

# Some unsuspected numerical sequences on Greek coins

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**Riassunto:** Cosa indicano i monogrammi riportati sulle monete greche? Davvero rimandano ai nomi dei magistrati monetali che hanno presieduto alle varie emissioni oppure sono dei semplici segni di controllo, come in genere si crede oggi? Il libro *I numeri svelati. Alla scoperta delle notazioni numeriche riportate sulle monete greche* (Editrice Diana, Cassino 2015), da me recentemente pubblicato in Italia, giunge alla conclusione che queste sigle sono dei numeri (espressi nel greco antico con le stesse lettere dell'alfabeto) che indicano la tiratura dell'emissione, vale a dire il numero di pezzi conati. Questo articolo tratteggia le linee fondamentali del mio libro.

**Parole chiave:** monogrammi, numeri greci, numeri sulle monete greche, tiratura delle emissioni monetali greche

**Abstract:** What did the monograms on the Greek coins mean? Did they really show the monetary magistrates' names that supervised the different issues or were they just control marks, as we believe today? My book *I numeri svelati. Alla scoperta delle notazioni numeriche riportate sulle monete greche* (Editrice Diana, Cassino 2015), recently published in Italy, comes to the conclusion that these symbols are numbers (expressed in the ancient Greek language using the same alphabetical letters) indicating the issue's edition, i.e. the number of coins minted. This article resumes the main lines of my book.

**Keywords:** monograms, Greek numbers, numbers on Greek coins, edition of the Greek issues

The most ancient Greek numeral system<sup>1</sup> is known as “Attic” or “Herodianic” system because it is associated with Aelius Herodianus, a grammarian of the 2<sup>nd</sup> century AD<sup>2</sup>. It was a simple iterative scheme like the one found in the most ancient Egyptian hieroglyphic numeration. The numbers from 1 to 4 were represented by repeated vertical dashes, one for every unit, whereas for number 5 the letter used was  $\Pi$  (or  $\Pi$ ), the initial of the word *pentē* (five). To represent the numbers from 6 to 9 they inserted other dashes next to the symbol  $\Pi$ , one for every unit. Even for other numbers the initial letter of the word represented their symbol: in fact number 10 was  $\Delta$  (comes from the word *deka*, ten), the number hundred was indicated with H, from *hekatōn* (one hundred), the number one thousand with X, from the word *chilioi* (one thousand) and ten thousands with M, from *myrioi* (ten thousands). Using this type of symbols the Attic numeral system was also called “Acrophonic” (from *akron*, “the beginning”, and *phōnē*, “voice”). The six basic signs of this system are:

<sup>1</sup> On the Greek numeral systems see HEATH (1981), p.30-35 and GUARDUCCI (2005), p.85-87.

<sup>2</sup> So in this respect HEATH (1981), p.30.

	∏	Δ	H	X	M
1	5	10	100	1.000	10.000

The conjunction of two basic signs indicates that a multiplication was applied: in this way other symbols were obtained. In fact, the number 50 was indicated with ∏<sup>5</sup> (5 times 10 = 5 x 10); 500 with ∏<sup>5</sup> (5 times 100 = 5 x 100); 5,000 was written ∏<sup>5</sup> (5 times 1,000 = 5 x 1,000); 50,000 was ∏<sup>5</sup> (5 times 10,000 = 5 x 10,000). To represent other multiples of 10,000 the symbol M was added according to the additive principle as many times as there were the tens of thousands to report: in this way 30,000 was written MMM; for the number 70,000 it was used the same symbol of 50,000 (∏<sup>5</sup>) followed by two times the ten thousands' symbol so the number became ∏<sup>5</sup>MM.

By associating and repeating the basic signs all the other possible number combinations were obtained: for example, number 32 was indicated with ΔΔΔII; number 276 with HH ∏<sup>5</sup> ΔΔΠI; 35,189 with MMM ∏<sup>5</sup> H ∏<sup>5</sup> ΔΔΔΠIIII and so on.

There were also some specific signs that indicated amounts of money, for example ⤴ (10 talents) which came from the union of Δ (number 10) and T (the symbol of the talent): this fusion of symbols showed that they were multiplied together (the talent is a monetary unit that corresponds to 6,000 drachms, therefore 10 talents are equal to 60,000 drachms)<sup>3</sup>. For an epigraphic example of Attic numeral system, **Fig. 1**.

The "Ionic" or "Alphabetic" numeral system started to take place between the end of the VIII and the beginning of the VII century BC<sup>4</sup>. It was made up of 27 alphabet letters, including three archaic letters that afterwards fell into disuse: *stigma* (Ϛ) which was used for number 6, *coppa* (Ϟ) used to indicate number 90 and *sampi* (ϙ) for 900 (see **Tab. I**).

