

THE AMOUNT OF WAGES PAID TO THE QUARRY-WORKERS AT
MONS CLAUDIANUS*

By HÉLÈNE CUVIGNY

(Plate II)

O. Claud. inv. 4751; 14.5 × 10.5 cm; A.D. 136–146.

| | | |
|----|-------------------------------|-----------------------|
| | ἐντολ(ή) Παχουμῖς μηνὸς Θωθ · | |
| | ὄψωνίου (δραχμαὶ) | μζ · τούτων |
| | προχρίας (δραχμαὶ) | κ, ἀποχῆν λαμβ(άνεις) |
| | ἐλαίου κοτύλας | γ |
| 5 | φακοῦ μάτιν | α |
| | κρομμύων μάτ(ιν) | α |
| | οἴνου κεράμιν | α |
| | συμβολῆς | (δραχμαὶ) γ |
| | τὸν σῖτον ἰς ὄρος | |
| 10 | δαπάνη | (τετρώβολον) |
| | τάς λυπ(άς) ἰς ὄρος. | |

1 εντο^λ 2-3, 8ς 3 προχρείας λαμβ^β 6 μα^τ 8 συμβολῆς 9 ἰς 10 ρ 11 λοιπ(άς)

Instructions from Pachoumis for the month of Thoth. Wages: 47 drachmae. Deductions: advance 20 drachmae (you get a receipt); 3 cotylae of oil; 1 *mation* of lentils; 1 *mation* of onions; 1 amphora of wine; *symbole*: 3 drachmae. My wheat to the desert. *Dapane*: 4 obols. The rest to the desert.

Pachoumis worked in the imperial quarries at Mons Claudianus. He was either a quarryman, a stone-mason, or a smith. He belonged to the group of workers called *pagani*.

The work-force at Mons Claudianus was divided into two categories, the *familia* and the *pagani*. The *pagani* were the local, free, skilled workers who came mostly from Syene, from Alexandria, and probably especially from the Theban region, if their names are anything to go by. The two categories of workers were *mercenarii*: both *pagani* and *familia* received a money-payment which is always called *opsonion*.¹ In addition to this sum they received a ration of victuals which was not the same for the two groups: the *pagani* were entitled to 1 artaba of wheat plus a wine-ration, the quantity and distribution

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Bibliographical abbreviations:

Ciulei 1983 = G. Ciulei, *Les Triptyques de Transylvanie* (1983);

Domergue = Cl. Domergue, *Les Mines de la péninsule Ibérique dans l'antiquité romaine*, Collection de l'École Française de Rome 127 (1990);

Drexhage = H.-J. Drexhage, *Preise, Mieten/Pachten, Kosten und Löhne im römischen Aegypten bis zum Regierungsantritt Diokletians, Vorarbeiten zu einer Wirtschaftsgeschichte des römischen Aegypten I* (1991);

Gara = A. Gara, *Prodiagrophomena e circolazione monetaria* (1976);

Hengstl = J. Hengstl, *Private Arbeitsverhältnisse freier Personen in den hellenistischen Papyri bis Diokletian* (1972);

Mrozek 1975 = S. Mrozek, *Prix et rémunération dans l'occident romain (31 av. n.è.-250 de n.è.)* (1975);

Mrozek 1977 = S. Mrozek, 'Die Goldbergwerke im römischen Dazien', *ANRW* II.6 (1977), 95–109;

Mrozek 1989 = S. Mrozek, 'Le travail des hommes libres dans les mines romaines', *Mineria e metallurgia en las antiguas civilizaciones mediterraneas y europeas*. II, *Coloquio Internacional asociado, Madrid, 24-28 octubre 1985* (1989), 163–8;

Noeske = H.-Ch. Noeske, 'Studien zur Verwaltung und Bevölkerung der dakischen Goldbergwerke in römischer Zeit', *Bj* 177 (1977), 271–416;

O. Claud. = *Ostraca Claudiana* (the ostraca mentioned in this paper are unpublished and quoted by their inventory numbers)

Röhle 1968 = R. Röhle, 'Das Problem der Gefahrtragung im Bereich des römischen Dienst- und Werkvertrages', *SDHI* 34 (1968), 183–222

