in the 4th book, after the synonyms and derivatives of the topic ἰατρική (medicine), there follow the synonyms and derivatives of topics related to medicine, such as θεραπεύειν (cure), νοσηλεία (nursing), ὑγίεια (health) and φαρμακεία (use of drugs). Next, the names of diseases are mentioned and the book is completed with the homonyms, synonyms and derivatives of the topic μαῖα (midwife).[13]

Of course, aside from just listing names without explanation, he often introduces topics (synonyms or derivatives) in a way that does not follow any logical sequence. The case of the 3rd book is characteristic, in which he starts with the names of kin and relationships, and then follows with topics about parents and marriage. Topics about friends and enemies come next, but he then continues with irrelevant topics about bankers, small and great rivers, wealth and then, finally, sports. The lack of any logical sequence verifies, without doubt, that there were alterations to the original text during the creation of the later epitome.

Naming of the Parts of the Human Body

Perhaps the only book that presents any notable consistency is the 2nd one, which refers exclusively to the parts of the human body. Clearly, it is an epitome of a larger work which should have focused on man from a purely medical approach.

Even the initial topics verify this: ἄνθρωπος (man), σπέρμα (semen), βρέφος νεογενές (newborn baby), νεανίσκος (child/youth), γέρων (old man).[14]

The second book begins with an introduction to man—first to the male and then to the female—with the topics ordered in a sequence according to the developmental phases of the human body. From the sperm of the man, the infant is created. Thereafter, depending upon his age, he acquires different names for each phase of development, from infancy to old age.

Given the particular nature of the 2nd book, where he discusses matters of human anatomy and the parts of the body, Pollux does not list any topic without interpretation. Rather than merely listing words, topics in this volume are treated as special terms, which are interpreted for a non-specialist reader. Pollux has a unique way of using metaphors for the interpretation and explanation of terms:

"…in each side of the nose are placed above the cheeks, what are called apples, that are the sub-eye guard of the eyes.[15] Or they are called (cheeks) as they bloom in time."[16]

These explanations are examples of the detailed etymological explanations which Pollux provided for the 2nd book.

As for the parts of the human body, the description begins with the hairy part of the head[17] and then the parts of the face, such as the eyes,[18] nose,[19] ears,[20] cheeks,[21] lips,[22] teeth[23] and mouth.[24] This way of recording anatomical data is called, according to the Roman tradition, "*a capite ad calcem*" ("from the head to the heel"). It is based in the anatomical classification of the parts of the human body which begins with the hair of the head and ends with the lower extremities. This was considered as the ideal model for anatomical descriptions until the end of the Renaissance. However, *The Onomasticon* ends in the area of the stomach, the last described organs being the liver[25] and the spleen.[26] This fact means that the rest of the text about the lower extremities has not survived through the epitomes; it has probably been lost. Nevertheless, the surviving text of the 2nd book contains an important catalogue of medical terms such as, for example, dermatology[27] and dentistry.

Dental and Oral Anatomical Terms

The oral and dental anatomy as presented by Pollux is of crucial importance in drawing the outline of dental knowledge during the first Christian centuries of the Roman Empire. *The Onomasticon* is not a medical or a dental treatise. However, we can see the perceptions about the dental arch and the degree of diffusion of dental knowledge among scholars of different fields, such as Pollux, and the broader intellectual elite of that time.

In *The Onomasticon*, the anatomy of the oral region begins with the cheeks (παρειές), which were also called apples (μήλα). They are located on the right and the left from the nose. Their main role is to protect the eyes, along with the eyelids.[28] After the cheeks, the lips (χείλη) follow, while the anatomical area located inside them is called στόμα (mouth). The mouth is also called χάνος (*chanos*: open space/gap) as a derivative of the verb χαίνω (*chainō*).[29] The top of the mouth is called ουρανός or υπερώα (palate) and is covered by innervated flesh, which extends from the internal surface of the teeth to the side surfaces of the tonsils. While Pollux mentions the innervation of the palate flesh, he does not make any reference to nerves or innervation in other anatomical structures of the oral region and even more of the teeth. In antiquity, the first one to mention tooth innervation was Galen of Pergamum.[30]

The oral cavity ends with the φάρυξ (*pharynx*) which, because of its narrowness, is also called ἰσθμός (*isthmos,* narrow passage). In the deeper part of the palate hangs the κίων or κιονίς (*kiwn* or *kionis,* uvula), which is called by some authors χόνδρος or γαργαρεών (*chondros* or *gargareōn*). When sick, it is inflamed and then it is called σταφυλὴ (*stafyli*, illness) or σταφυλοφόρος.[31] This is also supported by Rufus of Ephesus who, in his treatise *On the Names of the Parts of the Human Body*, is the main source of many of the anatomical terms of *The Onomasticon*[32] and which mentions σταφυλὴ (*stafuli*), not the anatomical element but the condition.[33] Today, it means the opposite, since stafyli is defined as an anatomical element only and not an illness.