In the Ionic system dozens, hundreds and units followed in decreasing or increasing order from left to right, so number 452 could be written in different ways like YNB or BNY; but often numbers didn't have to follow a specific order and could be mixed: 452 could also be YBN.

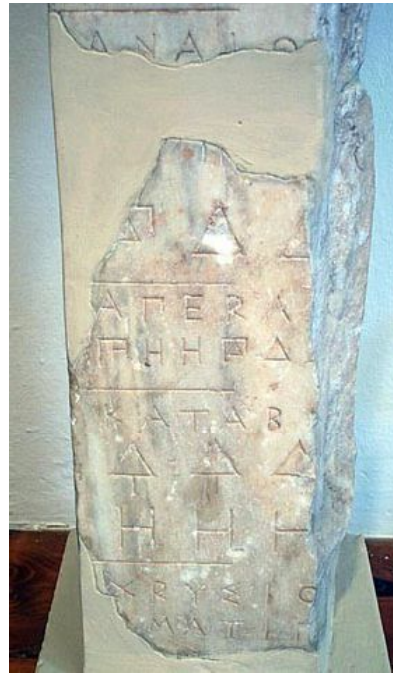
Sometimes the letters had a sign on the top and this often happened when lowercase letters were used (es. α'=1).

The Ionic system of numeration was practical and functional and it probably inspired those used by Arabs, Sirians, Arameans and Hebrews; however this system didn't completely replaced the Attic system, because sometimes they were used together, as we can notice on some inscriptions<sup>5</sup>.

<sup>3</sup> On this sign see HEATH (1981), p.31.

<sup>4</sup> On this dating see GUARDUCCI (2005), p.86.

<sup>5</sup> In the II-I century BC on two Boeotian epigraphs we can find numbers taken from the Attic numeral system used inside the same figure close to numbers taken from the Ionic numeral system: see ROESCH (1966), p.77-82, n.15; CALVET-ROESCH (1966), p.297-332. Furthermore, the two systems are found side by side in a number of papyrus-rolls found at Herculaneum: these state on the title page, after the name of the author, the number of books according to the Ionic numeral system, and the number of lines according to the Attic numeral system, just as we commonly use Roman figures to denote *Books* and Arabic figures for *sections* or *lines*. See HEATH (1981), p.35.



**Fig. 1** - Epigraph of 438 BC discovered in Athens' acropolis that shows the cost of the realization of the famous chryselephantine statue of Athena *Parthenos*, made by Phidias (numbers expressed according to the Attic numeral system). On the top, on the first row there are the overheads that amount to 100 talents (equal to 600,000 drachms) and 700 (Γ<sup>70</sup>ΔΔ on the second row) drachms; from the top, on the third and fourth row there is the cost of the realization of the pedestal: ΑΠΕΡ(Γ) Α [ΣΙΑ] / Γ<sup>70</sup>ΗΗΓ<sup>70</sup>ΔΔ= 770 drachms; on the fifth row there is the cost of ΚΑΤΑΒ (ΟΛΗ), pedestal, that has the amount of 30 talents and 300 drachms, which is written below on two lines with √√√/ΗΗΗ; the last row shows the cost of the gold for the statue: ΧΡΗΣΙΟ(Ν) [ΑΓΑΛ] ΜΑΤΙ [...]<sup>6</sup>

A	α'	1	I	ι'	10	P	ρ'	100
B	β'	2	K	κ'	20	Σ	σ'	200
Γ	γ'	3	Λ	λ'	30	T	τ'	300
Δ	δ'	4	M	μ'	40	Υ	υ'	400
E	ε'	5	N	ν'	50	Φ	φ'	500
Ϛ	ς'	6	Ξ	ξ'	60	X	χ'	600
Z	ζ'	7	O	ο'	70	Ψ	ψ'	700
H	η'	8	Π	π'	80	Ω	ω'	800
Θ	θ'	9	Ϟ		90	Τ	τ'	900

**Tab. I** - The Alphabetic or Ionic system of numeration.

Sometimes together with the numeral letters or symbols from the Ionic and Attic systems, they were used other symbols taken from minor numeral systems characteristic of some independent *poleis*, symbols that were widespread everywhere<sup>7</sup>. So, one of the most spread symbols of local

<sup>6</sup> IG I3 460; ML 54 B; Fornara 114.