¹ In the everyday language of the Hellenistic period ὄψωνιον replaces the classical μισθός, which continues in literary usage (M. Launey, *Recherches sur les armées hellénistiques* II (1950), 726). On the other hand, scribes setting up work-contracts nearly always use μισθός instead of ὄψωνιον, in my opinion because it was felt to be more solemn (Hengstl, 44 and n. 54 for *locatio operarum*; 60 for *locatio operis*).

of which is, however, uncertain. The *familia* received 1 artaba of wheat, lentils, and oil and, once a year, a set of clothes.² The *pagani* had themselves to procure oil, lentils, and other goods from the Nile Valley; the price was deducted from their wages. The text published above gives some examples of other deductions that could be made from the wages, like reimbursement of advances on pay and contributions to associations (*dapane, symbole*). The paying of the *pagani* and the *familia* respectively created two different kinds of documentation issuing from two different administrations, i.e. the *entolae* for the *pagani* and the receipts for advances on pay for the *familia*. The formulae of the receipts for advances on pay did not contain the amount of the *opsonion*, which is therefore unknown. On the other hand, in the *entolae* which each *paganus*-worker wrote every month to the quartermaster (*kibariates*), the amount of the monthly wages is hardly ever omitted. The *entolae* are usually not dated, but the receipts for advances, with which they are normally found, often are and they can thus be dated to the decennium 136–46.³

As a documentary type the *entolae* are extremely well represented among the ostraca from Mons Claudianus: out of a total of some 9,100 registered ostraca, about 1,240 are *entolae*.⁴ It is a new type of text in papyrology, a product of the special conditions that decided the organization of the work in the imperial quarries. These *entolae* will be published in the series *Ostraca Claudiana*, but their quantity is such that this publication may not appear for several years. For this reason I have thought it useful to publish one here, in order to submit in advance to historians the information they contain concerning the wages in money of the free workers in the imperial quarries. Hitherto, from the whole Roman Empire, only the pay of two Dacian miners was known, and we had almost no information on the pay of quarrymen.⁵

I. THE PAY-SCALE

1. Pachoumis earned 47 drachmae per month, which is by far the commonest amount attested. In their present, nearly definitive, state the texts mention 106 workers with wages of this size, but their specific occupation is not mentioned once.
2. 37 drachmae 4 obols. This rate of pay is attested for nine individuals, two of whom are smiths, one being a χαλκεύς, the other a στομωτής, a steel-temperer. The other seven do not state their craft. I cannot exclude that the lower pay-rate is a question of age, since in three cases the less well paid are sons, included by their father on his *entole*.

An abnormal amount of 37 drachmae is found in three *entolae*, of which at least two were submitted by Sarapion the Younger — in the third case the name of the worker is missing. Since the same Sarapion in other *entolae*, including duplicates of those of 37 drachmae, states his pay as 37 drachmae 4 obols, we must assume that the 37 drachmae are an error, the reason for which escapes us.

3. 28 drachmae. This is the lowest rate, known for five workers only. In four cases it is the pay of a son and once of a brother included on the *entole* of a worker who earns the normal 47 drachmae. The fifth case is that of Isidorus who was in the habit, instead of giving his patronymic (which was also Isidorus, as we know from other

² The only attestation is O. Claud. inv. 8497.

³ There are no receipts for advance earlier than 136 by which year we may, therefore, believe that the two management systems were established. The latest receipt dates from 197, but the nature of the archaeological contexts makes it impossible to date with confidence *entolae* other than those found together with receipts from 136–146.

⁴ The uncertainty about the exact number of *entolae* is due to the existence of related texts (accounts, receipts) which are more or less close to the *entolae* in form or function.

⁵ There is perhaps an exception: *PSI* VIII. 962.B.25–39 (A.D. 131/132) is a work-contract through which an inhabitant of a village in the Heracleopolite nome binds himself to assist his employer in μεταλλευτική εργασία for one year. For this he receives 180 drachmae of which 160 are paid in advance. This gives a monthly total of 15 drachmae which is not much, even if one should add various payments in kind specified in a lacuna. But the text presents many uncertainties and we do not know whether the work was full-time, nor whether mining or quarrying was concerned.

documents), of putting *παῖς* after his name. I shall leave aside the well-known ambiguity of the word *παῖς* and its derivatives ('slave' or 'young boy?'); suffice it here that Isidorus, with his patronymic, is not a slave, but probably, like others who earn 28 drachmae, an apprentice. Incidentally, the low number of apprentices is surprising.

