BOREAS

MÜNSTERSCHE BEITRÄGE ZUR ARCHÄOLOGIE

Begründet von Werner Fuchs

Herausgegeben von Hugo Brandenburg, Dieter Korol, Dieter Salzmann,
Magdalene Söldner, Klaus Stähler

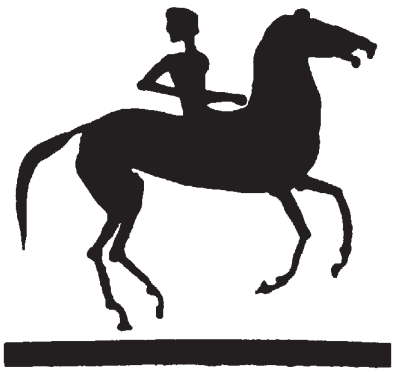
Redaktion: Holger Schwarzer

Band 36 **2013**

BOREAS

MÜNSTERSCHE BEITRÄGE ZUR ARCHÄOLOGIE

Begründet von Werner Fuchs



Band 36
Münster 2013

Gedruckt mit Unterstützung durch den Landschaftsverband Westfalen-Lippe,
Abteilung Kulturpflege

LWL
Für die Menschen.
Für Westfalen-Lippe.

und das Ministerium für Wirtschaft, Energie, Bauen, Wohnen und Verkehr
des Landes Nordrhein-Westfalen

BOREAS - Münstersche Beiträge zur Archäologie 36, 2013

Herausgeber: Hugo Brandenburg, Dieter Korol, Dieter Salzmann, Magdalene Söldner, Klaus Stähler
Redaktion: Holger Schwarzer unter Mitarbeit von Luisa Goldammer-Brill, Institut für Klassische Archäologie und Christliche Archäologie/Archäologisches Museum, Domplatz 20–22, 48143 Münster

Zu beziehen durch: Scriptorium, Trappweg 12, 34431 Marsberg/Padberg. Telefon: 02991-908773, Fax 02991-908774, Email: Scriptorium@t-online.de, Internet: www.scriptorium-muenster.de
Austauschangebote sind zu richten an die Herausgeber des Boreas, Institut für Klassische Archäologie und Christliche Archäologie/Archäologisches Museum, Domplatz 20–22, 48143 Münster
Email: inst.arch@uni-muenster.de

INHALTSVERZEICHNIS

Theun-Mathias Schmidt
Königssöhne als Zugochsen ihrer Mutter (Pol. 22, 20) – Mythologische Bildung und allegorisches Weltverständnis im Pergamenischen Reich und in den Bildern des Pergamonaltares 1

Holger Schwarzer
Heiligtümer der Aphrodite Paphia in der antiken Münzprägung 19

David Ojeda
A Colossal Cuirassed Statue from Seleucia Pieria 47

Konrad Hitzl – Andreas J. M. Kropp
Das Heiligtum von Olympia im 2. Jh. n. Chr. – Alte und neue Impressionen 53

Constanze Höpken
Ein blattförmiges Silberblech aus dem Iuppiter Dolichenus-Heiligtum auf dem Dülük Baba Tepesi bei Doliche 91

Ulrich Gehn
Eine Gruppe attischer Porträts im mittleren und späten 3. Jh. n. Chr. – Eine Neubetrachtung 99

Javier Á. Domingo
The Differences in Roman Construction Costs: The Workers' Salary 119

Klaus Fittschen
Lesefrüchte V 145

Helke Kammerer-Grothaus
Nikomedeia/Izmit – Kaiserliche Residenz und Kunstlandschaft in Bithynien 171

Hugo Brandenburg
Disiecta membra. Die Baudekoration der *basilica maior* von S. Laurentius und von S. Paul vor den Mauern in Rom – Bemerkungen zu einem Neufund spätantiker Baudekoration 199

Sylvia Diebner
Im Schatten der Peterskuppel und eines berühmten Archäologen – Gedanken zum Grab der »Universitätsprofessorsgattin« Edith Curtius (1885–1932) 213

Aus Westfalen

Tobias Runkel
Ein unbekannter Griffspiegel mit Darstellung der Dioskuren –
Bemerkungen zu einer spätetruskischen Spiegelgruppe 237

Jan-Pieter Löbbing
Eine Glassammlung aus Grevenbroich im Archäologischen Museum
der Westfälischen Wilhelms-Universität Münster 251

Adressen der Autorinnen und Autoren 289

Hinweise für Autorinnen und Autoren 291

Tafeln

JAVIER Á. DOMINGO

The Differences in Roman Construction Costs: The Workers' Salary

SUMMARY

The amount assigned to labor is one of the variables which had most influences on the final cost of Roman architecture. Consequently, its correct identification is an essential element when calculating the cost of the construction process, this latter being a study area which has developed significantly in recent years.

When evaluating the labor used in building works, an average salary of the 1st–2nd century A.D. of approximately 2 HS per day has traditionally been applied. This amount was obtained through extrapolating data contained in the »Edictum Diocletiani et Collegarum de pretiis rerum venalium« from the 4th century A.D., based on the evolution of the price of wheat. However, historical sources inform us of significant differences presented by some prices and wages which varied according to the geographical zone of the Empire in which they were applied. Therefore, this article analyses these differences so that labor costs can be evaluated more appropriately.

KEYWORDS

Roman architecture, economic cost, salary, labor

In 1922, when A. Segrè published his monograph about monetary circulation and prices in Egypt during the Roman period, he already wanted to emphasize the cost differences that might have existed among various geographic areas of the empire, even within the same chronological period: »Sarebbe infatti per lo meno imprudente suporre che nel mondo antico i prezzi tendessero a portarsi ad un medesimo livello in regioni anche lontane con quella facilità che caratterizza i tempi moderni. Tali condizioni dei mercati non si ravvisano neppure sotto l'impero, durante il quale è però assai probabile che la c.d. pacificazione del mondo romano, pure lasciando enormi diseguaglianze politiche ed economiche fra regione e regione, tendesse a livellare nei paesi del mediterraneo i prezzi delle merci di prima necessità e di agevole trasporto«[1]. Therefore, although the

The investigations were conducted with the support of the Departament d'Economia i Coneixement of the Generalitat de Catalunya.

[1] Segrè 1922, 5.

»pacification of the Roman world« might have contributed to a certain homogenisation of prices, a full uniformity was never achieved. There are enough testimonies: Pliny, for example, points out that Rome was a particularly expensive city[2], while Martial remembered with nostalgia how life in Hispania was much cheaper than in the urbs[3]. On the other hand, we know that the salary for a day of work of a worker in the time of Augustus in Italy could lie between 3.5 and 6 asses, while according to Cicero, the salary assigned to the same professional category, a few years before in Rome, was about 12 asses[4], and such diversity can only be interpreted on the basis of the different living costs among various cities in Italy[5]. Diocletian expresses himself similarly in »Edictum Diocletiani et Collegarum de pretiis rerum venalium«, where the cost of over 1,000 products is set at the beginning of the 4th century A.D., pointing out that the purpose of the document was not to equalize prices, but to set the maximum prices no one should exceed. Failing to do so would represent a grave injustice to provinces with lower prices[6].