<sup>7</sup> For inscriptions which have numerical symbols of a minor numeral system used far away from their place of origin you could see ROESCH (1966), p.77-80 and GRANDJEAN (1995), p.1-26.

origin was the numerical notation  $\odot$ , with which in Argos the 10 drachms value was indicated<sup>8</sup>; even the numerical notations  $\triangleup$  or  $\blacktriangle$ , or also  $\blacktriangle$ , that in the Andania's numeral system (city of Messenia) indicated the amount of 10 mine and then 1,000 drachms (in fact a mine is equal to 100 drachms, 10 mines are equal to 1,000 drachms) were often used<sup>9</sup>. Sometimes the symbol  $\blacktriangle$  was simplified only with A: the A could represent the number 1 (according to the Ionic system) or an amount of 1,000 drachms (according to the Andania's system). On the other hand even the M could represent the number 10,000 (according to the Attic system) or the number 40 (according to the Ionic system); the H could indicate 100 (according to the Attic system) or the number 8 (according to the Ionic system); the T could correspond the number 300 (according to the Ionic system) or the amount of 6,000 drachms that were in a talent (indicated with the letter T), etc. As we can notice, the Greeks used a compounded mathematical symbolism to express numbers and to make calculations, which were not always clear and effective.

The picture was even more complicated because both in common language and in numerical notations numbers were expressed in dozens (*dekades*), hundreds (*hekatontades*), thousands (*chiliades*), dozens of thousands (*myriades*) and hundreds of thousands (*dekakismyriades*): in this way Plato (*Phaedrus* 257) uses the expression “*ennea chiliades etōn*”, that means “nine thousands of years”, to indicate 9,000 years. Often high numbers were expressed by putting two numbers that, multiplied together, indicated the amount wanted: in the Book of Daniel<sup>10</sup>, for example, the prophet has a vision of God where “thousands upon thousands (*chiliai chiliades*) were attending Him, and myriads upon myriads (*myriai myriades*) were standing before Him”. “A thousand upon thousands” corresponds to a million (1,000 x 1,000 = 1,000,000) while “myriads upon myriads” is 10,000 x 10,000 which is equal to 100 millions. In both situations the final number is expressed in a very complicated way as compared to our numeral system: to understand which is the final number, it's necessary a multiplication (1,000 x 1,000 in the first case, 10,000 x 10,000 in the second), a little like what happens in the French language where the number 80 is pronounced *quatre-vingts*.

In Greek numerical notations, therefore, a number could be expressed implicitly in dozens (*dekades*), hundreds (*hekatontades*), thousands (*chiliades*), dozens of thousands (*myriades*) or hundreds of thousands (*dekakismyriades*). In this way the numeral ΤΝΔ (354), could be equivalent to 3,54(0) if expressed in dozens, to 35,4(00) if expressed in hundreds, to 354,(000) if expressed in thousands, to 3,54(0,000) if expressed in dozens of thousands and to 35,4(00,000) if expressed in hundreds of thousands. Only a detailed examination of the situation can decide if it has to do with a finished number or a number expressed in dozens, hundreds, thousands, dozens of thousands, or even hundreds of thousands and which numeral system is applied.

The variety of the symbols derived from different numeral systems (Attic, Ionic, more minor ones), the complexity of the ways these symbols combine together and the difficulty to understand if the number we are observing is expressed in dozens, hundreds, thousands, dozens or hundreds of thousands, make the interpretation of the Greek numerical notations not always easy.

For example, on the reverse of the coin no. 1 of the **Fig. 2**, minted in the name of Alexander the Great at Amphipolis in 320-315 BC, we can see in left field between Zeus' knee and his right hand, the number 50 according to the Attic numeral system ( $\text{P}$ ), while on the coin no. 2 (**Fig. 2**), minted by Antiochos I in 270-267 BC, it is easily recognizable the Attic symbol that indicates the amount of ten talents ( $\text{Ϡ}$ ). On a Massalia's drachm, coin no. 3 (**Fig. 2**) it is present the number 200 always expressed according to the Attic system (HH).

<sup>8</sup> About this numerical notation see TOD (1979), p.5.

<sup>9</sup> On these numerical notations see TOD (1979), p.47.

<sup>10</sup> Book of Daniel 7:10.



**Fig. 2. - No.1:** Alexander III 'the Great' (336-323 BC), silver tetradrachm (17,03 g, 26 mm), posthumous issue of Amphipolis (Macedonia), ca. 318-317 B.C. Obv.: head of Herakles right wearing lion's scalp. Rev.: Zeus enthroned left holding scepter and eagle; numerical notations in left field; ΒΑΣΙΛΕΩΣ ΑΛΕΞΑΝΔΡΟΥ, "(coin) of the King Alexander" (Classical Numismatic Group, Auction no.25, London March 2005, lot no.61986).