Lips are the gateways into the mouth. Pollux mentions that Homer called them ἕρκος ὀδόντων,[34] (*erkos odontōn*), i.e., a fence of the teeth. They are distinguished in the upper and lower lip in exactly the same way that the jaws are distinguished in the upper and lower jaw. In this case, the upper jaws of all animals are fixed, while the lower moves to process food. The sole exception is the crocodile in which, in accordance with the views of the author, the upper jaw moves while the lower is fixed.[35]

The lips, which are also called μύλλα (mylla)depending on their size, can be divided into ἰσοχειλῆ (*isocheili*) when displaying full or normal development and ἐπιχειλῆ (*epicheili*) when they are smaller than normal and with the characteristic rising of the upper lip.[36] The anatomical description of the lips continues with the presentation of the external surfaces of the face associated with them. As such, the area of the face which includes the lips is called κημός (*kimos*). The groove that is formed in the upper lip, i.e., the subnasal groove, is characterized as φίλτρον (*filtron,* philtrum) while the corresponding groove of the lower lip is called τύπος or νύμφη (*typos* or *nymph*)—this is the small groove located between the lower lip and the chin, now called the mentolabial sulcus. Between the outer and inner surface of the lip stands the προχειλίδιον (*prochilidion,* vermillion), which is the part of the lip that projects, while the joint of the lips is called προστόμιον (*prostomion,* oral commissure). The areas where the lips are attached to the jaws are called by Pollux χαλινοί (*chalini,* frenulum).[37] In contemporary terminology, the frenulum is the delicate membrane by which the lips are attached to the oral mucosa.

The teeth, according to Pollux, number thirty two. Today this reference does not have any special interest, but *The Onomasticon* is the only non-medical text of ancient Greek literature which mentions the exact number of teeth in the human dental arch. Even in medical treatises, such references are rare; only in the pseudo-Hippocratic letter to King Ptolemy *On the formation of man*[38] and one small part of the treatise *On the utility of the parts of the human body*[39] from within the whole of the Corpus Galenicum. In the other texts of the

ancient medical literature, the number of teeth is either not mentioned at all, or else is derived from summing up the number of teeth mentioned during the description of the dental arch, as in the case of Rufus of Ephesus.[40] The lack of any mention a definite number of teeth has to be attributed to the fact that the dental arch was not usually intact, a fact that is supported by a plethora of archaeological and anthropological findings. In the ancient world, the absence of oral hygiene in combination with nutritional habits often resulted in dental caries, periodontal diseases and other severe dental problems, which finally resulted in alveolar bone and tooth loss.[41]

The thirty-two teeth which form the dental arch are attached with sixteen per jaw. The four middle teeth in each jaw are recorded with a variety of names that are directly associated with their role. Accordingly, they are called τομείς (*tomis,* incisors) because they intersect with food. This is the most common name by which the four front teeth of the dentition appear in the ancient literature. They are also classified as γελασῖνοι ὀδόντες (*gelasini odontes,* smiling teeth), because these teeth are shown when we laugh, while they are called διχαστῆρες ὀδόντες (*dichastires odontes,* dissecting teeth) because of their ability to separate food. Finally, they are also referred as κτένες ὀδόντες (*ktenes odontes*), because they destroy anything that they grasp in-between them.[42] (The word κτείς, plural κτένες, is derivative of the verb κτείνω, which means destroy, kill.)

