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# Latin and Greek in Computing: Ancient Words in a New World

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**Abstract**— In the last century, computing has transformed our world creating a myriad of new tools, and devices that we use in our daily life. This pervasive innovation continues, accelerates, and is not expected to end any time soon. This creates a constant need for words to designate these new artifacts, and new brands as they are introduced in our technical dialogues; in many cases, old words are reused by giving them new meanings, for example, “computing” itself comes from Latin “computare” meaning to count. Indeed, in many cases the new concepts resemble old ones, for example, if we look back in history, as well known, the Trojan horse is key for the Greeks to achieve victory by infiltrating into the enemy fortifications in the Trojan war. Today, similar techniques are used to infiltrate hardware and software systems and they take their names after the ancient Trojan horse. The same holds for many other terms used in different domains of computing that come from ancient Latin or Greek words. However, many people may not be aware of the origin and meaning of most of these ancient words that have found new uses in computing. In this manuscript, we consider some of the most used Latin and Greek words in computing, analyze their original meaning, and how it relates to their new meaning. We also advocate for basic computing science and engineering courses to cover the origins of the most common ancient words used in computing connecting past to present and technology with history and humanities.

■ **THE INTRODUCTION** Computing as any new scientific discipline needs new words that are in many cases derived from Latin and Greek. The need to coin a new terminology and the mechanisms for its successful creation have been the subject of discussion since the classical world. The Latins already

considered the Greek origin as a prestige resource that would give credibility to the newly created words [1]. These discussions about the coinage of new words connect with a tradition in the western culture which has been used in many disciplines before such as Medicine, Law, Mathematics or Botany, experiencing

parallel developments in times of special scientific flourishing. This provides benefits as many Latin and Greek terms are well known and used in different languages and the mechanisms to form words by adding prefixes and suffixes are also widely used. For example, the Greek prefix “tele-” is used to form words such as “television, telecommunications, or telephone”, so adding in all cases the distance to the meaning of the original word. Differently from other disciplines like botany or chemistry that followed a systematic approach to naming, the rapid development of computing has led to a lack of structure in terms that are continuously introduced without following any convention for the predetermined scheme.

Today, knowing the origin of a word is only a search away in a browser; however, that has not been the case in the past. A self-explanatory example is that when civil servants were commissioned by the Byzantine empire to catalog and describe the main buildings of the empire, they were unable to identify the origin of the Senate building in Constantinople. Indeed, due to the lack of information they came up with the explanation that the name of the so-called Senate was none other than that “Senatos built the Senate” [2] even though the text was produced late in the seventh century or early in the eighth, just two centuries away from the disappearance of one of the most important institutions of ancient Rome [3]. Interestingly, even though today the information is readily available and easy to access, many people do not know the origin of many words that are used in every day in computing. For example, to start with, what is the origin of the word computing? This confirms what Pliny the Younger clearly stated 2000 years ago: “We are always ready to make a journey and cross the sea in search of things we fail to notice in front of our eyes, whether it is that we are naturally indifferent to anything close at hand, while pursuing distant objects, or that every desire fades when it can easily be granted, or that we postpone a visit with the idea that we shall often be seeing what is there to be seen whenever we feel inclined” [4].

The present work aims to show how, despite the apparent distance between the new lexical needs of computing and the terms from classical antiquity, these continue to be its greatest source of terms for the construction of new words. We also intend to link them to their ancient origins and to explore the ways in which they relate to their new meanings in computing. Finally, we discuss the benefits of knowing the origins of the words used in computing and advocate that computing students should be exposed to the origin of this words as part of their computer science and engineering courses.

### **THE NEED FOR NEW WORDS: VERBA PARIENDA SUNT (WORDS HAVE TO BE CREATED)**

Cicero argued that even disciplines that lent themselves so little to the elegance of discourse, such as agriculture, had to give new names to the things they dealt with [5]. “Words have to be created” [6] not only within traditional fields, but in new ones, such as computing. In this case words are not only created faster, but in many cases also become obsolete faster. For example, the once popular floppy disks or the token ring local area networks.

There are several ways to create words. One is to combine existing words or add a prefix, or a suffix. For example, prefixes like micro or inter are widely used in computing in terms such as microprocessor, microarchitecture, Internet, interconnection, and many others.