The wages of 47 drachmae, 37 drachmae 4 obols, and 28 drachmae belong to the same pay-scale. The proof of this is that fathers who are paid 47 drachmae often include sons or younger brothers on their *entole* who earn 37 drachmae 4 obols.

There are rare traces of another pay-scale where a maximum of 48 drachmae (received for example by a blacksmith⁶) corresponds to lower grades of 38 drachmae, 38 drachmae 2 obols, and 38 drachmae 4 obols (the last two are found within the same month). It will lead too far here to enter into the details, but the facts at our disposal suggest that the rise in wages was introduced around A.D. 151, perhaps after an interruption of the quarrying. The uncertainty concerning the amount of the lower wages must derive from the disorder that ensued when operations restarted with a different pay-scale.

We may thus conclude that wages of the local, skilled workers employed at Mons Claudianus depended only on the age of the worker, not on his craft, since quarrymen and smiths received the same pay.⁷ The pay-scale was very even, and one quickly reached the top level of 47 drachmae.

The workers at Mons Claudianus were better paid than those of the Nile Valley. On the basis of the table of monthly wages recently compiled by Drexhage,⁸ one can calculate that the average pay for a civilian in Egypt in the second century A.D. was a little more than 25 drachmae. The maximum during the same period was 40 drachmae, but this was uncommon (only two cases out of twenty-two). Not until around A.D. 250 do we find wages of above 40 drachmae. It should be noted that these monthly payments are often lower than the results obtained by multiplying by thirty certain daily payments which may come as high as 4 drachmae per day. The impression is that payment per day was often more advantageous, either because the man did not work regularly or because a temporary employee weighs less heavily on the budget of the employer, who could thus afford to appear more generous.

These 47 drachmae represent about half of the pay of a legionary infantryman who earned 300 denarii a year, equal to 1,200 drachmae, or, on a monthly basis, 100 drachmae per month, but who had to pay for his own wheat. Traditionally the monthly ration per man in Egypt is one artaba, or *c.* 39.5 litres, of wheat. The fixed, official price for an artaba of wheat was at this time eight drachmae. The market-price was a little higher at an average of 9.2 drachmae in the first half of the second century.⁹ These prices mean that the 47 drachmae were more or less equivalent to the price of five artabae of wheat. So, since one artaba is enough to nourish one active, grown man, the better paid among our workers received enough to feed five people.¹⁰

There is never any question of deductions from the wages because of religious feasts, holidays, or illness. One cannot, however, completely exclude that such deductions were made in disguised forms, e.g. as payments to an official.

⁶ This shows that the 'high' wages of 47 and 48 drachmae are not reserved for quarrymen.

⁷ Many different crafts are mentioned in the O.Claud., but they are hardly ever used to distinguish individuals. For this reason we do not know the occupations of our *pagani*, except for a very few cases where a *sklerourgos* (quarryman), a *stomotes* (steel-temperer), or a *mechanikos* (machine operator) are mentioned. The pay of the *mechanikos* is not known.

⁸ Drexhage, 425-9. I have selected for my calculations only the twenty-two cases which seemed certain.

⁹ Based on Nos 21-4 of the table of market-prices of wheat in Lower and Middle Egypt by R. Duncan-Jones, *Structure and Scale in the Roman Economy* (1990), 151. The published texts do not give a

trustworthy impression of prices in Upper Egypt (Duncan-Jones, 152), but perhaps it was not so different, in spite of the impression given by certain ostraca concerned with taxation, where it would seem to be much lower. In a unique ostrakon from Mons Claudianus (O.Claud. inv. 1077, a letter) there is discussion of a sale of wheat during the reign of Trajan or Hadrian. Two possible prices of two or three staters respectively are mentioned in a somewhat obscure context, i.e. eight or twelve drachmae.

¹⁰ The calculation is easily made on the basis of the data collected by L. Foxhall and H. A. Forbes, 'Σιτομετρικά (*sic* H.C.): the role of grain as a staple food in Classical Antiquity', *Chiron* 12 (1982), 41-90.