The next teeth are the κυνόδοντες (*kynodontes,* canines). There are two in each jaw, one at each side, and they received their name after their acuteness, which gives them a form that resembles the teeth of dogs. Both the incisors and canines have a single root.[43]

The next category of teeth is the γομφίοι (*gomfii,* molars). In other medical writers of antiquity, such as Galen,[44] there was no distinction between the premolars and the molars. According to Pollux, the molars are located next to the incisors, five on each side and ten in each jaw. Obviously, the molars are located on both sides of the canines, which is not clearly stated, perhaps because the reference point in the presentation of the teeth are the incisors, which are recorded first. The molars are further divided into molars with two roots and those having three roots. Pollux, however, does not explicitly mention in which jaw each group is impacted. In *The Onomasticon*, the presentation of the molars is completed with references to their usefulness, stressing that the μύλαι (*myle,* crowns) of the molars are used for grinding food, rather like a wheat mill grinds grains.[45] By the term μύλαι he refers to the part of the tooth that protrudes over the gums in the oral cavity. Galen, who is a contemporary of Pollux, mentions that besides meaning only the protruding part of the molars, μύλαι could also refer to molars as a whole.[46,47]

The last kind of teeth are the σωφρονιστῆρες* (pl. *sōfronistires*, sing. *sōfronistir,* wisdom tooth), which are found at the end of each quadrant of the dentition and which erupt after an individual reaches age 20. These are the third molars and they are also called κραντῆρες (*krantires*).** Pollux seems to accept the Aristotelian notion that in certain people they may appear even after the eightieth year.[48]

After completing the presentation of the three types of teeth, Pollux then goes into a brief description of the tooth in general. This description reflects more the morphology of the molars rather that the incisors or canines. As such, the part of the tooth that protrudes from the gums is the μύλη (*mili,* crown) which is further distinguished from

* The word σωφρονιστήρ (sofronistir) is derivative of σώφρων (sofron), which means wise or prudent. The first reference to the third molars as sofronistir is attributed to the stoic philosopher Kleanthis of Assos (ca. 330–232 BCE), who mentions that the naming is related to the period of eruption which coincides with the time when a man's mind matures. See: Ioannes von Arnim, Stoicorum veterum fragmenta, vol. I, (Leipzig: Teubner 1903): fr. 524, pp. 12–14. It is also interesting to mention that, according to the treatise *Lives and Opinions of Eminent Philosophers* by Diogenes Laertios, Kleanthes died because of gum suppuration (7.176.1). This is the first recorded death due to dental disease in ancient Greek literature.

** The word κραντὴρ (krantir): one that accomplishes, the teeth that complete the set, as with the eruption of that tooth by which the dentition is completed (karantires are called the teeth that erupt later at the accomplishing and completing of age.) See: Ioannes von Arnim, Stoicorum veterum fragmenta, vol. I, (Leipzig: Teubner 1903): fr. 524, pp. 12–14.

a) βωμίσκος (*bōmiskos,* altar, base), the part that is located on the side of the flesh. In other words, the side surfaces and the bulk of the crown and b) the τράπεζα (*trapeza,* table), the part which grinds the foods, i.e., the occlusal surface of the teeth.[49]

Particularly problematic is the interpretation of the terms ὀλμίσκοι (*olmiskoi*) and φάτναι (*fatnai*).[50] There are two possibilities. The first, and most likely, is that *olmiskoi* qualifies as the bone cavities of the jaws, while the sum of them is the *fatnai*. Obviously these are the alveoli that support the teeth. This interpretation supports Rufus of Ephesus, who argued that *olmiskoi* and *fatnai* are the crevices which support the teeth.[51]

However, it is also possible that *olmiskoi* means the pits of the occlusal surfaces of the molar teeth, while *fatnai* refer to what we today call the alveoli. Galen mentions that the attachment of the teeth is made to the alveoli (φατνία, *fatnia*), the name of which is derived from the timbers (φάτναι, *fatnai*) of the wooden troughs used for feeding animals. The alveoli are cavities in the bone which accommodate the roots of the teeth; they are part of the jaw bone.[52] Accordingly, the teeth are interlocked in the cavities formed in the alveolar process.[53]

The description of the tooth is completed with the flesh that surrounds each tooth attached in the alveoli. The flesh which surrounds the outer side of the teeth is called οὖλα (*oyla*, gingiva), while that of the internal surface is ἔνουλα (*enoyla*). The contact points of two teeth are called ἁρμοί (*armi*, joints). The teeth impacted in the jaws, contacting each other, are aligned in such a way that this arrangement of teeth is called—and remains to this day called—οδοντικός φραγμός (*odontikos phragmos*, dentition, dental arch), and altogether the row of teeth is called, barrier.[54]