A second alternative to create words is to use metaphors or names of persons or places to designate concepts that are related to them. This is the case of the well-known Trojan horse but also of algorithm and Kerberos as we will see in the next section.

Finally, reusing words giving them a new meaning is also in a sense a way to create new words. In fact, many of the terms in computing come from other fields like navigation, architecture, or warfare. For example, one of the first Internet browsers was the Netscape navigator, web portals take their name after the grand entrances to buildings, fortifications and cities and network firewalls from building firewalls. In cybersecurity many terms from warfare are reused

like weaponized payloads, attacks, or ransomware. In many cases, the words used have their roots in Latin and Greek.

**EVERY WORD HAS ITS OWN STORY** This well-known slogan in linguistics [7] also applies to computing. In the following, we shortly go over a few common computing words to illustrate the richness of their history and origin. The list also includes some of common brand names in computing, that are also linked to Latin or Greek.

We start with **“computing”** itself that comes from Latin *“computare”*<sup>1</sup> which means *“to count”* or *“to calculate”* which was indeed one of the first functions of modern computers. The term is used, for example, in Pliny’s *Natural History* [8] to refer to a right calculation of man’s happiness<sup>2</sup>. In fact, the verb *“calculate”* also comes from Latin *“calculus”* formed by *“calcis”* that denoted a type of stone and *“-ulus”* which is a diminutive meaning *“small”* and denoting the small stones that were used to make calculations.

Another word that has an interesting story is **“algorithm”** which is attributed to the name of Mohammad ibn Musa al-Khwarizmi a mathematician that made significant contributions to algebra and is also linked to the introduction of the decimal numbers in Europe [9]. Algorithm comes from the Latin word *“algorismus”* which was used in the Latin Middle Ages and is the latinized form of the name *“al-Khwarizmi”*. In Arab, *“al-Khwarizmi”* means: *“the man living in Khoresm”* which is an area in central Asia. Therefore, the word algorithm has Arabic roots, but it has reached us through medieval Latin.

In fact, there are many other terms adopted in computing that originally come from Latin or Greek. For example, **“operating system”**, one of the most common concepts in computing comes from Latin *“operatus”* that is the past participle of *“operari”* with a meaning of *“working or producing”* and Greek *“systema”* that meant *“organized whole formed by parts”*. The same happens with **“program”** that

originates from Latin *“programma”* that is formed by the prefix *“pro-”* that means *“previous”* or *“coming before”* and Greek *“grámma”* which means *“letter”*. Therefore, *“programma”* had a meaning of *“something written beforehand”*, and also of *“written public notice”*. Finally, **“cursor”** comes from the Latin word *“cursus”* *“race”*, and the verb *“currere”*, or more specifically from *“cursum”*, its supine form, or *“cursus”*, its perfect participle, with the meaning of *“runner”* that perfectly conveys the essence of what a cursor does on a computer screen.

An example of a word that derives its origins in ancient Greek, is **“cryptography”** that comes from *“kryptós”* and *“graphé”*, the first meaning *“hidden”* and the second, *“writing”*. Therefore, the term perfectly describes one of the fundamental goals of cryptography that is to make sure that the information is not accessible except by the sender and the receiver. In fact, *“crypto”* has been used as a prefix in other words like *“cryptocurrency”* or *“cryptominer”* where cryptography is a key element. Another example is the **“Enigma”** machine (Figure 1) used in the second world war to transmit encrypted messages [10]. Enigma comes from Latin *“aenigma”* which in turn was taken by the ancient Greek *“aínigma”*, meaning *“riddle.”*



Figure 1. The Enigma ciphering machine

<sup>1</sup> All references in Latin and Greek are to be found at the end of the references list: [19] for Latin and [20] for Greek.