In this article we want to focus our attention precisely on this point, the price and cost disparity in the Roman world, analysing how this variety could affect the cost of labor used in construction. In fact, although the cost differences among regions must have not been very high, it is perhaps in architecture where they would show up more clearly. We only need to think on, for example, how a small variation in the cost of each cubic foot of material used, or the salary paid to construction workers, could involve a significant increase in the final cost of a building, perhaps to the point of overcoming the economic possibilities of a promoter, or the city itself.

According to studies made in the recent years about the cost of Roman architecture[7], the variables with a bigger impact on the final price are indeed the cost of materials (Tab. 1)[8], the cost

---

2 Plin. nat. 18, 90.

3 Mart. 12, 31; 10, 96.

4 Cic. Q. Rosc. 10, 28.

5 West 1916, 294 seq. The differences in the salaries received by some professional categories, and price variations some products presented in different geographical areas, is clearly shown in the work of Szaivert – Wolters 2005, 315–354.

6 Giacchero 1974, 269 (Edictum 106–115).

7 About the process of calculating costs of construction in the ancient world, and the interpretation problems with many of the variables that should be considered, see: DeLaine 1997; Barresi 2000, 309–368; DeLaine 2001, 230–268; Barresi 2002, 69–81; Barresi 2003; Pensabene 2003, 341–367; Pensabene 2004, 73–84; Camporeale – Papi – Passalacqua 2008, 285–308; Prisset 2008, 125–139; Barresi 2010, 337–350; Borgia 2010, 281–299; Mar – Pensabene 2010, 509–537; Meneghini – Bianchi 2010, 71–79; Volpe 2010, 81–91; Domingo 2012, 381–418; Pensabene – Mar – Cebrián 2012, 161–175; Soler 2012, 193–228.

8 Most of the data available on the cost of marble is offered by the Edict of Diocletian. Even so, we know that along the 4th century A.D., when the prices listed in the Edict were no longer a valid reference, the price of some marbles increased significantly, to the point that in 363 Julian attempted to stimulate the opening of new quarries with a new law in order to lower the price: Cod. Theod. 10, 19, 2: »Imp. Julianus A. ad Rufinum com. Orientis. Quoniam marmorum cupiditate in immensum quoddam saxorum pretia acuta sunt, ut sumptuosa voluptas copia relaxetur, permittimus omnibus, ut qui volunt caedere habeant licentiam attributam: fore enim arbitramur, ut etiam complures saxorum nitentium venae in lumen usumque perveniant.« This initiative must have had some degree of success, since few years later, in 393, the emperors were forced to close private quarries in order to intensify the use of imperial quarries, cf. Cod. Theod. 10, 19, 13: »Impp. Valentinianus, Theodos. et Arcad. A.A.A. Rufino Pf. P. privatorum manus ab exercendo quolibet marmoreo metallo prohiberi praecipimus, ut fiscalibus instantia locis liberior relaxetur«; Pensabene 1974–75, 188.

of transportation, and especially the cost of labor. This latter variable represents 55 % of the total investment for the construction of the portico of a street in Antiocheia (Kragos)[9]; 65 % for the portico of a street in Soloi-Pompeiopolis[10]; 51.5 % for building the walls of the theatre of Nicaea from the beginning of the 2nd century A.D.[11]; 63 % for building the portico in summa cavea of the Flavian amphitheatre in Pozzuoli[12]; 49.9 % for Volubilis Capitol[13] from the beginning of the 3rd century A.D.; 33.5 % for the part built in local stone in the upper terrace of the provincial forum in Tarraco[14], and 36,5 % for the part of the same enclosure built in marble[15]. These values are similar to those documented from medieval times, when in the construction of a chapel, a sacristy and a cloister in the monastery of Célestins de Sens near Paris in 1477–1482 labor represented 51.5 % of the total investment[16]. On the other hand, we also know that the cost of labor in making marble sculptures approached 9/10 of the total cost, allocating only the remaining 1/10 for the purchase of the raw material[17].

Despite the economic importance of this item, there are very few sources that allow us to reconstruct its cost. These comprise most notably the already mentioned »Edictum Diocletiani et Collegarum de pretiis rerum venalium«, which includes the salaries of the major occupational categories, some of them linked to the building activity[18]:

-50 denarii/day:	to the constructor in stone, with lunch
-50 denarii/day:	to the carpenter, with lunch
-50 denarii/day:	to the lime preparer, with lunch
-60 denarii/day:	to the stonemason, with lunch
-60 denarii/day:	to the wall mosaicist, with lunch
-50 denarii/day:	to the floor mosaicist, with lunch
-75 denarii/day:	to the wall painter, with lunch
-150 denarii/day:	to the figure painter, with lunch
-50 denarii/day:	to the cartwright, with lunch

9 Borgia 2010, 297 fig. 16.

10 Borgia 2010, 298 fig. 17.

11 Barresi 2010, 345.

12 Barresi 2004, 262–267.

13 Domingo 2012, 381–418.

14 Mar – Pensabene 2010, 524–528.

15 Mar – Pensabene 2010, 528–534.

16 Cailleaux 1985, 117–156.

17 This calculation has been made based on the 200 HS cost of a bathtub in Cirta (measuring 1.04 x 0.81 x 0.51 m), with a volume of material used of 0.4 m^3. As this volume of marble equals approximately 1/3 of that required for a normal statue, the resulting cost of the marble needed for a statue would be about 600 HS. As the price of these sculptures in Africa is generally between 4,000 and 7,000 HS, we assume labor would represent 9/10 of the investment, Duncan-Jones 1974, 119.

18 Giacchero 1974, 276 seq. (Edictum 7, 2–7, 31).

-50 denarii/day:	to the blacksmith in cart making, with lunch
-2 denarii:	to the manufacturer of raw bricks, ready to fire – for each 4 2ft-bricks, daily wage
-2 denarius:	to the manufacturer of raw bricks, ready to sundry – for each 8 bricks, daily wage with lunch
-25 denarii/day:	to the driver of camels, donkeys or mules, with lunch
-25 denarii/day:	to the mule driver, with lunch
-75 denarii/day:	to the figurative works modeler, with lunch
-50 denarii/day:	to the plaster modeler, with lunch
-25 denarii/day:	to the water carrier, with lunch

This source, however, is difficult to apply for three different problems: 1) it belongs to a particular historical moment, so facts are not directly applicable to other historical periods; 2) validity of the Edict is not assured on the Western part of the empire, and finally; 3) it comprised the maximum prices of items, those that could not be overcome, so it does not necessarily reflect the actual costs.