Pollux seems to accept the view of Aristotle that males have more teeth than females, and he accepts the view that people with dense teeth in close contact live longer that those who have spaced teeth. In order to make an impression on the reader, he interpolates a delightful story. According to his tale, Pyrrhus (319-272 BCE), King of Epirus and one of the greatest ancient marshals, had a unique dentition because his teeth were so dense that they gave the sense of one solid bone with only superficial groves in the shape of teeth.[55]

Pollux does not fail to refer to dental anomalies and diseases. He recognizes as a disease the οδοντοφυΐα (*odontofiia*, dentition) and the οδονταλγία (*odontalgia*, toothache).[56] Νωδός or ἀνόδους/ἀνόδων (*nōdos* or *anodoys/anodōn,* edentulous or toothless) is characterized as someone who lacks any teeth.

Προόδων (*proodōn*) names anyone who has protruding teeth, whilst ὀξύγενυς or γένυς (*oxygenys* or *genys*) is a person with a protruding mandible and lip (nowadays called prognathic).[57] Finally, he mentions the medical instruments ὀδοντοξέστης (*odontoxestis,* tooth scraper) and ὀδοντάγρα (*odontagra,* tooth forceps).[58] These are not the only instruments used in dental procedures,[59] but they are the only ones recorded as derivatives of the word ὀδούς (*odons,* tooth).

Influences During the Recording of Oral and Dental Terms

One most interesting aspects is the search of sources from which information was taken to write dental lexicographical reports. It is known that Pollux used numerous works, including lexicographical aids. For example, in the introduction of the 9th book he states that he has taken into account the *The Onomasticon* of the sophist Gorgias and other similar writings. It seems, however, that he does not appreciate such works because he believes that Gorgias' list of terms is tiring and, most importantly, that the way in which it is built reveals sketchiness, without offering something new to the extant knowledge, making its study boring.[60]

As regards the second book, in the introductory letter committing the project, Pollux is absolutely clear as to what were his sources:

> Julius Pollux sends his greetings to Caesar Commodus. What I could find following those who knew the correct terminology for the parts of the human body that is exactly what I was ready to learn from them. But I was taught many things also by the students of the Peripatetic [school], which they have gathered by themselves, their own evidence

> along with the evidence of doctors: some of these we have gathered from them. Because, for these matters of which knowledge is a result of experience, the benefits of these matters come from those who have gained knowledge from experience. Be merry.[61]

We see, therefore, that the collection of material for the second book was based on the works of authors who knew the correct terminology for the parts of the human body. Obviously, Pollux refers to doctors as having a good knowledge of anatomy. The second important source was the students of the peripatetic school, whose founder was Aristotle, the giant who defined the science of dentistry.[62]

This study focuses exclusively on the part of the second book, where oral and dental terms are discussed, and on the influences upon Pollux in their recording. First of all, he mentions Homer, who characterizes the lips as the fence of the teeth. This expression, ἕρκος ὀδόντων, is found in three passages of the *Iliad*[63] and seven of the *Odyssey*;[64] Homer uses it as a common expression when he speaks of lips. Besides Homer, a multitude of authors—such as Aristophanes, Xenophon and Phrynichus the comic poet—used this expression. However, Pollux's references to these writers are not concerned with the topics of the dental scholar's terminology of that period, but rather as common terms in everyday life. For example, a toothless person is called νωδό (*nōdo*, edentulous) but Pherecrates, the comic poet, also calls him ἀνόδοντα (*anodonta*, toothless).[65]

Worth special mention are the references to Aristotle's work. Although Aristotle was not a doctor like his father Nicomachus, he occupied himself with the study of nature and live organisms, paying remarkable attention. In particular, the *History of Animals*—a treatise that can be considered the first genuine dental treatise in ancient Greek literature[66]—Aristotle gives a significant number of descriptions regarding the special dental characteristics of several kinds of animals.[67] It is therefore reasonable that Pollux draws information from Aristotle and this treatise.