II. COMPARISON WITH THE WAGES OF THE DACIAN MINERS

The table of Drexhage mentioned above gives instant confirmation that nearly all wages in drachmae in Roman Egypt are sums divisible by four, or, in other words, they can be reduced to a round sum in stateres of tetradrachmae. This preference for sums divisible by four is seen also in the *entolae*, where advances on pay are often 20 or 40 drachmae and transfers between individuals are very often divisible by four.¹¹ Now, the only amount from the period A.D. 136–46 which is divisible by four is that of 28 drachmae which is also the least attested, and one has to ask what calculations were behind the peculiar amounts of 47 drachmae and 37 drachmae 4 obols. They are apparently not the results of a multiplication of a daily pay¹² since, at Mons Claudianus, the monthly wages are not divisible by thirty, the number of days in every Egyptian month, nor, for that matter, by any lower number of days, if feast-days were after all deducted.¹³

At almost the same time, but far from Egypt, in Dacia, three illiterate workers were hired to work in the mines of Alburnus Maior. Copies of the contracts with which they bound themselves to their employer were written on *tabulae ceratae* and show, among other things, the length of the employment and the total wages which would be paid to them in several, unspecified instalments. The last column in the table below shows that in the two cases where there are enough data to make the calculations the total is remarkably close to the payment in money received by the workers at Mons Claudianus.

The first edition of the 'Transylvanian triptychs' is found in *CIL* III.11. The three contracts of employment that are of interest to us are TC IX, X, XI, pp. 948–9. I use the latest, and best, text, established after consultation of the originals by Röhle.¹⁴ The texts are reproduced by Noeske who also gives a detailed commentary (Noeske, 396–404).

| CIL no. | date hired | expires | length | total pay | pay for 30 days (in drachmae) ¹ |
|--------------------|-------------|--------------------------|-----------------------|-------------------------------------|--|
| TC IX | 23 Oct. 163 | 13 Nov. 164 | 388 days ² | 90 denarii ³ | 27,835 |
| TC X | 19 May 164 | 13 Nov. 164 ⁴ | 179 days | 70 denarii children ⁵ | 46,927 |
| TC XI ⁶ | in lacuna | 13 Nov. | half a year? | 10 denarii 105 denarii | 6,703 70? |

Notes

1. It is known that the denarius was statutorily equivalent to the tetradrachm or stater, so that the drachma was statutorily equivalent to the sestertius.¹⁵ It is thus possible to convert the Dacian wages into Egyptian monthly wages and to see that the result is very close to 28 and 47 drachmae. The conversion is, of course, theoretical and serves for verification only, since nothing points to the Dacian wages being paid in monthly instalments.

2. Ciulei is mistaken when he sets the duration of this contract at one year and thirteen days (Ciulei, 49). I do not understand how Noeske obtains a sum of 386 days. If we include the day when the contract was written (*ex hac die*) and the day on which it expires, as he does for TC X, I get 388 days in the following way:

| | | |
|--|--------|-----|
| October 163 | | 9 |
| November, April, June, September | 30 × 4 | 120 |
| December, January, March, May, July, August, October | 31 × 7 | 217 |
| February (NB: 164 is a leap-year) | | 29 |
| November 164 | | 13 |
| | TOTAL | 388 |