1) Regarding the first issue, we do not know about inflationary processes in Roman times well enough to securely carry out an extrapolation of the values contained in the Edict to other historical periods. Even so, we can make a rough calculation through the method used by J. DeLaine, where the basis value taken for calculating inflation is the price evolution of the modii castrenses of wheat along the 1st–4th century A.D.: since the price of a modius castrensis of wheat in time of Diocletian is 100 denarii, the cost of a day's work of a mason and a carpenter, which reaches 50 denarii, can be set to 0.5 modius castrensis; since the average price of a modius castrensis in the 1st–2nd century A.D. is approximately 1 denarius[19], the cost of a day's work in this period could be set to 0.5 denarius (= 2 HS)[20] (Tab. 2 a. b). The scarcity of data has forced us to take this amount as the average salary for a construction worker during the 1st–2nd century A.D. and for any geographic area of the Roman Empire[21]. On the other hand, in a previous study we could calculate the value of the average wage of an unskilled worker at the beginning of the 3rd century A.D.: considering that some studies suggest that about a half of the price difference between the 1st and the 4th century A.D. would be reached by the end of the 2nd century A.D., while the other half would be reached

[19] This is what we seem to deduce from two inscriptions of the 1st century A.D. in Pompeii. The first one, »frumentu(m) m(odius) unus semis a(ssibus) XVIII« (CIL IV 1858), equates the price of 1 modius to 12 asses (= 3 HS). The second inscription, »tri(t)icum (denarium) I« (CIL IV 5380), makes the equivalence to 1 denarius (= 4 HS). On the other hand, we know that Nero, after the fire of 64 A.D., set the price of the modius to 3 HS (Tac. ann. 15, 39), Corbier 1985, 86. In any case, there is some doubt about whether the inscriptions referred to the modius castrensis or the modius italicus (1 modius castrensis = 1,5 modius italicus), Duncan-Jones 1976b, 53–62.

[20] DeLaine 1997, 119–121. 209; Barresi 2000, 182. 345.

[21] DeLaine 1997, 209; Barresi 2000, 345 seq.; Barresi 2003, 164; Barresi 2010, 343; Mar – Pensabene 2010, 511; Borgia 2010, 281–299; Soler 2012, 210.

along the 3rd century A.D., with periods of strong inflation[22], we can conclude that the price of the modii castrenses in early 3rd century A.D. (1 denarius in the 1st–2nd century A.D. and 100 denarii in early 4th century A.D.) would be 50 denarii. This figure is similar to that found in an inscription reporting the donation during a famine that affected the African city of Thuburnica after year 180 A.D., of 10,000 modii of wheat with a price of 40 denarii for each modius[23]. Therefore, bearing in mind that a working day is equivalent to 0.5 modius castrensis, the cost of a day's work at the beginning of the 3rd century A.D. could be set at about 20–25 denarii (= 80–100 HS) with an average value of 90 HS[24]. However, the application of this method involves accepting a comparable price evolution between wheat and other products, a hypothetical assumption that does not take into account that prices could indeed vary depending on the actual general inflation, but also on supply and demand for each of the products[25].

2) Concerning the second issue with the values contained in the Edict of Diocletian, which refers to its possible application to the western part of the empire, there are two arguments that seem to suggest an affirmative answer: the presentation by Diocletian in the Edict, claiming that it is intended for »universus orbis«[26], and the discovery of a fragment of it in the Italian town of Pettorano sul Gizio, perhaps from Sulmona, made in Carrara marble although written in Greek[27]. This inscription covers a total absence of findings of the Edict in the West, as the rest of known fragments come from eastern cities[28].

3) Finally, in regard to the third problem with the Edict, the emperor himself notes that the aim of it was not to price products – that would be unfair since some provinces had lower prices in comparison to other – but only to limit the maximum prices to avoid exorbitant increases resulting from the greed of a few[29]. In fact, and as noted above, some sources show how prices could

---

22 Corbier 1985, 105.

23 Duncan-Jones 1974, 111: »Q. Furfanius Q. f. Lem. M[art] | ialis, pec(unia) a se ob hono[res] suos IIvir(atus) et flam(onii) Aug. | reip(ublicae) inlata d. d. statu[as] | fac(iendas) cur(avit) praeter sum[mam] | numeratam ob decus ... | quinq[uennalitatis), et amplius ludo[s], | et epul(um) bis, et trit(ici) m(odios) X m(ilia), | cum esset (denariis) denis, ex (denariis) [centum milibus] ... | nis a Bellico patre n[o]mine eius populo dat[is] | item sportulas ordin(i) bis« (CIL VIII 25703–4). About this inscription see: Carton 1891, 182–184 no. 29. 30.

24 Domingo 2012, 381–418.

25 In any case, M. Corbier assumes a certain stability in the evolution of prices of various products, probably increasing the cost of material, wages, and wheat at a similar rate, Corbier 1985, 105; Corbier 1986, 491.

26 Giacchero 1974, 269 (Edictum 116. 117).

27 Guarducci 1940, 11–24.

28 Fragments of the Edict of Diocletian have appeared in 10 towns in mainland Greece, 10 localities in the Peloponnese, 3 in Euboea, 2 in Crete, 1 in Samos, 6 in Caria, 4 in Phrygie, 1 in Egypt, and 1 in Cirenaica, Frézouls 1977, 255.

29 Giacchero 1974, 269 (Edictum 106–115). In fact, the greed of some people seeking to make more money in times of shortage is one of the causes of the uncontrolled increase of some products, according to bishop Cyprian of Africa (Ad Demetr. 10): Mrozek 1975, 34.

vary among geographical areas: while in Italy the modius of wheat in the 1st century A.D. would cost about 4 HS, in Rome it could reach 8–10 HS; and while the price of bread for one person was 2 asses in Lanuvium (CIL XIV 2112), in Rome it could reach 3 asses (CIL VI 10234). On the other hand, some products such as grain, were generally more expensive in the cities than outside of them: the average price of grain in the middle of the 4th century A.D. in Antioch of Syria, one of the largest cities of the empire, was almost twice the price paid in Egypt[30]. Also documented are price changes over the same year: in Karanis, for example, in 191–192 A.D. the price for an artaba of wheat was 18–20 drachmas in December and 18 drachmas in January[31]. Moreover, it is also necessary to keep in mind the cost of transporting products – according to Pliny[32], for instance, some Indian luxury goods after being imported to Rome could multiply their cost for a hundred[33] – and fluctuations in supply and demand. Strabo[34], for example, shows how the growing demand for coloured marble from the time of Augustus had brought down the price of the white marbles[35].

Anyway, despite the prices contained in the Edict of Diocletian did not necessarily correspond to the actual values, we have some examples showing how the difference must not have been very large: a papyrus brings up the purchase of grain by the government of Karanis in 312 A.D., a date very close to the promulgation of the Edict of Diocletian, at a cost of 975 modii castrenses for 297 11/12 artabae[36]. This amount of artabae has been valued at 65 talents, equivalent to 97.5 denarii each modius, a value similar to that found in the Edict, of 100 denarii[37].