<sup>2</sup>*“Vana mortalitas et ad circumscribendam se ipsam ingeniosa computat more Thraciae gentis, quae calculos colore distinctos pro experiment cuiusque diei in urnam condit ac supremo die separatates dinumerat atque ita de quoque pronuntiat.” Nat. His. (VII.40)*

**Greek mythology** has also found its place in computing, in many cases with words related to warfare. For example, the **Trojan horse** is now used to name software or hardware components that are disguised as harmless tools or gifts, but that can be used by an attacker to infiltrate or damage the target system [11]. According to the *Aeneid*, more than two thousand years ago, the Greeks built a huge wooden horse (*Aen. Lib. II, 15*), hid a group of men inside and pretended to sail away in defeat leaving the horse behind [12]. The Trojans brought the horse into the city as a trophy (Figure 2), but at night, the hidden men crept out of the horse and opened the gates of the city to the Greek army that destroyed Troy and won the war. Since then, Trojan horse is used metaphorically to denote any trick that causes a user or system to allow a foe to enter in a system bypassing the security mechanisms. In fact, in computing it is common to use just “Trojan” to refer to a Trojan horse which is ironic as it identifies the harmful component with Troy that was in fact the victim of the attack.



Figure 2. The Procession of the Trojan Horse in Troy by Giovanni Domenico Tiepolo

The name of one of the Internet hyperscalers also comes from an ancient Greek word. Indeed, an “amazon” denoted a female warrior in ancient Greek. The word is traditionally thought to be formed by the prefix “a” meaning without and “mastós” that denoted the “breast.” The name was given as some female warriors were believed to cut off one breast to better draw bowstrings. However, the origin of the word is controversial as discussed in [13] and it seems

that this etymology may have been made up by the Greeks when incorporating the word into their language. In any case, the meaning has been kept throughout the centuries and indeed, an arrow can be clearly seen in Amazon’s logo (Figure 3).



Figure 3. Amazon logo

Mythological creatures like **Kerberos** have also been mutated into the digital world to protect users. Kérberos was a dog with several heads (in most cases three) (Figure 4) that guarded the underworld to prevent the dead from leaving and the living from entering. Kerberos was taken to name an authentication protocol that is widely used in computing systems [14]. As with the Trojan horse, Kerberos was used metaphorically to imply protection and security.



Figure 4. Kerberos by William Blake

In many cases, the terms are taken from other fields by making analogies. This has been the case with navigation, architecture, and biology to name a few.

**Navigation** has also influenced computing terminology. For example, **Kubernetes**, the name of the popular container orchestration platform used to automate the management of containerized applications [15] comes from ancient Greek

“kybernétes” with the meaning of “steersman, helmsman” or “pilot”. Figure 5 shows the logo of Kubernetes that is a helm clearly showing the link to navigation and to the meaning of the Greek word.



Figure 5. Kubernetes container orchestration platform logo

The influence of the word “kybernétes” in computing goes well beyond the container orchestration platform. “Kybernétes” was also used to metaphorically mean “to govern” or “to guide”, for example by Plato. In the 20<sup>th</sup> century, Norbert Wiener used the German word “Kybernetik” from the Greek term to denote the field that studies communication and control [16] that later became known as “**Cybernetics**”. Subsequently, “cyber” has been used as a word-forming element in many terms such as “cyberspace”, “cybersecurity”, “cybernaut” or the also “cyber” inspired “cyborg” [17].

The influence of **architecture** in computing is so clear that it gives the name to an entire discipline: computer architecture. There are also many other architecture related terms that are adopted with a metaphorical meaning in computing, like for example “firewall”. An interesting word is “**portal**” that comes from Latin “porta”, meaning entrance or gate to a city or a large building (Figure 6). This term has metaphorically been used to designate Internet or web portals as the entrance to the Internet.

Finally, terms in **biology** have also been used in computing. For example, an interesting Latin term that is widely used is “**virus**” and its opposite “**antivirus**”. In computing, virus is used to denote a malicious program or code that can spread from one computer to another and can cause damage, steal data or allow an attacker to manipulate the computer. As with biological viruses, computer viruses can mutate [18]. Antivirus programs are also designed to detect and neutralize computer viruses playing a similar role to

that of antiviral drugs. The word “virus” is a Latin term that originally denoted a slimy liquid, or poison. “Antivirus” is obtained by adding the Greek prefix “anti” that means “opposed to, against, opposite of”. At the end of the 19<sup>th</sup> century, small infectious agents that can multiply when they attached to living cells but not live on their own, were discovered and the word “virus” was used to name them. This second meaning is analogous to that of a computer virus as they also need a computer to run on and have the ability to propagate. Therefore, the use of the term facilitates the understanding of what a computer virus or antivirus is to a non-expert.

As we can see, the list of computing terms with Latin or Greek origin is endless, goes on and includes many of the most widely used words.