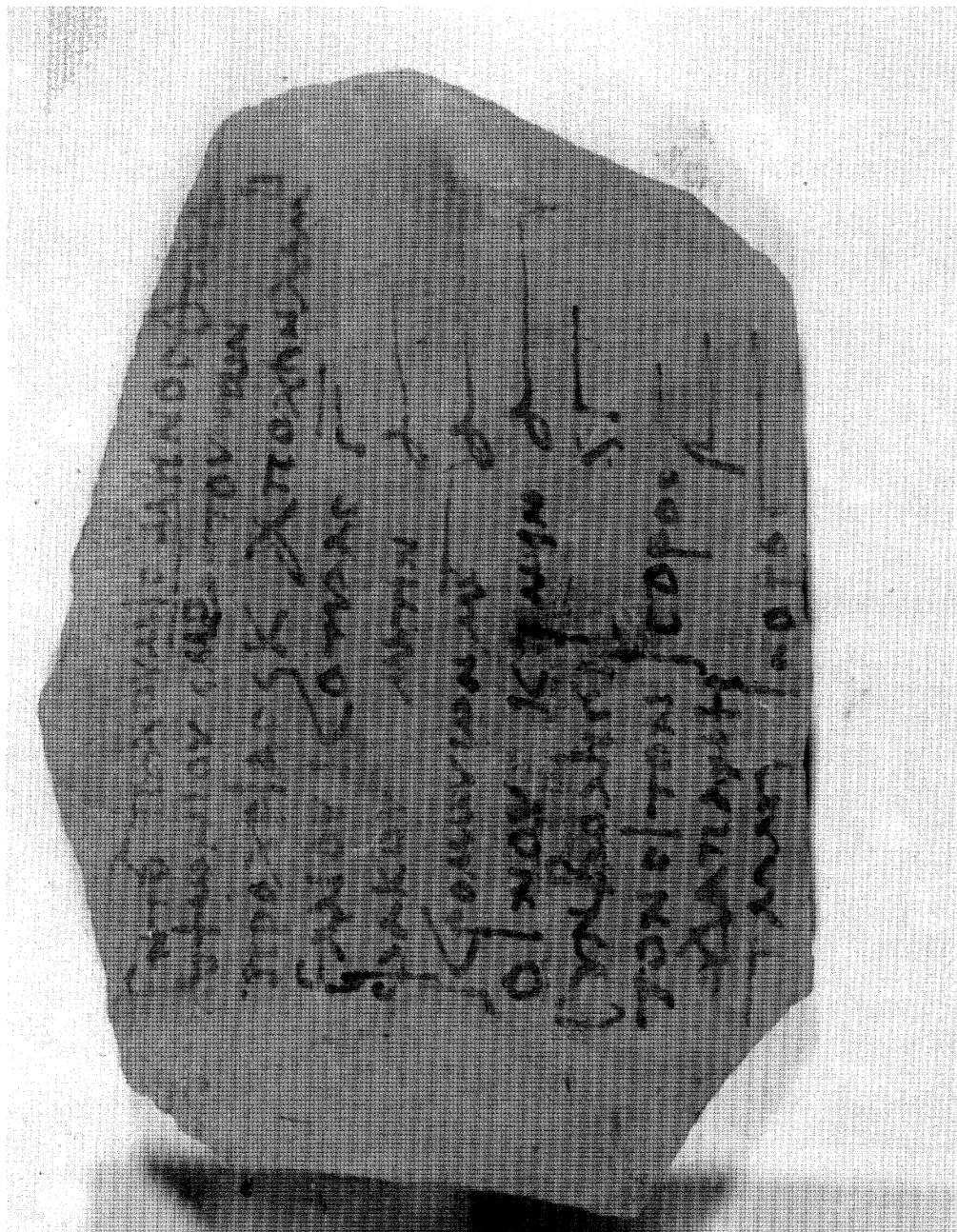
¹¹ It should be remembered in this connection that taxes were payable in tetradrachms (Gara, 77 and 144).

¹² This, as we shall see below, has been believed by several scholars in treatments of the wages of the Dacian miners.

¹³ There were, of course, holidays, but probably not the same number every month.

¹⁴ Noeske, 398, n. 681.

¹⁵ Gara, 14.