DIVERSITY OF CONTRACTS

In the Edict of Diocletian we notice various methods in the allocation of salaries depending on the various professional categories. Hence, veterinarians, barbers, lawyers, etc. received immediate payment for a certain job; dyers, weapon grinders, parchment makers, scribes, notaries, etc. are

30 Duncan-Jones 1974, 346.

31 Duncan-Jones 1990, 145.

32 Plin. nat. 6, 23.

33 In fact, the drain of large amounts of money to other markets, foreign to the Roman Empire, for the purchase of luxury goods, was a constant concern. Tiberius already lamented in a letter to the Senate on 22 A.D. the tendency of some Roman citizens for luxury and the harmful habit of buying products to foreign peoples and even enemies, since this caused a continuous bleeding of Roman gold and silver currency in the imperial finances. Twenty years later Seneca also criticized imports of luxury goods from the East, just as in the early Flavian period did Pliny the Elder, again criticizing the drain of gold and silver coins to the distant markets of Arabia, India, and China, reaching an amount of 100 million HS each year, Giacchero 1980, 1103–1107.

34 Strab. 9, 5–16.

35 Soler 2004, 470 seq.

36 P. Cair. Isid. 11.

37 Duncan-Jones 1976b, 56.

paid according to the number of items made or treated; scholarly persons, educators, teachers of reading and writing, etc. are paid monthly; manipulators of copper, wool, etc. are paid according to the raw material treated; and finally, professionals involved in building activity such as stonemasons, carpenters, marble workers, painters, brick makers, figure modellers, etc. are paid daily, in which case lunch is also included. From this we presume that the monthly payment is applied to activities of an intellectual nature, carried out repetitively, in which the notion of production is not involved. Payment in the act applies to activities or services which are difficult to quantify, or the work of a specialist regardless of the effort or time required for his activity (lawyers, veterinarians, etc.). Payment by piece made applies to the manufacture of uniform, mass-produced objects. The payment per day applies to non-productive activities or those not consuming raw materials (such as water carriers or drivers of animals), productive activities in which results are difficult to quantify by piece (painters, mosaicists, etc.), and most of the activities related to architectural construction[38]. However, with regard to construction-related professional activities, in employment contracts preserved[39], prior to the enactment of the Edict of Diocletian, we notice a daily remuneration was never established, but preferably it was arranged on the basis of two systems:

Based on the number of building elements installed or made: In a contract of 172 A.D. preserved on papyrus[40] the payment of a certain amount of money is established based on the number of bricks laid by a worker (40 drachmas for each 10.000 bricks). Another contract preserved in a papyrus from Oxyrrhynchos dated on the 2nd century A.D.[41] assigns a remuneration depending on the amount of carved stone blocks (4 drachmas for each 16 blocks of outer facing stone, or 30 pieces of stone for the inner side of a wall)[42].

For a particular period of time or for the whole duration of the work: in various work contracts of 136–150 A.D. preserved on ostraca from the quarries of granite and porphyry in Mons Claudianus[43], in Egypt, a monthly salary to paganoi workers is applied; in one of these contracts, the assigned salary is 47 drachmas per month plus a daily portion of food and wine[44]. Similar organization appears to be at the gold mines in Alburnus Maior, in Dacia, where some wax tablets were found containing various employment contracts for free men, no. IX–XI (CIL III, p. 924–259): in the first one, of 163 A.D., a payment of 70 denarii is expected, plus the food portion, for 178

---

38 For a description of each of these professional categories and the type of remuneration they received see: Frézouls 1977, 257–259.

39 One of the best known work contracts is preserved in an inscription of 105 B.C. from Puteoli (CIL I 698), Humphrey – Oleson – Sherwood 1998, 269 seq. It specifies each of the construction processes to be undertaken in a particular work, accurately indicating the measures and how every element should be made.

40 P. Teb. 42; Barresi 2000, 338.

41 P. Oxy. 488.

42 Barresi 2000, 339.

43 In the quarries of Mons Claudianus there was a distinction between familia workers, unskilled labor working throughout the year, and paganoi, formed of specialized workers who worked only occasionally, Serafino 2009, 43. About work organization in these quarries see: Cuvigny 2005, 309–353.

44 Serafino 2009, 43–52.

days of work[45]; in the second one, of 164 A.D., 70 denarii is the planned payment, plus most likely the food portion, for 177 days of work; and in the third, chronologically similar to the preceding, »Restitutus Senior« agrees to work for »Titus Beusantis« for a salary of 105 denarii, probably with a six-month contract[46]. It is also unlikely that the payment of these amounts was done daily, since in some contracts from the gold mines of Dacia, fines are prescribed to workers missing work, with an amount per day of absence set to 5 HS, about twice what would correspond to a working day[47]. This amount would be deducted from the monthly allocated wage.

Therefore, from these contracts preserved, it appears that the calculation of the cost of labor responsible for the construction of a particular building did not derive from the actual number of days worked, but it was rather established in advance, depending on the estimated number of necessary working days. This model is perfectly adapted to the organization known to rule the execution of an architectural project, in which the *curator*, appointed by the *ordo decurionum* of the city to take over a certain construction, entrusted the realization of each of the parts of a building to different specialists. At this point, an initial economic allocation was needed for each of the processes to be carried out (purchase of supplies, transportation, ornamentation, labor, etc.)[48]. So we can understand how, with the exception of the Edict of Diocletian, in most contracts there is no reference to the salary per day, but the amount received by an individual worker throughout the completion of a particular work or along a certain period of time.

APPROXIMATION TO THE COST OF LABOR

Estimation of the cost of labor in the Early Imperial period must face some difficulties, such as the scarcity of available data, the problem of extrapolating the values contained in the Edict of Diocletian to other periods, and the fact that this document from the beginning of the 4th century A.D. did not include the actual prices but the maximum allowed.

It is therefore necessary to focus on other sources that can overcome these deficiencies; most of them from Egypt, Italy (Pompeii) and the mining district of Alburnus Maior in Dacia (Tab. 3). Besides these sources, which we analyse later, we can add an important document from Hispania from the period of Emperor Domitian, the »lex Ursonensis«, containing a stipulation of the salaries earned annually by the *apparitores* or minor officers of the Urso colony[49]. In Chapter 62 one can read: each duumvir has 2 *scribae* receiving 1,200 HS each, 1 *accensus* receiving 700 HS, 2 *lictores*

45 Mrozek 1975, 70 seq.

46 Serafino 2009, 43–52.

47 Carcopino 1937, 97–104; Mrozek 1975, 71 seq.

48 Mar 2008, 175–190.

49 A study about this chapter of the »lex Ursonensis« in: Fear 1989, 69–78.

receiving 600 HS each, 1 *haruspex* receiving 500 HS, 2 *viatores* receiving 400 HS each, 1 *praeco*, 1 *librarius*, and 1 *tibicen* receiving 300 HS each; for each edile there's 1 *scriba* who perceives 800 HS, 1 *haruspex*, 1 *praeco*, and 1 *tibicen*, each one perceiving 300 HS, with a total yearly investment of 16,400 HS[50]. Although the professional categories listed have nothing to do with building activity, and there are no equivalences in the Edict of Diocletian that allow us to contextualize and compare the amounts perceived[51]. Data contained in this lex shows how the salary for a same professional category could vary depending on some conditions or variables; in this case, depending on whether a service is provided to an edile or a duumvir.

