Two accounts with ‘minus carats’ figures

The reading and interpretation of two accounts of payments made in solidi minus *n* carats invite closer study. A feature common to both is the presence of variable rates of deduction within the same document.

P.Daris 41

The first part of this account was presented in the edition as follows:[1]

† δι(ὰ) Φλ(αουίου) Φοιβάμμωνος νο(μ.) ιγ κ̣[ερ(άτια)
ἀφ’ (ὧν) ·
ε π(αρὰ) κα (ἥμισυ) (τέταρτον) [
⟦ (νο(μ.) ε π(αρὰ) ε (ἥμισυ) (τέταρτον)⟧
(γίνεται) νο(μ.) ιγ π(αρὰ) ξθ λο(ι)π(ὰ) κερ(άτια) . [
νο(μ.) ζ π(αρὰ) μβ (ἥμισυ) (τέταρτον) [
νο(μ.) . . π(αρὰ) ε (ἥμισυ) / [

The arithmetic and arrangement of the account are not immediately intelligible. The total given in line 5, written in a slightly larger script to the right of the space between lines 4 and 5, ought to relate to the other entries. In fact, it represents the total of the entries in lines 3ff., if some of the figures are revised. The photograph shows that the number of solidi in the deleted l. 4 is not ε but α; the sign for (ἥμισυ) was not written after μβ in l. 6; the unread number in l. 7 is α; and νο(μ.) at the beginning of l. 3 was omitted from the transcript. A few other emendations are necessary. In what was read as Φλ(αουίου) in l. 1, there is a small upright after phi, compatible with iota rather than an abbreviation stroke; a tiny trace to the right suggests the presence of a letter hidden under a crease in the papyrus. I propose to read the name Φίβ. At the end of lines 1 and 5, there are remains of sinusoids of the kind used for the ½ fraction.

I give below a text that incorporates these revisions and with a slightly different line numbering and arrangement, to bring it closer to the layout of the papyrus (I have also used symbols for the fractions):

† δι(ὰ) Φὶβ Φοιβάμμωνος νο(μ.) ιγ κ̣[(ερ.)] □[
ἀφ’ (ὧν)·
νο(μ.) ε π(αρὰ) κα □ □/
4 ⟦ (νο(μ.) α π(αρὰ) ε □ □/⟧
4a (γίν.) νο(μ.) ιγ π(αρὰ) ξ̣θ λο(ι)π(ὸν) κ(ερ.) □[
5 νο(μ.) ζ π(αρὰ) μβ □/
νο(μ.) α̣ π(αρὰ) ε □/

Through Phib son of Phoibammon 13 sol. ½ car.
of which:
5 sol. minus 21½¼
~~1 sol. min. 5½¼~~
7 sol. min. 42¼ total 13 sol. min. 69, remainder ½ car.
1 sol. min. 5½

[1] *Ed. pr*. *ZPE* 182 (2012) 269–271; the text reprinted in *P.Daris* is the same.

There are three important figures, two stated and one implied:

(i) The 13 solidi ½ carat mentioned at the end l. 1, presumably money on account, against which expenses were made.

(ii) The actual sum total of the entries in lines 3, 5, and 6: 5 solidi minus 21½¼ (carats) + 7 sol. min. 42¼ + 1 sol. min. 5½ = 13 sol. min. 69½ (car.).

(iii) The total of 13 solidi minus 69 (carats), with ½ carat as a remainder, given in l. 4. This ½ carat is the difference between the total given in this line and the actual total of the entries, but if this is what the scribe meant, the use of λοιπόν is peculiar; the term normally refers to the balance left after expenses are deducted from receipts or some other sum.

It might be possible to justify this remainder if we thought along the lines of Banaji's metrological interpretation of the 'minus carat system'. If we disregard the deductions of minus 69 or 69½ carats and reckon with 13 solidi *tout court*, ½ carat is the difference between the sum in l. 1 and the total in l. 4. There are some Arsinoite contracts in which sums described as '*x* solidi minus *y* carats' are referred to in the same document also as '*x* solidi'.[2] However, the exact purport of the sum in l. 1 cannot be established with certainty, and the fact that ½ is the difference between (minus) 69½ and 69 carats cannot be ignored.

The likely occurrence of the term ῥυπαρόν in l. 14 suggests an Arsinoite provenance.[3] The document was assigned to the fifth/sixth century, but the rates of deduction rather place it in the early sixth: 5 sol. min. 21¾ car. (l. 3), which correspond to 1 sol. min. 4.35 car.; 1 sol. min. 5¾ (l. 4); 7 sol. min. 42¼ (l. 5), which implies 1 sol. min. *c*.6.03;[4] 1 sol. min. 5½ (l. 6). If we assume that the papyrus comes from the Fayum, deductions of –5½ car. are attested in (*SB* 18.13860 +) *SB* 8.9770 of 511 (with *BL* 9.264), and of –6 car. in *CPR* 10.29 (521/2 or 536/7).[5]

The plurality of deductions recorded within a few lines of a single account is remarkable. On the face of it, they attest variable rates used in a given place at a given time, even if these payments were not made on the same day. Such variations do not admit a simple metrological explanation, unless we assume that solidi of different weight were used in different transactions.