O. CLAUD. INV. 4751. ENTOLE OF PACHOMIS FROM MONS CLAUDIANUS.

3. The original supplement [*sept*]aginta was made in analogy with TC x, but was not cogent, because the duration of the contract is not the same in the two tablets and the amount would be abnormally low. Later the supplement [*non*]aginta has been preferred (Mrozek 1975, 72; Noeske, 397).
4. The date 19 May, instead of 20 May, is based on a new reading by Röhle (Noeske, 400, n. 703)¹⁶ which extends the duration of the contract to 179 days instead of 178. Ciulei wrongly arrives at five months and thirteen days (Ciulei, 49).
5. Röhle returns to the original reading *liberisque* instead of *cibarisque* as proposed by Carcopino.¹⁷ Carcopino's correction was widely accepted and is still upheld by some (Röhle, 188–91). Noeske, 402 accepts *liberisque*, and this reading does, indeed, seem necessary from the facsimile in *CIL* III.11, p. 948: *i* and *e* are certain.¹⁸ The pay of these children is much below that of Mons Claudianus and suggests that the children were younger than our *pais* Isidorus and the sons of workers. Unlike mining, where certain operations require more agility than physical strength, quarrying is unsuitable for child-labour. Children were also employed in Egyptian gold-mines as witnessed by Agatharchides in the second century B.C. (*De Mari Erythraeo* 26).
6. The date of contract TC xi is lost, so Noeske does not take much interest in this text, where the daily pay cannot be calculated. Mrozek, on the other hand ((1977), 104), tries to show that the contract was concerned with a period of six months. He argues that the employment contracts traditionally expired on the *Idus* of November, since TC ix and TC x suggest that they were set up at the end of May for an employment of about six months, or before the *Idus* of November for an employment of about one year. I find this argumentation interesting, on condition that we accept the TC ix and TC x are representative of the time of the year when contracts were normally set up. Since the payment stipulated for this period is 105 denarii, Mrozek deduces that the annual pay was 210 denarii, which would correspond, on Mons Claudianus, to a monthly pay of exactly 70 drachmae. We do have a single example, an account which is related to the *entolae*. This text, O.Claud. inv. 8429, shows deductions from the wages specified for two consecutive months. The first two lines run: Φαοφι ὀψ(ωνίου) (δραχμαί) ο, Ἄ{τ}θυ<ρ> ὀψ(ωνίου) (δραχμαί) ο, 'Wages for Phaophi, 70 drachmae, wages for Hathyr 70 drachmae'. This ostrakon would confirm Mrozek's hypothesis, but the conclusion is fragile: TC ix and TC x do not concern a period of exactly a year or six months, so why should this be the case with TC xi?

III. IS THE MONTHLY PAY THE RESULT OF A MULTIPLICATION OF THE DAILY PAY, OR OF A DIVISION OF THE ANNUAL PAY?

The basis for the calculation of the miners' pay has been much discussed. In my opinion both Mrozek and Noeske are following a false trail when they try hard to show that the wages were the result of a multiplication of the daily pay. Thus, Noeske starts with the postulate that the wages mentioned in the contracts result from a multiplication of a certain number of working days by a daily pay and that this daily pay must be payable in the coinage of the day. As 90 denarii divided by the number of working days does not result in a round figure, he concludes that the daily pay was 4 asses and 2

¹⁶ The facsimile in *CIL* which supports the reading *liberisque* (cf. n. 5) does, admittedly, not confirm the reading XIII as made by Röhle (in *Acta Musei Napocensis* 6 (1969), a publication to which I do not have access).

¹⁷ J. Carcopino, 'Note sur la tablette de Cluj *CIL* III nr X p. 948', *Rev. Philol.* 63 (1937), 103.

¹⁸ The problem is whether the facsimile is accurate or if *liberis* is a wishful reading. A good photograph would disperse the remaining doubts, but those I have seen are, unfortunately, not of an adequate quality (*Inscriptiones Daciae Romanae* 1 (1965), 234;

Apulum 7 (1968), 324). Röhle claims to have seen 'klar und deutlich die Buchstaben liberisque' on a photograph which has been sent to him (Röhle 1968, 189). Besides Noeske, M. Kaser, *Das römische Privatrecht* I² (1971), 570, n. 72, also accepts the reading *liberisque*, which, on the other hand, is rejected by H. Kloft, 'Arbeit und Arbeitsverträge in der griechisch-römischen Welt', *Saeculum* 35 (1984), 215, n. 75, although not on palaeographical grounds. I. I. Russu, *Inscriptiones Daciae Romanae* I.1.41, does not choose between the two.

quadrantes and introduces the idea that the period of work included non-paid days of rest (Noeske, 397–8). Several arguments can be found against this:

it is doubtful that the round figures of 70, 90, or 105 denarii result from such a multiplication;

it was unimportant to be able to pay the workers by the day: since these workers were employed for a longer period, they were not day-labourers;

the Egyptian papyri suggest that the monthly wages in money were not on the same level as the day-by-day payment. The two types of payment are used in different situations, where both the nature of the work and its duration varied. We have already seen that the daily wages were sometimes proportionally higher than the monthly ones and that, on the other hand, the monthly wages were generally divisible by four, i.e. could be paid in staters. Consequently the monthly wages are not the result of a multiplication of the daily pay, but are based on a different calculation, although we should not forget that the wages at Mons Claudianus differ from the norm in Egypt, inasmuch as two out of the three pay-rates cannot be paid in staters;

the fact that the amounts are the same every month on Mons Claudianus suggests that the number of working days was not taken into account.