On the other hand, as noted above, an amount of 0.5 denarius per day (= 2 HS) has traditionally been considered as an average value for construction-related labor in the 1st–2nd century A.D.[52], established from the extrapolation of the values from the Edict of Diocletian on the basis of the evolution of the price of grain. However, other sources suggest a higher value for the same period, about 1 denarius per day (= 4 HS). For example, in a building contract from Oxyrrhynchos in the 2nd century A.D. a salary of four drachmas is established for a stone carving workman[53] (4 Egyptian silver drachmas = 1 denarius[54]). Some inscriptions of the 1st century A.D. from Italy suggest S. Mrozek that the salary for a working day would be 1 denarius[55]: »operar[i]s pane(m) denariu(m)«, inscription from Pompeii (CIL IV 6877); »XI k(alendas) ac(ce)pi (denarium) I«, also from Pompeii, and surely referring to a daily wage (CIL IV 8566). And finally, in the Gospel of Matthew the same wage is set, one denarius per day, for a day laborer working in a vineyard[56]. A substantial amount considering that in the Edict of Diocletian the salary stipulated for this professional category was equivalent to half the salary of a construction worker: 25 denarii per day plus the lunch (a bricklayer or a carpenter had an established salary of 50 denarii)[57]. These three cited sources refer to places pretty far away from each other (Egypt, Italy, and Palestine), covering a chronological range comprising the 1st–2nd century A.D., and all of them show the same salary.

---

50 Frank 1940, 94 seq.

51 In the Edict of Diocletian the salary for a scrivener is set to 25 denarii per 100 lines of good writing (7, 39) and 20 denarii for each 100 lines of second quality writing (7, 40). In any case, the figures shown in the »lex Ursonensis« are very low, and would hardly allow the support of a family. But we know this was a fairly common characteristic among officers, who usually did not exercise these professions for the economic benefits they could get, but rather for the bestowed prestige. That is why they generally had a second occupation: Lucio Antonio Eutychano from Ostia, for example, was a lictor and a builder at the same time, see Fear 1989, 73.

52 DeLaine 1997, 119–121. 209; Barresi 2000, 182. 345.

53 P. Oxy. 488; Johnson 1936, 308; Barresi 2000, 339.

54 Barresi 2000, 339; Barresi 2003, 161.

55 Mrozek 1975, 70–75.

56 Mt. 20, 1–2: »Simile est enim regnum caelorum homini patri familias, qui exiit primo mane conducere operarios in vineam suam; conventione autem facta cum operariis ex denario diurno, misit eos in vineam suam«; Szaivert – Wolters 2005, 42.

57 Giacchero 1974, 276 (Edictum 7, 1a).

However, other sources provide different data. In a contract from the quarries of Mons Claudianus, for example, we can see a monthly salary of 47 drachmas, besides the ration of food and wine. So the total value could reach, according to C. Serafino, 70 drachmas per month (= 70 HS), slightly more than 2 HS per day[58]. A similar salary was paid to the paganoi in the mines of Alburnus Maior in Dacia (CIL III p. 924–959): contract no. X, with a duration of 177 days, established a salary of 70 denarii, at a rate of 1.5–1.6 HS/day plus probably a food ration[59], and contract no. XI, with an estimated duration of 6 months, sets a salary of 105 denarii, according to S. Mrozek at a rate of 2.3 HS/day[60]. This figure is reached if we consider every day of the working year, although some authors prefer to reduce this amount to 300 days a year[61], other authors to 220–290 days, depending on the activities held[62], and, finally, another group to 200 days[63]. If we take a value of 300 working days, the labor salary stipulated in this contract would reach 2.5–3 HS[64]. On the other hand, workers of the *familia* category in these mines perceived only 5–7 HS per month[65], a very low amount that is likely to be accompanied by other income or payments in kind.

Therefore, unlike what we observed in Egypt, Italy and Palestine, the mining districts of Alburnus Maior and Mons Claudianus are approaching the theoretical estimates of 2 HS/day. In

---

58 Serafino 2009, 47.

59 Carcopino 1937, 97–102. The text of the contract reads as follows: »[Macri]no et Celso cos., XIII Kal. Iunias, Flavius Secundinus scripsi, rogatus a Mem | mio Asclepi, quia se li[tte]ras scire negavit, it quod dixsit se locas[se] et locavit | operas [sua]s opere aurario Aurelio Adiutori ex ha[c] die [in] idus novembres | proxsimas denariis [sep]taginta liberisque. [Mercede]m per [te]mpora accipere | debebit. [S]uas operas sanas va[le]ntes [ede]re debebit conductori [s(upra) s(cripto)]. | Quod si invito condu[c]tore recedere aut cessare voluerit, [da]re | debebit in dies singulos HS V numeratos... [Quod si] | fluor impedierit, pro rata conputare debebi[t]. Conductor si tem[po]re peracto mercedem sol[v]endi moram fecerit, ead[em] po[ena] | tenebitur exceptis cessatis tribus | Actum Immenoso Maiori | Titus Beusantis qui et Bradua | Socratio Socrationis | [M]emmius Asclepi.« – »Sous le consulat de Macrinus et de Celsus (164 de notre ère), le 13 avant les kalendes de juin (20 mai), je, Flavius Secundinus, à la demande de Memmius, fils d'Asclepius, lequel a affirmé ne pas savoir écrire, ai consigné ce qui suit: il a déclaré s'être loué et il a loué ses services corporels, dans l'entreprise de l'extraction de l'or, à Aurelius Adiutor, et ce à dater d'aujourd'hui jusqu'aux prochaines ides de novembre (13 novembre) moyennant une somme de deniers fixée à 70 et libres. Quant à ses services il devra les fournir au Ferrier [de la mine] précité, sains et valables. Dans le cas où, contrairement à la volonté du fermier, il aura lui-même voulu abandonner ou interrompre le travail, il devra donner au fermier une somme calculée à raison de 5 sesterces par jour. Dans le cas où une inondation de la mine aura empêché le travail, il devra subir ce décompte proportionnellement (au nombre de jours d'interruption). Quant au fermier, au cas où, l'échéance passée, il aura tardé à s'acquitter, il sera tenu à la même pénalisation, exception faite de trois [jours de] retard. Fait à Immenosum Maius; [ont signé:] Titus, fils de Beusas, surnommé Brauda, Socratio, fils de Socratio, Memnius, fils d'Asclepius.« – J. Carcopino's interpretation is that we need to add a payment in kind to the salary, for the contract sets a daily penalty of 5 HS in case the worker leaves or stops work at the mine, a very high amount if the daily wage was actually 1.5 HS, see Carcopino 1937, 102. Anyway, according to Mrozek 1975, 72, this type of fines were equivalent to twice a daily wage, so the daily wage in this case would correspond to 2.5 HS.