**No.2:** Antiochos I (281-261 BC), silver drachm (4,13 g, 20 mm) minted at Seleucia on the Tigris. Obv.: Diademed head of Antiochos I right. Rev.: Apollo seated left on omphalos, examining arrow and resting hand on grounded bow, numerical notation in left field; ΒΑΣΙΛΕΩΣ ΑΝΤΙΟΧΟΥ, "(coin) of the King Antiochus" (Classical Numismatic Group, Auction no.35, London 13 August 2001, lot no.63743).

**No.3:** silver light drachm (2,64 g, 16 mm) minted at Massalia (Gaul), ca. 200 BC. Obv.: head of Artemis right. Rev: ΜΑΣΣΑ; lion right; in exergue HH (Gorny & Mosch Giessener Münzhandlung, Auction no.138, Munich 7 March 2005, lot no.6).

These and other numerical notations found on Greek coins were always interpreted by numismatics scholars like mint signs or monograms<sup>11</sup> showing the name of the monetary magistrate that supervised the different issues with the specific duty to guarantee the correct weight of the coins minted and to avoid shortages and thefts of the precious raw metal. What function had then these numbers?

To understand let's look at **Fig. 3**, that shows some drachms minted at Istros, in Thrace, in the IV century BC. On the coin no. 1 we can find the ten talent symbol ( $\hat{\Gamma}$ ), while on the other two coins there are not any initials or letters like we always believed up to now, but numbers in ascending order. The reason of these numbers was to indicate the volumes of the coins that the mint prepared at the time of realization of reverse die. The drachm no.1 belongs to the group of issues that is directed to reach 10 talents that corresponds to 60,000 drachms; a talent is equal to 6,000 drachms, so 10 talents will be equal to 60,000 drachms. The coin no. 2, instead, belongs to the tranche of issue that is directed to be higher than 100,000 drachms. In fact,  $\times$  must be untied in XPA, which means 1,000 according to the Attic system (X) multiplied by 100 according to the Ionic system (P), so  $1,000 \times 100 = 100,000$  to which is then added the number 1 of Ionic system (A): this number stands for "a hundred thousand and a drachm" and indicates that the reverse where it is engraved was used to reach the group of 100,000 drachms and even further. The  $\Delta$  engraved, always on the reverse of coin no. 2, between the fish and the sea eagle, shows all the same 100,000 drachms, but in a different way: in fact  $\Delta$ , which is 10 according to the Attic system, is expressed in dozens of thousands (*myriades*) and therefore corresponds to the number 10(0,000). Even  $\Phi\Upsilon$  on the coin no.

<sup>11</sup> Monograms are many letters put together and overlapped with which indicate a proper noun. The passion of the Greeks for monograms always fooled scholars forcing them to interpret the complicated interlacements on the coins like monograms and not like numerical notations.

3 are not letters, but two numbers ( $\Phi = 500$  and  $Y = 400$ ) that are multiplied together:  $500 \times 400$  is equal to 200,000, whereby it is obtained that the drachm no. 3 belongs to the group of issue that is directed to reach 200,000 coins minted, that are 200,000 drachms. Evidently engraving on every reverse die the number of coins (that, with the help of the reverse die itself, would be coined), helped the mint workers to count more easily the pieces coined, because it was possible to divide them in groups, each characterized with a different numerical notation.



**Fig.3** - Silver drachms minted at Istros (Thrace) in the 4th Century BC. Obv.: two young male heads facing side by side, one upright and the other inverted. Rev.:  $\text{ΙΣΤΡΙΑ}$ ; a sea-eagle standing to left on a dolphin, attacking it with its beak; numerical notations below. **No.1:** Classical Numismatic Group, (London) FPL 787292, 2005 (5,60 g, 16 mm); **No.2:** Baldwin's Auctions Ltd, Auction 47, London 25 September 2006, lot no.24 (5,98 g, 17 mm); **No.3:** Auktionshaus H. D. Rauch GmbH, Vienna Auction no.11, 12 September 2006, lot no.263 (5,55 g, 15,7 mm).

Even clearer are the numerical notations visible on some obols minted at Soloi, in Cilicia, in **Fig. 4**. The first group of coins does not bring any information about the edition (coin no. 1). The coins with the numerical notation  $\text{ΑΠ}$  (coin no. 2) are already geared towards the edition of 80,000 drachms: in fact  $\text{ΑΠ}$  corresponds to 1,000 ( $\text{Α} = \text{Α} = 1,000$ ) multiplied by 80 ( $\text{Π}$ ). The coin that belongs to the last group of the issue (coin no. 3) does not have a hard numerical notation interpretation, but is very clear:  $\text{ΕΚΑΤΑΙ}$ , “one hundred”, that implies “*chiliades*” (“thousands”), with a result of 100,000 drachms. Although it is an issue of obols, the editions are always expressed in drachms: since an obol is the sixth part of a drachm, the edition of 100,000 drachms indicates a production of 600,000 obols.