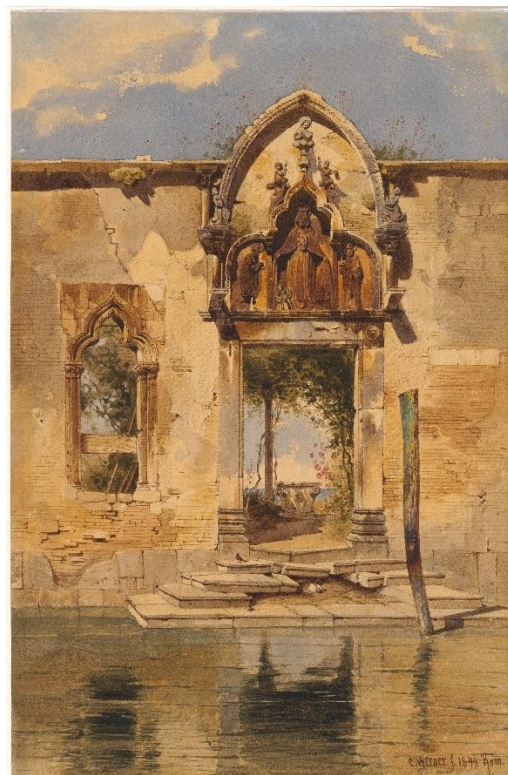


Figure 6. The Portal of the Madonna della Misericordia from the Canal by Carl Friedrich Heinrich Werner

**TELLING THE STORY OF COMPUTING WORDS TO OUR STUDENTS** After briefly covering a few common computing words, we can clearly see that there are many other words and terms that have interesting stories and origins that could

trigger the curiosity and the desire to learn of our students. As many words in the computing language are based on words from ancient Greek and Latin, we think that knowing their origins will be useful for students not only enriching their culture, but also helping them to understand other words and concepts.

Therefore, we cannot say like Cicero “Atque haec quidem de rerum nominibus<sup>3</sup>.” In fact, we must say the opposite and advocate for introducing students to the etymology of the most important words in computing.

This can be done in several ways. For example, some terms can be introduced during class when they are first used. This would require only a few minutes and the potential benefits for students are multiple. So, classes will be more engaging and motivating; moreover, knowing the roots of the words and the meaning of the terms that form them, will facilitate the understanding of the underlying concepts and their application to other fields. Additionally, it will help students to go beyond the purely technical skills and activate their curiosity to explore the classics linking computing to humanities. Finally, as students will in the future be the ones that introduce new terms in computing, having this knowledge will help them in choosing the right words and ensure that their new meaning matches their origin. Therefore, we think that with a very small effort, students would get significant benefits.

Additional materials describing the origins of words can be provided to students as sidebars on the textbook or handouts. Assignments both individual or for groups of students can also explore the origins of some terms or the names for new concepts as they are being developed.

A second alternative is to introduce the main terms in an independent seminar or activity. This can be easily done both for undergraduate and graduate students and could be a first step to assess the benefits and

interest, while experimenting with the contents to find the best way to present the terms to the students.

Finally, a third option is to have the terms introduced in humanities related courses that are taken as electives by students. In this case, the main benefit is that the terms will be presented by experts on their origins rather than by experts on computing. As these courses are elective and shared by many majors, likely it will be difficult to reach most students and therefore, computing terms must be introduced in a more general context, possibly with terms used in other disciplines. We think that an effort should be made in this direction for the benefit of our students and of future computing terminology too. Indeed, having this knowledge may prevent the misuse of terms as it has already happened with the prefix “cyber” that has been used to create new words with no connection to its original meaning.

**CONCLUSION** Many of the terms that are used every day in computing have been coined from ancient Latin and Greek words. Knowing their origin and how their new meanings relate to the original ones helps to better understand and remember more easily the underlying concepts behind the words. It also links the present and future with our past and computing with humanities and history. Therefore, we strongly believe that adding the source of the most common computing terms as part of the contents of basic courses of computer science and engineering would be highly beneficial and enriching for students.

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<sup>3</sup> “And that is all I had to say about the names of things”, Cicero in [4] Book III, II, 5.

<sup>4</sup> We can see that Greek mythology also influences researchers when naming their projects. In our case, we took the name from the famous character in Homers’ Iliad.

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