60 Mrozek 1975, 71.

61 DeLaine 1997, 105 seq.

62 Meneghini – Bianchi 2010, 75 seq.

63 Duncan-Jones 1978, 160.

64 Serafino 2009, 47 assumed a salary of 2.5 HS/day including lunch.

65 Serafino 2009, 50–52.

any case, probably these mining districts, owned by the emperor, were somehow controlled by the central power, with the aim of an economic management by the emperor, by which the wages set would not follow the general market economy, and which would also explain the similarities of wages in all of them[66]. In this sense, we know there also was an equation of the *stipendium* perceived by soldiers quartered both in Numidia and in Antioch, despite being two very different economic contexts[67]. Still, it is likely that some construction-related workers had salaries similar to those received in the mining districts: an Egyptian papyrus of 172 A.D. states, for example, that a worker received 40 drachmas for placing 10,000 bricks[68]. If we try to calculate the cost in time for arranging these bricks, based on studies by J. DeLaine, the result is that two workers could lay about 1,000 bricks per day[69] (500 bricks each). Consequently, a worker could reach 60 drachmas per month, at a rate of 2 drachmas per day (= 2 HS).

WAGES AND LIVING STANDARDS

Given the disparity of data offered by the sources analysed, with salaries in the 1st–2nd century A.D. ranging from 2–4 HS/day, we wonder how much money was needed to maintain a person or a family. In this regard, numerous studies have incorporated price lists of various products obtained from literary, epigraphic and papyrological sources. One of the most recent and more complete investigation is the work of W. Szaivert and R. Wolters[70]. A first fact may be surprising in this sense: maintaining a slave in Rome could reach 2–3 HS/day. So it appears from the statement by Frontinus[71] according to which the sum of money spent on the *familia publica* slaves, in charge of maintaining aqueducts in Rome in the late 1st century A.D., was 250,000 HS. Considering a number of 240 slaves, the investment would be just over 1,000 HS per person per year, slightly over 3 HS per day[72]. However, since the text specifies that this amount also included the cost of supplies needed for the job, L. C. West proposes to reduce the daily amount to 2–3 HS per person per day[73]. However, this figure contrasts with the data provided by Pliny, according to which the maintenance of a slave in 60–65 A.D. would suppose a monthly cost of around 20 HS in Rome, 0.5–1 HS per day[74].

---

66 Serafino 2009, 48 seq.

67 De la Hoz Montoya 2011, 155.

68 P. Teb. 42; Barresi 2000, 338.

69 DeLaine 2001, 230–268 stated that the number could drop to 500–700 bricks per day depending on the size (larger pieces are harder to handle) or their place in the wall, as those aimed at an exposed façade had to be placed more carefully and with a higher precision.

70 Szaivert – Wolters 2005.

71 Frontin. aqu. 116.

72 Mrozek 1975, 73.

73 West 1916, 304.

74 Duncan-Jones 1974, 208.

Regarding the cost that supposed maintaining a family, Pompeii is the city offering more information. From there comes, for example, a shopping list specifying the different products purchased every day, for 9 days, and the cost of each item. These products must have been enough to feed at least three people, namely the writer of the list, a *puer*, and a *domator* (CIL IV 5380: on the first day they spend 15 asses, on the second day 25 asses, on the third day 15 asses, on the fourth day 28 asses, on the fifth day 53 asses, on the sixth day 60 asses, on the seventh day 4 asses, on the eighth day 5 asses, and on the ninth day 14 asses). The average daily expenditure is 6 HS[75], equivalent to 2 HS (= 0.5 denarius) per person per day. This figure fits perfectly with the calculations made by U. Kahrstedt, which meant an average cost of living in the Early Roman Empire of around 0.5 denarius per person per day[76], and with Pliny's statement, noting that in 111–113 A.D. the maintenance of a free man in Italy would be 70 HS per month[77] (about 2.5 HS per day).

Other inscriptions from Pompeii suggest similar values: CIL IV Suppl. II 4428 sets a value of 4.5 HS, to which we must add the missing price of oil and onions, so the figure could reach 7 HS, about 5–8 asses (= 1.25–2 HS) per person per day[78]; CIL IV Suppl. II 4000 establishes a value of 10 HS, for the extra purchase of hay and a double ration of oil[79]; and CIL IV Suppl. II 4888 establishes a value of 4 HS[80], to which we must add the cost of firewood, so the figure would reach approximately 5 HS. Therefore, the maintenance of a family in Italy would cost around 6–7 HS per day approximately, a little over 1.5 denarius[81].

These figures show that a salary of 2 HS per day would be very tight to support even one person in Italy, furthermore when it is needed to buy other products besides food. Therefore, it seems that the sources indicating a daily allowance of about 1 denarius in Italy during the 1st century A.D. are more accurate than the theoretical estimates made, based on the extrapolation of the data contained in the Edict of Diocletian. To check the suitability of a salary of 2 HS in Italy we can attempt to verify two correspondences: 1) the relationship between wages paid between the 1st and 4th century A.D. and the cost of the modii castrenses, and 2) the greater or lesser ability to support a family at the beginning of the 4th century A.D. with a daily wage of 50 denarii, as pointed out by the Edict of Diocletian.

1) The relationship between the value of wages and the cost of the modii castrenses, both in Egypt and in Italy, the only two regions from which we have enough data to make this comparison, seem

---

75 Breglia 1950, 52 seq.

76 Kahrstedt 1958, 211.

77 Duncan-Jones 1974, 208 no. 1169.

78 Mrozek 1975, 31.

79 OLIIVM A IV | PALIIA A V | FAIINVM AI XVI | DIARIA Λ V | FVRFVRII Λ VI | VIARIA I A | OLIIVM Λ VI.

80 Lign(a) | Procu (?) IV | Pan(em) HVI | Coliclo (=cauliculum) II | Be(tam) I | Sina(pi) I | Men(tam) I | Sale I.

81 Breglia 1950, 53. To a similar figure comes R. Etienne, who states that the basic expenses for a humble family of three would reach 2,160 HS a year, about 6 HS and 1 as per day: Etienne 1966, 188. 212. 232.

to keep a ratio of around 0.5, the same reflected in the Edict of Diocletian (Tab. 4): the stipulated daily salary allowed to purchase approximately half modius castrensis. In any case, this proportion seems to be slightly lower in Italy, most likely due to the higher cost of some commodities, while in Egypt, from the second half of the 3rd century A.D., the amount of grain that could be purchased seems to be slightly larger.