3

**Fig.4** - Silver obols minted at Soloi (Cilicia) in 350-330 BC. Obv.: helmeted head of Athena right. Rev.: Grape bunch with tendrils; ΣΟΛΕΩΝ, "(coin) of Soloi's citizens"; on the sides of the cluster on no. 2 ΑΠ and on no. 3 ΕΚΑΤΑΙ ("one hundred"). **No.1:** Gorny & Mosch Giessener Münzhandlung, Auction no.156, Munich 5 March 2007, lot no.1496 (0,65 g, 9 mm); **No.2:** Herakles Numismatics, Auction May 2008, Huntersville (USA), lot no. 13145 (0,62 g, 8 mm); **No.3:** Classical Numismatic Group, Auction 9 January 2007, London, lot no.378 (0,62 g, 8 mm).

The initials on the two coins in **Fig. 5**, minted at Massalia (Gaul) in 200-150 BC, are made up of two overlapped elements, and it clearly indicates that these elements are not letters but numbers and they have to be multiplied together, exactly what was necessary to do with two numbers found in the compound numbers in the Attic system (for example  $\Gamma^2$  is compounded by the number  $\Delta = 10$  surmounted by the number  $\Pi = 5$  with the result 50). The overlapped numbers in the numerical notations visible on the reverse of the coin no. 1 are 10 in the Attic system ( $\Delta$ ) that multiplies 20 in the Ionic system (K) with the result of 200 hundreds of drachms, that is 20,0(00) drachms. The numbers on the reverse and on the obverse of the coin no. 2, instead, are 1,000 in the Attic system (X) that multiplies 100 in the same system (H) and the result is 100,000 drachms. These two Massalia's drachms provide a good example of essential and concise numbers.



1

2

**Fig. 5** - Silver light drachms or tetrobols minted at Massalia (Gaul) in 200-150 BC. Obv.: diademed head of Artemis right, with bow and quiver at shoulder. Rev.: lion right; ΜΑΣΣΑ-ΛΙΗΤΩΝ, "(coin) of Massalia's citizens"; numeral notations in right field (on no. 2 also on the obverse). **No.1:** Leu Numismatik, Auction no.86, Zurich 5 May 2003, lot no.181(2,77 g, 16 mm); **No.2:** Classical Numismatic Group, Mail Bid Sale 67, London 22 September 2004, lot no. 43 (2,65 g, 15 mm).

There are numbers also on the reverse of the tetradrachms in **Fig. 6**, minted in 258-252 BC by Ptolemy II Philadelphus (285-246 BC), the second Hellenistic king of Egypt (the issue is distinguished by the shield's symbol, represented in the back of the eagle). On both coins, in front of the eagle's chest it is recognizable *sampi* ( $\Gamma^2$ ), which indicates 900 according to the Ionic numeral system. Even the initials that are on the bottom left, in front of the eagle's claws, are numbers: on the second coin, this number is bigger than the one on the first coin. On the coin no. 1 in fact MN can be solved in 40 (M) for 50 (N) = 2,000, while on the coin no. 2  $\Omega$  corresponds to 800 ( $\Omega$ ) for 4 ( $\Delta$ ) = 3,200 (all the numbers mentioned are expressed according to the Ionic numeral system). The connections between these numbers are: T (900) indicates the total numbers of tetradrachms minted in that issue, that is 900 thousands (*chiliades*) tetradrachms. Instead, the number on the bottom left is a sequential number (no longer expressed in tetradrachms, but in drachms), which indicates the group of issue to be coined at the time of realization of that reverse

die. So MN is equal to 2,000 thousands (*chiliades*) of drachms: the coin with the numerical notation MN belongs to the tranche of issue directed to reach the edition of 500,000 tetradrachms; in fact, if we divide 2,000,000 drachms in 4 (value of one tetradrachm) we get 500,000 that is the number of tetradrachms of corresponding value. The number  $\Delta$ , instead, indicates the group of issue of 3,200(,000) drachms corresponding 800,000 tetradrachms (3,200,000 drachms : 4 = 800,000 tetradrachms): only 400,000 drachm are missing (that means 100,000 tetradrachms) and we reach the limit announced of 3,600,000 drachms (this is the number of drachms corresponding to 900,000 tetradrachms indicated with  $\Gamma$ ). The product of 800 ( $\Omega$ ) x 4 ( $\Delta$ ) = 3,200, indicated with  $\Delta$ , is a quantity expressed in thousands (*chiliades*) and for this reason this number can be written 3,200(,000) that contains the thousands between brackets<sup>12</sup>.