Pollux is clearly influenced by the Aristotelian work and he borrows passages from it. The first reference to the Aristotelian work is made when he mentions the name κραντῆρ (*krantir*) for the third molar teeth and the fact that they may grow, in some cases, even after the 80th year.[68] The second reference is made to Aristotle's misperception that women have fewer teeth than men. It is really remarkable that Aristotle's incorrect views on the number of teeth in women survived from the 4th century BCE, when Aristotle lived, until the middle of the 2nd century CE. However, Pollux does not extend his belief to other animals, like Aristotle, who considered that the same happened with sheep, goats and pigs. The subject of the 2nd book of *The Onomasticon* is concerned solely with the presentation of the parts of the human body. Pollux also repeats the incorrect view of Aristotle about the proportional relation between dense teeth and longevity, and vice versa.[69] The third and last reference is about the naming of σταφυλή (*stafuli*, uvula), which Aristotle also called σταφυλοφόρον (*stafuloforon*).[70]

As regards the purely medical works, Pollux does not make any references to the *Corpus Hippocraticum*. This observation is only about the dental terms of the second book, but not the entire second book of *The Onomasticon* where we find nine of the total twelve references under the name of the doctor of Kos. We really must wonder as to why Pollux does not mention any of the treatises of the Corpus Hippocraticum, such as *On fleshes*; in chapters 12 and 13 of this treatise, the teeth and their nature are studied. Meanwhile, in other parts of the 2nd book, he refers specifically to extracts from Hippocrates' works, such as in *On the Places in Man* and in *On Fractures*. However, in the part on teeth Pollux does not mention by name either Hippocrates or any other medical writer from whom he gets dental information.

The most interesting reference to Hippocrates about teeth is made in the 9th book, where he speaks of the benefit of the quality of heat. Pollux says: "When Hippocrates mentions that cold is hostile to nerves, bones, teeth and the brain, it is obvious that he knows the benefits of heat to teeth."[71]

The detrimental effect of cold on teeth is one of the main issues of ancient Greek dental theory. It is an intractable puzzle, which obsesses several Hippocratic writers and runs along the entire ancient Greek medical literature. As such, for the Hippocratic school, the quality of cold played a key

role in the formation of teeth.[72] Similar views survive in the doctrines of Aristotle and Galen; according to them, teeth have an earthy consistency because they are bones, and so the qualities of cold and dry dominate.[73]

However, the cold nature of teeth could not justify the harmful effect of cold on the teeth. The question is: how is it possible that teeth are made from cold and yet at the same time the cold can be hostile to them? The same query concerns the Aristotelian writer of the treatise *Problems*: why are teeth so sensitive to cold and also, why is cold a source of toothache since teeth are cold by their nature?[74] This very issue is the subject of the 18th aphorism of the fifth section of the treatise *Aphorisms*, where Hippocrates notes that cold is hostile to the bones, teeth, nerves, brain and the spinal cord. On the contrary, he believes hot to be beneficial to them.[75]

From Pollux's perspective, it is clear that he lists this aphorism in order to interpret it. However, of all of the organs which are harmed by cold he chooses to focus exclusively on teeth. In Pollux's view, it is obvious that Hippocrates knows the beneficial effect of hot on teeth, and so the opposite quality of cold must be hostile to them. It is indeed curious as to why Pollux decides to take a clear position on such a specialized medical issue and interpret Hippocrates' view about the effect of the quality of hot or cold on teeth. We have to assume that Pollux was aware of the dispute among doctors about the intractable problem of the harmful effect of cold on teeth, and decided to interpret the aphorism based on a philological interest.

When writing the dental-oral terms of *The Onomasticon*, Pollux was aware of the content of the pseudo-Hippocratic letter to king Ptolemy *On the formation of man*. In this letter, which is attributed traditionally to Hippocrates (although this is not true and, strangely, it is not included in Littré's edition),[76] it is said that the human teeth number thirty two and that the incisors are also called διχαστῆρες ὀδόντες (*dixastires odontes*). Besides *The Onomasticon*, this letter is the only other work in ancient literature that mentions the incisors by that name. Accordingly, we may assume with relative safety that the pseudo-letter was one of the sources used by Pollux to create *The Onomasticon*.

Though Pollux's references to other medical treatises are limited, it is certain that he used information from Rufus of Ephesus' treatise *On the Names of the Parts of the Human Body*.[77] Rufus' aim in that treatise was the recording of the names of the parts of the human body; Pollux's *The Onomasticon* is superior to the work of Rufus at least insofar as it concerns the oral and dental parts.