2) It seems likely that the salaries stipulated in the Edict of Diocletian – remember that this document reflects the maximum prices and values, which must not be exceeded, and therefore does not necessarily coincide with reality – do allow maintaining a small family. For example, with 25 denarii plus 1 serving of food per day, one of the lowest salaries recorded in the Edict, you could buy 300 g of bread, ½ litre of milk, 2 dl of medium quality wine, 90 g of pork, 80 g of dry cheese, 200 g of beans, 300 g of average quality grapes, 30 g of oil, and a little salt (= 2,700 calories). Therefore, this pay allowed to feed two adults; the one who received the daily food portion, and the one consuming the purchased products. Thus, the salary of 50 denarii, which always comes with a serving of food, would feed three adult members of a family[82], or two adult members plus some children: the food tables of Velia, from the Trajan period (CIL XI 1147), indicate that the maintenance of a child would be only 16 HS per month for a boy and 12 HS per month for a girl, while some inscriptions from Terracina (CIL X 6328) indicate that the same maintenance would be 20 HS for a boy and 16 HS for a girl[83].

The differences observed between the ability to support a family on an average daily salary of 50 denarii, in the Diocletian period, and its theoretical equivalent set to 2 HS per day for the 1st–2nd century A.D. (amount that can hold one adult in Italy), or the differences observed between this value and that deduced from some sources in Egypt, Italy and Palestine, which indicate a daily salary of one denarius, can be adjusted if we remember that the salaries established on a daily basis in the Edict of Diocletian usually went with a serving of food. This value has not been taken into account in the extrapolation of the data contained in the Edict to the 1st–2nd century A.D. (= 2 HS/day) and, therefore, we should add it[84].

---

82 Frézouls 1977, 262–267. In any case, it is important to note that many workers increased their revenue with products from the land, from hunting, or fishing, as in the ancient economy there was not a clear distinction between town and countryside, and between artisan and agricultural activity: Giacchero 1970, 156.

83 Segrè 1922, 81; Duncan-Jones 1974, 208.

84 Still, the question remains whether all professional categories received the same daily portion of food, as we know, for example, that this was not the case in the distribution of water among the workers in the quarries of Mons Claudianus; about 917 employees according to an ostraca from the 2nd century A.D. (O.Claud. inv. 1538), some of which were soldiers (7 % of the total staff), likely in charge of maintaining order, the custodial staff, the staff responsible for controlling the marbles, checking the measures and their matching to the order, etc.: Cuvigny 2005, 388–344. In fact, the distribution of water was done according to the professional hierarchy: 1 keramion (6,5 litres) is the maximum daily water ration documented, received only by two figures, a soldier and a civilian, 5/6 keramion (5.4 litres) receive the soldiers and the master mason, ½ keramion (3.25 litres) receives a worker belonging to the category of the paganoi, and 1/3 keramion (2.16 litres) receives a worker belonging to the familia: Cuvigny 2005, 348 seq.

In fact, the practice of paying part of the salary in kind was a widespread resource in the Roman world, and Suetonius states that this method could be preferred by many employers[85]. In some cases half of the full compensation was reached[86]. For example, in the tomb of Ghirsa in Tripolitania, from the 4th century A.D., we can read the cost of its construction, an investment of 45,600 denarii, besides the food for workers[87], a cost that must have been quite high, for the fact of being noted in the epigraph. At the same time, it was possible to make in-kind payments to the state, at least in Mauritania, as provided in an edict of Caracalla promulgated in 215–216 A.D.[88]. At certain times, even some state officials were paid in kind[89].

Therefore, we need to evaluate the cost of a food ration based on the living standards of Roman society and the cost of some commodities[90]. As seen above about 2 HS per day were needed for maintaining a person in Italy. Therefore, the economic value of the salary of a construction worker in Italy can be approximated effectively to 1 denarius per day: data in some inscriptions of Pompeii confirm this figure, and the theoretical extrapolation of the values contained in the Edict of Diocletian to the 1st–2nd century A.D. (2 HS/day) plus the cost of food for an adult (2 HS/day) certify this figure.

Different is the case of Egypt and Dacia, where wages were slightly lower, and also the average cost of a modius castrensis, about half of those documented in Italy. Therefore, we can set an average salary of about 2 HS per day. In Hispania, of which we have very limited data, the situation must have been similar, or perhaps the perception of slightly lower salaries, around 1.5–2 HS/day. In fact, we know that the cost of one modius of grain in 101 A.D. was 1 HS[91], a value which corresponds to about half the average price in Egypt at the same time, 2–2.5 HS, and far from the 4 HS documented in Italy.

---

85 Suet. Tib. 46.

86 Mrozek 1975, 81 seq.

87 Carcopino 1937, 104: »pr(a)eter cib[aria] opera[nt]ibus« (CIL VIII 22660).

88 Corbier 1978, 292; AE 1948, 109: »debita fiscalia frumentaria sive pecuniaria«.

89 Corbier 1978, 293.

90 The city of Pompeii is the largest source of data about the circulation of money. For example, among some of the greatest fortunes found, only in five of them the cash amount found exceeded 4,000 HS, and only in one case it reached 9,000 HS. In fifteen cases, the fortune found was between 1,000 and 3,000 HS. A special case is the Villa delle Argenterie in Boscoreale, where the amount of the net worth of the house was about 100,000 HS. Most domestic cash accumulations were around 200 HS, while people carrying money would usually have around 2–20 HS. Regarding to bank movements in the city, Cecilio Giocondo's wax tables show a maximum amount of 38,078 HS, while the vast majority of the amounts did not exceed 10,000 HS: Breglia 1950, 47–54. On the other hand, Apuleius mentions the existence of some large fortunes in Africa, from 1 to 4 million sestertii (apol. 23; 71–75; 77): Haywood 1938, 79; Duncan-Jones 1974, 110 seq.

91 Mart. 12, 76; Mrozek 1975, 12. 14.

CONCLUSIONS

The amount assigned to labor is one of the variables that impact on the final cost of Roman architecture. Therefore, the knowledge of it, more or less accurately, will determine the correct estimation of the cost of the construction process. In fact, as we have seen, we cannot apply an approximate average value derived from theoretical extrapolation of the data contained in the Edict of Diocletian to any geographic area of the empire during the 1st–2nd centuries A.D., since we must take into account that the prices of commodities and wages paid did not necessarily evolve in the same way, over time or in all provinces: these could vary effectively at the same rate as general inflation, but also according to the laws of supply and demand of each product, at every moment and in every particular place. In this sense, the price of 22 HS per modius registered in Italy in year 5 A.D. is quite significant, a value which is twice the normal price in this period, and probably results from an unusual period of shortage, which may also have been the case with the 400 HS[92] per modius paid in Africa between 68–69 A.D.[93].

In fact, we must bear in mind that many times the prices listed in the sources reflect extraordinary situations such as famine, shortage, gifts or sales at minimal cost thanks to the unusual generosity of some euerget. We just need to remember also, how the Edict of Diocletian points out that values contained do not correspond to the actual prices but to maximum values. Hence we have the difficulty of knowing the real costs of these products or stipends, and hence also the complexity of determining the differences in living standards that certainly existed between some regions: Italy, and especially Rome[94], was a particularly expensive place compared to other provinces such as Egypt, North Africa, Dacia or Spain.