**Fig.6** - Silver tetradrchms minted by Ptolemy II Philadelphus in 258-252 BC. in Alessandria. Obv.: Diademed head of Ptolemy I right. Rev: eagle standing left on thunderbolt, with wings closed; shield in right field; ΒΑΣΙΛΕΩΣ ΠΤΟΛΕΜΑΙΟΥ, "(coin) of the King Ptolemy"; numerical notations in the left field. **No.1:** Leu Numismatik, Auction no.86, Zurich 5 May 2003, lot no.450 (14,22 g, 27,6 mm); **No.2:** Jean Elsen & ses Fils S.A., Auction no.93, Brussels 15 September 2007, lot no.718 (14,06 g, 27 mm).



$\Gamma\text{H}$  =  $\Gamma\text{H}$  =  $\Gamma\text{H}$  = 5( $\Pi$ ) x 100( $\text{H}$ ) = 500(,000) dr.;

$\text{X}$  =  $\text{X}$  =  $\text{X}$  = 1.000( $\text{X}$ ) x 1.000( $\text{A}$ ) = 1.000.000 dr.;

$\text{A}$  = 1.000( $\text{A}$ ) x 100( $\text{P}$ ) = 1.000.00(0) drachms;

<sup>12</sup> It is to exclude the possibility that one of the symbols engraved on tetradrachms of Ptolemy II Philadelphus to be a date. Such a hypothesis has been advanced by SVORONOS (1904-1908), nrs.558-598, in relation to a group of tetradrachms minted by Ptolemy II Philadelphus characterized by the shield symbol, monogram ΣΩ and an additional letter: Svoronos saw in this last letter a number indicating a date. But against this hypothesis CAVAGNA (2008), p.179, notes that letters by Svoronos interpreted as dates are too few to be some dates that mark a long period of time, while Davesne [in DAVESNE - LE RIDER (1989), p.275] tracks many die's identities that reveal a production of this group of tetradrachms concentrated in a restricted period of time (maximum three or four years) and not diluted in more years.





**Fig. 7** - The issue of silver tetradrachms struck in 312-309 BC by Ptolemy I Soter, as satrap of Alexander the Great, bearing the image of Athena *Promachos* and the symbol of the eagle on thunderbolt. Obv.: Head of Alexander right, wearing diadem and elephant's skin headdress. Rev.: Athena *Promachos* advancing right, brandishing spear and holding shield; numerical notations to right; eagle on thunderbolt in right field; ΑΛΕΞΑΝΔΡΟΥ, "(coin) of Alexander".  
**No.1:** Gorny & Mosch Giessener Münzhandlung, Auction no.151, Munich 9 October 2006, lot no.256 (15,67 g, 27,5 mm); **No.2:** Gorny & Mosch Giessener Münzhandlung, Auction no.190, Munich 10 November 2010, lot no.380 (15,63 g, 27 mm); **No.3:** Classical Numismatic Group, Auction Triton V, London 16 January 2002, lot no.1532 (15,37 g, 26,7 mm); **No.4:** eBay, Auction 7 July 2000, Item #374290953 (15,63 g, 27 mm); **No.5:** *Sylloge Nummorum Graecorum*, Copenhagen (Denmark), 18 var (15,57 g, 26,3 mm).

A very illuminating numerical progression is the one that characterizes some silver tetradrachms struck in 312-309 BC by Ptolemy I Soter, as a Egypt's satrap, bearing on the reverse the image of Athena *Promachos* and the symbol of an eagle on the thunderbolt, in **Fig. 7**. The great variety of initials on the reverses of the tetradrachms of the same emission confirms that they can only be progressive numbers. These initials are too many to be monograms of monetary magistrates or mint's signs: it is impossible that 18 monetary magistrates took part and it is even more ridiculous to suppose that the same mint could be identified with 18 different initials in only one issue<sup>13</sup>. For the same reason they cannot be simple dates: in an annual date, the month could change but the minting year should have been the same on many coins while the initials are all different from each other. Instead, seen like numbers the initials on the coins reveal an interesting numerical sequence.