In spite of all the subtleties they use to calculate the daily pay of the workers, Mrozek and Noeske speak in terms of wages for a year or half a year.¹⁹ As a matter of fact, the concept of annual pay is fertile and would explain the atypical monthly wages paid at Mons Claudianus.

Let us begin with the fact that 70 denarii are the pay for half a year minus seven days, in TC x. This would mean that yearly pay was 140 denarii.²⁰ This results in a striking coincidence.

140 denarii, or 560 sesterces, are not divisible by twelve, but 141, or 564 sesterces or drachmae, are and the result is 47, the monthly wages at Mons Claudianus. 141 is of course an unexpected amount for a year,²¹ but perhaps we can be allowed to believe that the sum was adjusted in order to make it payable in monthly instalments.²²

If we try the same model on the payments of 28 drachmae (= 7 staters or denarii) a month, it would be derived from an annual sum of 84 denarii, which is the pay of the worker in TC ix; the six supplementary denarii correspond to the twenty-three days by which the employment exceeds a year. It should be noted that the payment for these last six days, which by strict reckoning should be 5.293 denarii, is rounded up to the next whole denarius in the worker's favour. It seems probable that the gap between a strict pay-scale and the variable periods of employment left room for bargaining, but no trace of this has been found on Mons Claudianus.

The demonstration is less convincing as concerns the amounts of 37 drachmae 4 obols,²³ both because the Transylvanian tablets have not preserved documentation of a similar rate, and because the annual rate of 113 denarii, on which it should be based if we apply the same principle, is less suitable for payment in monthly instalments than 114 would have been:²⁴ 113 denarii divided by twelve give 37 drachmae and a remainder

¹⁹ Mrozek 1968, 318: on the basis of TC xi, 'We can calculate that the annual pay of a minor was 210 denarii or 2.3 sesterces or more than 9 asses a day'. Mrozek 1977, 104: 'der jährliche Verdienst des Restitutus agnomine Senioris betrug also 210 Denare, was pro Tag ungefähr 2,3 Sesterzen ausmacht'; Noeske, 402: 'wenn Memmius Asclepi für ein halbes Jahr Arbeit im Bergwerk 70 Denare verdient . . .'

²⁰ Thus put by Domergue, 345.

²¹ In the Lex Ursonensis (Spain, first century A.D.) the annual remuneration (*annua*) of the municipal employees is a multiple of the aureus (= 25 denarii), see *CIL* II Suppl. 5439, ch. 62 and the comment by Mrozek 1975, 75–6.

²² This is not normally the case for the yearly wages in Egypt as listed by Drexhage, 430. Only in one case out of twelve is the amount divisible by twelve, but on the other hand it is nearly always divisible by four.

²³ I have wondered whether the wages of 37 drach-

mae 4 obols could be calculated on the same basis as the daily payment of 5 asses, attested in *CIL* IV Suppl. 4000 (Pompeii, *ante* A.D. 79). The inscription is quoted e.g. by W. Krenkel, 'Währungen, Preise und Löhne in Rom', *Das Altertum* 7 (1961), 167–78, at 175 (*non vidi*, reference taken from J. Szilagyi, 'Prices and wages in the western provinces of the Roman Empire', *Acta Antiqua* 11 (1963), 325–89, at 347). At this rate the payment for thirty days would indeed be 37 sestertii and 2 asses, or at the statutory exchange-rate, 37 drachmae and 3.5 obols. But this is surely a co-incidence, since we have seen that the daily rates were used for irregular and temporary employment and were not used as a basis for the wages of permanent personnel.