The names of the several parts of the mouth and the teeth which are listed in *The Onomasticon* are greater in number than the corresponding ones in Rufus's work. Furthermore, Pollux's descriptions are more instructive. For example, Rufus mentions about gingiva: "Οὖλα δὲ αἱ περὶ τὰς ῥίζας σάρκες."[78] ["Gingiva (is called) the flesh around the root (of teeth)"]. On the other hand, Pollux mentions with regard to the gingiva: "αἱ δὲ περιειληφυῖαι σάρκες τοὺς ὀδόντας, οὖλα μὲν τὰ ἔξωθεν, ἔνουλα δὲ τὰ ἔνδον· αἱ δὲ μεταξὺ τῶν ὀδόντων ἁρμογαὶ."[79] ["The fleshes that surround the teeth (are called) in the outer side οὖλα (gingiva), and in the inner side ἔνουλα (internal gingiva), while between the teeth (are called) ἁρμογαὶ (interdental papillae)".]

Although Pollux uses as a model *On the Names of the Parts of the Human Body*, he does not accept everything without thought and, of course, he does not repeat its mistakes. He ignores and does not repeat the incorrect view of Rufus that all the teeth are called κραντήρες (*krantires*).[80] On the contrary, he mentions in *The Onomasticon*, as with Aristotle[81] and other authors, that the third molars are called σωφρονιστῆρες or κραντῆρες.[82] Similarly, while Rufus mentions that παρειές (*pareies, cheeks*) are called also γνάθοι (*gnathoi*) and σιαγόνες (*siagones*) ("αἱ παρειαί καλοῦνται καὶ σιαγόνες, καὶ γνάθοι"),[83] Pollux does not include the name σιαγόνες, because he does not consider the two words as synonyms. For Pollux, παρειές are also called γνάθοι ("παρειαὶ δὲ καὶ γνάθοι ἂν καλοῖντο"), while he speaks about γένυες καὶ σιαγόνες[84] referring to the upper and lower jaw in the same sense as we refer to them today.

A special issue in the course of the development of the scientific ideas of dentistry is that Rufus does not mention anything about the innervation of the palate, though he distinguished nerves from the ligaments and the tendons.[85] On

the other hand, when Pollux refers to the palate he writes clearly that it is covered with innervated flesh (νευρῶδες δέρμα). Therefore, the reference to the innervation of the palate has to come from a later source than that of Rufus, but it could not be his contemporary Galen who was the first to mention tooth innervation.[86] That is, the source used by Pollux was an unknown intermediate link between Rufus and Galen, who knew the innervation of the palate but not that of the teeth.

Galen and Pollux: Contemporaries But Unknown to One Another?

In his introduction to the first book of *The Onomasticon*, Pollux claims that he had been Commodus' teacher.[87] Galen, on the other hand, had been Commodus'[88] personal physician since his childhood. So, the question arises: why does Pollux not use Galen as one of his sources and, even stranger: why does Galen not mention Pollux?[89]

If Pollux had indeed been Commodus' teacher, then we have to assume that he certainly knew Galen, as well as his work. Galen had reported on tooth innervation in his treatises *On bones for beginners*,[90] and in *On the utility of the parts*,[91] since his first stay[92] in Rome (162-166 CE). These treatises were well known and easily accessible, and so they were available to Pollux. Moreover, Pollux, as a member of the imperial court, should have had the chance to discuss with Galen not only medical but also philological issues, since it was well known that he had a rich education and writing skills worthy of an expert.[93] There are not many indications that Pollux used Galen's work as a source of information, while any references[94] are fragmentary and isolated.

Moreover, it is curious that Pollux does not mention the Corpus Galenicum, though Galen was a close friend and personal physician to the emperor Marcus Aurelius. It is true that Galen had very good relations with the entire intellectual elite of the imperial court and, especially, the teachers of the younger members of the imperial family. It is also true that Galen treated the orator and sophist Aelius Antipater, teacher of the sons of the Emperor Septimius Severus, Geta and Caracalla. Indeed, Galen must have had a close friendship with him, as Galen speaks with very complimentary words for the modest manners and the education of Antipater.[95]

As regards Commodus' reign, Galen avoids any reference[96] to this, although he mentions in detail people surrounding the Caesar during these early years. For example, he says that he treated one of the sons of Sextus Quintilius, a close partner of Commodus.[97] In parallel, it seems that he had a close relationship with Peitholaus, Commodus' pedagogue whom the emperor Marcus Aurelius held responsible, among others, to call on Galen any time the young Commodus was sick.[98] Characteristic of their close friendship and Galen's appreciation to Peitholaus is the fact that he discusses with him issues about medical training. He trusts him so much that Galen does not hesitate, in one case, to instruct Peitholaus on the treatment of Commodus.[99]