The coin no.1 of the **Fig. 7** has the sign  $\Gamma\text{H}$  that corresponds to the number 500 as it is made by 5 ( $\Pi$ ) that multiplies 100 (H). This numerical notation is expressed in thousands of drachms and, therefore, indicated with the number 500(,000) drachms, equal to 125,000 tetradrachms: this cipher indicates the coins' number the mint was going to coin when it was realized that reverse die. On the coin no. 2, the step of a million drachms is indicated with the sign  $\times$  that, since it is constituted by 1,000 (X) x 1,000 (A), corresponds exactly to 1 million drachms (or 250,000 tetradrachms). In order

<sup>13</sup> In the **Fig. 7**, for shortness, only 6 of the 18 different numerical notations engraved on the tetradrachms of Ptolemy Soter of the issue with Athena *Promachos*/eagle on thunderbolt, are showed. The whole issue was entirely reconstructed in DE LUCA (2015), p.39-44.

to clarify still better, the amount of a million drachms is again indicated - once again on the reverse of the coin no. 2- with AP which is from  $1,000(A) \times 100(P) = 1,000,00(0)$ ; a line on top of the two numbers is a diacritical sign which shows that these are numbers and not letters.

The next group is a million and a half drachms: it is represented on the coins (coin no. 3) with a vertical notation and is made up of number 1 (A), number 300 (T) and number 500 (Φ): while the last two numbers are multiplied together with the result of 1,500,00(0), the number 1 (A) is joined to this final number giving the numerical notation the sense of “more than 1,5 million drachms” (375,000 tetradrachms).

The quantity of three million drachms, belonging to the additional group, is indicated with a notation that combines completeness and conciseness: on the reverse of the coin no. 4, the multiplication of 10,000 (M) x 3 (γ) x 100 (H) gives place to exactly 3,000,000 drachms (equal to 750,000 tetradrachms).

The numerical notation engraved on the reverse of the coin no. 5 indicates the end of the issue. This complicated number, that resembles a bit to a modern roadsign, is made up of 500 (Φ) x 10 (Δ) x 70 (O, inscribed in Δ), whose result is 3,500,00(0) drachms, equal to 875,000 tetradrachms.

Another clear example of numerical sequence is found on some Alexandrine tetradrachms assigned to the Sicyon mint and dated 225-215 BC by Price<sup>14</sup>, marked with the symbol of the boy with *taenia* (fillet) and the additional symbol of the dove feeding. In **Fig. 8**, the sign  $\odot E$  on the reverse of the first coin, under Zeus's throne, corresponds to 50(0,000) drachms: the number E(5) is multiplied by  $\odot$  (Argos' original symbol for 10 drachms); the number 50 is the result expressed in tens of thousands (*myriades*) and is equal to 50(0,000) drachms. Since the coins in the matter are tetradrachms which have a value of four drachms each, the group of 500,000 drachms are reached minting 125,000 tetradrachms: in fact, 125,000 tetradrachms x 4 (value for each tetradrachm) = 500,000 drachms. So, all the coins belonging to the first group of 125,000 tetradrachms, obtained from different reverse dies, have the notation  $\odot E$ .

The coin no.2 belongs to the group of issue destined to surmount the million drachms: the sign  $\overline{AP}$ , in fact, is divided in H (100 in the Attic system) x P (100 in the Ionic system) = 1,000,0(00) drachms; to this result, which is expressed in hundreds (*hekatontades*), is then added the number 1(A) which indicates that the million drachms have been surmounted, so the final expression (“a million and a drachm”) it can also be read “more than a million drachms”. To reach the edition of a million drachms you need to mint 250,000 tetradrachms: in fact 250,000 tetradrachms x 4 drachms (value of a tetradrachm) = 1,000,000 drachms.

The coin no.3 belongs to the group of issue leaning to reach two million drachms: the sign  $\overline{YE}$ , in fact, is divided into Y (400 in the Ionic system) x E (5 in the Ionic system) = 2,000 thousands (*chiliades*) of drachms, or 2,000(,000) drachms. To reach the two million drachms edition means minting 500,000 tetradrachms: in fact 500,000 tetradrachms x 4 drachms (value of a tetradrachm) = 2,000,000 drachms.

The obverses of the three coins in **Fig. 8** certainly come from the same observe die: in fact, we can clearly see how Herakles' nose and especially his full lips are identical. The different ways they were kept and the obverse of the coin no.2 slightly doubled (probably because during the minting it moved), makes the differences between the three coins. The curly detail behind Herakles' ear absolutely identical on each coin, eliminates all the doubts that they come from the same die.

<sup>14</sup> See PRICE (1991), Vol.I, p. 159-161.