²⁴ An annual rate of 114 denarii would mean a monthly payment of 38 drachmae, which sum is sporadically attested on Mons Claudianus (see above, p. 141).

of 8 drachmae (= 56 obols), which cannot be divided by twelve, unless we use the traditional drachma of 6 obols (instead of 7, as was normal at this time). The result of this would be $8 \times 48 \div 12 = 4$ obols.²⁵

The *entolae* of Mons Claudianus attest wages which are, in two cases, abnormal. Since the earnings in money of these quarrymen are exactly the same as those of the two miners in Alburnus Maior whose earnings can be known with certainty, I propose that the peculiar amounts on Mons Claudianus are the result of a division into monthly instalments of an annual pay which was fixed for all free workers in the *metalla* (quarries and mines) of the Empire, where the tradition may have been to employ workers on a yearly or half-yearly basis, as suggested by the Dacian contracts. Such a general regulation of wages, made to work across differences in monetary systems, calendar,²⁶ and methods of exploitation,²⁷ could be used as an argument in favour of the hypothesis of Dušanić, who suggests that there existed a central office in Rome, an hypothesis which he bases on other indications of a centralization of the administration of the *metalla* throughout the Empire.²⁸

If my hypothesis, by which I have tried to explain the similarity of pay-scales in Dacia and at Mons Claudianus, is correct, it is an unexpected and striking example of the economic integration of the Empire such as Augustus wanted it, when he imposed the denarius, or its statutory equivalents, as the universal currency-unit. If it is not correct, it remains interesting that these free miners and quarrymen, working in two provinces so far apart, received the same payment in money, a payment which was above the earnings of other members of their class, like manual workers or farm-labourers.²⁹ One cannot, however, maintain that the earnings of the miners in Alburnus Maior were exactly the same as those of the quarrymen at Mons Claudianus, since we do not know if the miners also received rations in kind. Such rations are not mentioned in any contract, now that *cibarisque* has been rejected, even though some commentators believe that a grain-ration was a matter of course, so that there was no need to mention it.³⁰

CNRS, Paris

²⁵ This solution supposes that drachmae of 6 and 7 obols, respectively, are used in the same operation. This could be awkward, but is not without parallel: in *P. Cair. Mich.* 359, Part II, p. 14, n. 10, Shelton quotes *P. Lond.* 1.131 (corr. in *BL* 1, p. 230), where 85 drachmae 2 obols of bronze are converted into 71 drachmae 1 obol of silver, at a rate of 29 obols for 4 drachmae. As Shelton notes, although the 85 drachmae have been converted at the announced rate into 17 tetradrachms, the last 19 obols were converted into 3 drachmae 1 obol calculating 6 obols to the drachma. Since the 6-obol drachma was better suited to the Egyptian monetary system than that of 7 obols, accountants must have been tempted to use it (*Gara*, 71, n. 47).

²⁶ The miners were not employed for a round number of months and it is not known at what intervals they were paid. The contracts use the vague *per tempora*, for which see Noeske, 399, 401. At Mons Claudianus workers were apparently paid at the end of each month, as was usual for everyone who was paid by the month.

²⁷ Mons Claudianus is under direct administration: the workers let their service to the emperor, represented by his procurator. The mines at Alburnus Maior were under indirect administration: the imperial procurator lets the mine shafts to private entrepreneurs who hire and pay the workers (Domergue, 301–5).

²⁸ Perhaps a *tabularium* dependant on the *procurator a rationibus*, see S. Dušanić, 'The Roman Mines of Illyricum: Organization and Impact on Provincial Life', *Mineria e metalurgia en las antiguas civilizaciones mediterraneas y europeas* II (1989), 154–5.

²⁹ Noeske, 402; Mrozek 1989, 166.

³⁰ M. Corbier, 'Salaires et salariat sous le Haut-Empire', *Les Dévaluations à Rome* 2 (1980), 81. The *locus classicus* in this connection is *Dig.* xxxviii.1.50.1 (thus Mrozek 1977, 105): 'Non solum autem libertum, sed et quemlibet alium operas edentem alendum: aut satis temporis ad quaestum alimentorum relinquendum: et in omnibus tempora ad curam corporis necessaria relinquenda' ('But not only the freedman, but anyone else engaged in performing services, is to be provided with food, or to be allowed sufficient time to earn the price of his food, and all are to be left time to take necessary care of themselves', trans. A. Watson, *The Digest of Justinian* (1985)). The argument is open to discussion, firstly because the passage does not concern paid work, but the rather special case of free services; secondly rations may be of different sizes, as we have seen for the *pagani* and the *familia* at Mons Claudianus and, furthermore, in the Egyptian work-contracts the description of payment in kind is never less precise than that of the payment in money (cf. the numerous examples collected and analysed by Hengstl, *passim*).