P.Princ. 3.139

The back of a document with an oath by the emperor Anastasius (491–518) was reused for accounts of which parts of two columns survive. The first column refers to sums of money in the scheme νο(μ.) *x* π *y*; the editors did not expand π, written 'without indication of abbreviation', though they recognized its function, to indicate 'the number

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[2] The topic is discussed by J. Banaji in a paper reprinted as chapter 5 in *Exploring the Economy of Late Antiquity: Selected Essays* (Cambridge 2015) 91–109; see esp. p. 98f. Banaji's examples are SB 6.9280 (but S. Kovarik tells me that the reading is dubious), 6. 9459, and 8.9772.

[3] See B. Palme, *P.Harrauer* 60 introd. More difficult is εξ( ) in lines 11–13; the editor considers ἐξ(οδιασμοῦ) as an option, and offers comparanda from Hermopolis, but the context is different, though the resolution is possible. F. Morelli compares *BGU* 12.2188.12 (Herm.; 526) χρ(υσοῦ) νο(μισμάτιον) α εξ( ), tentatively resolved as ἐξ(οδιαζόμενον); on this expression, see A. Benaissa, *CE* 85 (2010) 380.

[4] 0.35 and especially 0.03 cannot be represented as plausible combinations of ancient fractions (0.35 = *c*. ¼⅛).

[5] I am grateful to S. Kovarik for information on money in Byzantine Fayum.

of κεράτια deducted from the solidi’.[6] The sums in the first nine lines presuppose solidi of the ‘minus 3 carat variety’: 10 sol. min. 30 (νο(μ.) ι π(αρὰ) λ, lines 1 and 4), 20 min. 60 (l. 2), 30 min. 90 (ll. 3 and 5, both crossed out; in l. 3 for [□] read ϙ̣), 5 min. 15 (l. 6), 40 min. 120 (l. 9); what was written in l. 7 is not clear.[7] Lines 10–11 display a different pattern, with the result that the readings were questioned in *CPR* VII, p. 158: ι π(αρὰ) με, 10 min. 45, and κε πα̣(ρὰ) κε, 25 min. 25. An online image (http://arks.princeton.edu/ark:/88435/h989r5793) shows that the reading in l. 10 is correct, and these are solidi of the minus 4½ carats kind. In l. 11 we find another deduction: π(αρὰ) ρ̣β □´, minus 72½, which implies a deduction of 2.9 carats per solidus.[8] This is only slightly below the –3 car. rate, but it is still different. The picture is comparable to *P.Daris* 47: the number of carats subtracted does not remain steady.

The papyrus is unprovenanced but the majority of the papyri in the group acquired with *P.Princ*. 139 (inv. GD 7550) came from Oxyrhynchus, and this may hold for this text too.[9] The accounts will have been written during the reign of Anastasius or shortly thereafter. The rate of deduction at Oxyrhynchus is low in comparison to other areas at the beginning of the sixth century: minus 2 in *P.Oxy*. 62.4349 (504) and 16.1966 (505).[10] The rates are higher in the Fayum (see previous note) and in Hermopolis (–5 in 504 [*SB* 16.12378] and 513 [*CPR* 7.43][11]). It should be stressed, however, that these data come from contacts, which can be dated with certainty and normally attest only one rate; accounts are different.

[6] To write π(αρά) would not have gone amiss; the version of the text in DDbDP has perpetuated π for over two decades.
[7] The edition prints νο( ) κε π οε; if νο(μίσματα) is to be read, it seems to have been followed by κ π(αρὰ) ρε; this would imply 1 sol. min 5¼, a higher rate of deduction than the others but not an implausible one. (The editors thought that the line was crossed out, but this is not true.) Several other readings are dubious, but the purport of the entries mostly escapes me. Read διαγ( ), not διέγρ(αψε) in l. 2; τῆς αὐτοῦ, not τῆς αὐτῆς in l. 7.
[8] 0.90 has no equivalent in ancient fractions; an approximation would be ⅔¼ = 0.9166.
[9] *CPR* VII p. 158 = *BL* 8.285 places it in the Hermopolite nome, but this relies on a deprecated reading (correction reported in *BL* ibid.).
[10] The same rate might be attested in *P.Mich*. 11.612.15 (514), read as χρυσοῦ ν[ομισμάτια πέντ]ε παρ̣ὰ̣ κερ[(άτια) ±5]□ ἰ̣δ̣ιωτ̣ι̣κῷ ζυγῷ; to judge from the images, δέκ]α̣ might just be impossible.
[11] For later Hermopolite developments, see *P.Jena* 2.19 introd. (p. 83).