**Fig. 8** - Alexander III 'the Great' (336-323 BC), silver tetradrachms, posthumous issue of Sycion (Sycionia), ca. 225-215 BC. Obv.: head of Herakles wearing lion's scalp right. Rev.: Zeus enthroned left holding scepter and eagle; numerical notations under the throne of Zeus; boy left with *taenia* in left field; on the legs of Zeus dove feeding left; ΒΑΣΙΛΕΩΣ ΑΛΕΞΑΝΔΡΟΥ, "(coin) of the King Alexander".

**No.1:** Classical Numismatic Group ([www.cngcoins.com](http://www.cngcoins.com)), Mail Bid Sale 69, London 8 June 2005, lot no.163 (17,29 g); **No.2:** Gorny & Mosch Giessener Münzhandlung, Auction no.118, Munich 15 October 2002, lot no.1264 (16,82 g); **No.3:** Gorny & Mosch Giessener Münzhandlung, Auction no.118, Munich 15 October 2002, lot no.1265 (16,00 g).

The circumstance that the coins in **Fig. 8** come from the same obverse die, but from different reverse dies because they contain different notations, makes us believe that these notations are actually numbers. The dynamic is the following: the obverse die, identical for all the three coins, is used from the first moment to reach the  $\odot E$  edition (500,000 drachms; coin no. 1, **Fig. 8**) and when this edition is reached, the obverse die remained in use, until it broke or was consumed, together with the reverse die showing informations about to the following target  $\Lambda P$  (1,000,000 drachms) and then  $\Upsilon$  (2,000,000 drachms). Of course, the obverse die, where the three coins in figure no.8 were obtained, was not the only one used to reach the  $\odot E$ ,  $\Lambda P$  and  $\Upsilon$  edition, but there were even other obverse dies, used by other minters.

Therefore, the signs under Zeus's throne could be only numbers. In fact, they cannot be monograms of monetary magistrates because they are all different: usually the same monetary magistrate took care of the entire issue and only at the end he was replaced. For the same reason they cannot be mint's signs (there was no reason to always change the sign on the coins minted certainly by the same mint) or dates (if the symbols are interpreted as numbers, they are not strictly consecutive and indicate very high figures, such as, for example, three millions). Even less we can image that these signs can be monograms of the engravers because it's impossible that there was a different engraver for every reverse die: the identity of the obverses of the three coins in **Fig. 8** shows, at least in this case, that the material used came from the same engraver. Even less likely is that those signs on the coins in **Fig. 8** can be control marks<sup>15</sup>: why change them continuously?

<sup>15</sup> As for the issue in question so believes PRICE (1991), Vol.I, p.155-159.

But what is the purpose of all these different numerical notations?

The answer is that they help to keep the count of the pieces minted as they make recognizable specific groups of coins. Without these identifying marks, all coins of the issue would be confused and indistinguishable. Little by little the minters struck the coins, they divided them by numerical notations and writing them on a special memo: in case there was a mistake counting the pieces minted, it was enough to recount the coins of one specific group and not all the coins minted until then. Furthermore, dividing the coins of the same issue in so many different groups, more manageable than a single amorphous mass, had the obvious advantage of allowing easy verification of the mint's work by the authority to which was to be delivered the emission once coined in full. In this way the monetary magistrates could control the whole amount of precious rare metal received at the beginning of their mandate.

As it is possible to see from the above mentioned examples, the identified numerical notations always indicated amounts of money expressed in drachms, even if they were engraved on coins with a higher value than a drachm (like tetradrachm) or even lower (like obol). That it dealt with drachms and not other monetary units is confirmed by the complete reconstruction of issues (the figures appear to be compatible with the number of dies belonging to the issue and with the number of coins from those presumably generated) and also by the fact that in common parlance the large digits used without any specification were implicitly referred to amounts in drachms. Thus in *The Knights* (829) of Aristophanes, Paphlagon threatens to denounce the Sausage-seller because he stole “*treis myriades*”, that means thirty thousand (3 x 10,000) drachms: in fact, the expression “*treis myriades*” implies “*drachmōn*” that means “of drachms”. The same does Plutarch in *Marius* (34) using the expression “*myriadōn epta ēmisuos priasthai*” (“buy for 7 myriads and a half”) that implies “*drachmōn*” (“of drachms”).

The element which made these notations even more difficult to be understood like numbers rather than initials of names or words, was that the same number could be obtained in many ways using different symbols (the numbers were represented in an essential way and often expressed in dozens, hundreds, thousands, dozens of thousands or hundreds of thousands, so like writing a certain number but implying a larger one).

But, analyzed from a new point of view, today Greek coins reveal high numbers cleverly summarized, numbers always assembled in different ways and unsuspected numerical progressions that provide important informations about the amount of coins issued in the ancient time.

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