After all, if Pollux had been Commodus' teacher then it should be true that Galen would not have ignored the chance to become friends with him. It is known that Galen had interests in common with Pollux besides medicine, as he was the author of works on lexicographical and stylistic issues, which have been lost.[100] It is hard to imagine that if Galen knew and appreciated Pollux' work, he would not be tempted to address him on philological issues similar to these he discusses in his annotations in Hippocrates treatises.[101] Finally, we have to conclude that Galen did not know Pollux or, most probably, that he did not appreciate Pollux and his work; this is why he remains silent. Unfortunately we cannot draw any definite conclusions because Galen's lexicographical works have been lost.

However, it is certain that *The Onomasticon* was not assessed by his contemporaries in general, as Philostratus confirms. He doubts whether Pollux should be characterized as uneducated, educated or simultaneously educated *and* uneducated. This criticism is focused on the style of his critical orations and especially on the use of the Attic dialect; as to the last issue, Philostratus believes that Pollux had not demonstrated anything special.[102] Philostratus' final blow lies in his last statement, that the educated-uneducated holder of the chair of rhetoric in Athens had a child who was uneducated[103] and that it was

probably Pollux's own inadequate education which undermined his abilities as a father and teacher, so that he could not meet the minimum educational requirements of his son.[104] Finally, and more severe and also demonstrating self-interest, was the criticism by Phrynichus Arabius (also known as Phrynichus of Bithynia),* who asserted that the *The Onomasticon* did not feature genuine topics of the Attic dialect, but rather that it was mixed with topics from Homer, Hesiod and the Aeolian dialect. It would be an exaggeration to accept all of these critical accusations.

Conclusions

The Onomasticon is a lexicographical and encyclopedic thesaurus which was useful until modern times. Western scholars discovered and were interested in the thesaurus after the 15th century CE. However, the usefulness of its study is longitudinal, especially in the terminology on anatomy, since the 16th century anatomists frequently drew terms from it to replace Arabic anatomical terms.[105] Undeniably, Pollux was a source of anatomical terms which are still in use today. Similarly, modern Greek oral and dental terminology is remarkably identical to that of *The Onomasticon*, as though 18 centuries had not passed since its writing.

In contrast to the critics, we have to accept that Pollux had a critical mind, and presented us with a valuable work which contains a precious treasure of dental knowledge in addition to its linguistic material. Through the *The Onomasticon* we can estimate the high interest in oral and dental pathology in that time. The large number of terms on dental and oral issues reflects the development of oral and dental science in the middle of the 2nd century CE to such a degree that an adequate terminology had been developed, sufficient to describe the anatomical parts, dental instruments and oral and dental diseases. This is in contrast with the Latin literature of the early Christian era, in which we do not observe such verbal richness which would evince the development of dentistry. The Latin dental terminology was disappointingly restricted to only the essentials.[106] Even the efforts of Aulus Cornelius Celsus in De medicina (*On medicine*) to develop Latin terms corresponding to the Greek ones[107] were not enough to achieve a compact mass of dental terms and concepts.

It is for these reasons that *The Onomasticon* is not merely just another essay which enriches our knowledge of the practice of medicine and dentistry during the Roman imperial era; due to its huge volume of information, it allows us to see clearly the science of the teeth through the vision of a non-specialist but reliable observer.

* Phrynichus was a strict Atticist and a rival to Pollux in the fight for the seat of rhetoric in Athens. Expecting to win the desired promotion, he dedicated his essay On Attic Words, to Attidius Cornelianus, the supreme officer called ab epistulis graecis. It seems that this effort did not have the expected result and so, next, he dedicated his essay Sophistic Preparations to the emperor Commodus himself. However, the seat finally went to Pollux. In this way, Phrynichus became a fierce opponent of Pollux, exercising a harsh criticism which caused Pollux to reply in the 10th book of The Onomasticon listing quotations of ancient writers. See. Zecchini G. *Polluce la politica culturale di Commodo*. in: L' Onomasticon di Giulio Polluce. Tra lessicografia e antiquaria, Contributi di storia antica, 5, eds. Cinzia Bearzot, Franca Landucci Gattinoni, Giuseppe Zecchini (Milano: Vita e Pensiero, 2007): 18, 22-25.

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