In this study we have tried to get a closer look precisely at the differences that might have been between the salaries paid to the same professional category on the different geographical areas in which it operated, noting that the average daily wage in Italy in the 1st–2nd century A.D. must have been around 1 denarius, probably a little higher in Rome, while in other regions, such as Egypt and Dacia, it could have been around 2 HS. In Hispania, despite the limited information we have, the average salary could be set around 1.5–2 HS/day. These values are very close to those documented in the quarries and mines of imperial ownership, as seen in Mons Claudianus and Alburnus Maior, and perhaps could be extended to other state-owned holdings, such as the quarries of Chemptou, Syene, Mons Berebicides in Egypt, Paros, Euboea, Proconnesus, Scyros, Synnada, Teos, Troade, Chio, Hymettos, Pentelico, and perhaps also in Luni[95]. In the case of the quarries of Luni,

---

92 Hier. chron. 170.

93 Suet. Galba 7.

94 As noted above, the price of grain in Rome was considerably higher than that recorded in the rest of Italy. In fact, according to Aurelius Victor, under Augustus 20 million modii of grain each year were brought to Rome from Egypt, and its transportation would greatly raise the price of this product (Aur. Vict. epit. Caes. 1, 6).

95 Pensabene 1974–75, 185.

located in Italy, the imperial ownership could imply the perception of lower salaries in relation to those documented in Italy, although we have no data to support this hypothesis. In any case, we can cite the case of salaries paid to some soldiers, who received the same amount regardless of the geographical area in which they were established[96].

Consequently, these differences, for which we provided documentary evidence, imply that the same building could have different costs depending on the geographical area where it was erected, even assuming the same distance to the extraction quarries for the stone used. This could explain, at least in part, the much lower prices documented in epigraphs for some constructions in North Africa, compared to other Italian buildings with similar features[97]. Even so, it should be noted that we will hardly ever have exact values of the cost of labor, since this was not calculated based on the actual number of days worked (a variable we can roughly get to know[98]), but it was established usually based on the manufactures produced (bricks, ashlars, pebbles, etc.) or from a previous estimate of the number of days needed to complete a work, and therefore it would not always coincide with the actual time employed.

96 De la Hoz Montoya 2011, 155.

97 Poinssot 1983, 22.

98 Thanks to architecture manuals from the 19th century, written in a pre-technological time, we can make estimates of the time required to perform each of the construction processes involved in an architectural project. Standing out among them is the manual edited by G. Pegoretti in 1869.

Tab. 1: Price of building materials

Type	Ancient Name	Modern Name	Origin	Cost 1st c. A.D. (HS/ cubic ft.)	Cost 2nd c. A.D. (denarius/ m³)	Antonine Period (denarius/ cubic ft.)	Cost 3rd c. A.D. (denarius/ cubic ft.)	Cost 4th c. A.D. (denarius/ cubic ft.)	Bibliography
Marble	Lapis Porphyrites	Porfido rosso antico	Egypt (Mons Porphyrites)		96			250	Barresi 2003, 168 seq.; *Edictum de pretiis*
	Lapis Lacedaemonius	Porfido verde antico	Greece (Stefanià)		96			250	Barresi 2003, 168 seq.; *Edictum de pretiis*
	Marmor Numidicum	Giallo antico	Tunisia (Simitthus)		77			200	Barresi 2003, 168 seq.; *Edictum de pretiis*
	Marmor Docimenium	Pavonazzetto	Turkey (Docimium, Iscehisar, Afyon)		77			200	Barresi 2003, 168 seq.; *Edictum de pretiis*
	Marmor Scyreticum	Breccia di settebasi	Greece (Skyros Island)					200–150	Lazzarini 2010, 488
	Marmor Taenarium	Rosso antico	Greece (Mani peninsula)					200–150	Lazzarini 2010, 488
	Marmor Iassense	Cipollino rosso	Turkey (Milas)					200–150	Lazzarini 2010, 488
	Hekatontalithon	Centopietre	Egypt (Wadi Mammamat, Qena)					200–150	Lazzarini 2010, 488
	Lychnites	Pario licnite	Greece (Stefani, Paros Island)					200–150	Lazzarini 2010, 488
	Marmor Luculleum	Africano	Turkey (Sığacık)		58			150	Barresi 2003, 168 seq.; *Edictum de pretiis*
	Marmor Thessalicum	Verde antico	Greece (Chasabali, Larisa)		58			150	Barresi 2003, 168 seq.; *Edictum de pretiis*
	Marmor Chalcidicum	Fior di pesco	Greece (Eretria, Euboea)					150–100	Lazzarini 2010, 488
	Marmor Chium	Portasanta	Greece (Latomi, Chios Island)					150–100	Lazzarini 2010, 488
	Marmor Carystium	Cipollino verde	Greece (Karystos, Styra, Euboea)		38,5			100	Barresi 2003, 168 seq.; *Edictum de pretiis*
	Lapis Pyrrhopoecilus	Sienite	Egypt (Siene, Aswan)		38,5			100	Barresi 2003, 168 seq.; *Edictum de pretiis*
	Marmor Claudianum	Granito del foro	Egypt (Mons Claudianus, Gebel Fatira)		38,5			100	Barresi 2003, 168 seq.; *Edictum de pretiis*
	Marmor Sagarium	Breccia corallina	Turkey (Bilecik)					100–75	Lazzarini 2010, 488
	Marmor Troadense	Granito violetto	Turkey (Ezine)		29			100–75	Barresi 2003, 168 seq.; Lazzarini 2010, 488
	Unknown	Granito misio	Turkey (Bergama)					100–75	Lazzarini 2010, 488
	Lapis Alabastrites	Alabastro cotognino	Egypt (Zawiet Sultan etc.)		29			75	Barresi 2003, 168 seq.; *Edictum de pretiis*
	Eracleotico	Non existent	Turkey (Herakleia ad Latmos)		29			75	Barresi 2003, 168 seq.; *Edictum de pretiis*
	Marmor Triponticum	Occhio di pavone	Turkey (Kutluca, Izmit)		29			75	Barresi 2003, 168 seq.; *Edictum de pretiis*
	Marmor Pentelicum	Pentelico	Greece (Mount Pentelicus, Athens)		29			75–50	Barresi 2003, 168 seq.; Lazzarini 2010, 488
	Eutidemiano	Non existent	Unknown					60	*Edictum de pretiis*
	Marmor Lunensis	Carrara	Italy (Alpi Apuane, Carrara)	4–5				60–40	Lazzarini 2010, 488; Pensabene 1978–79, 17–38
	Marmor Lesbium	Bigio antico	Greece (Moria, Lesbos Island)		19			50	Barresi 2003, 168 seq.; *Edictum de pretiis*
	Marmor Thasium	Tasio	Greece (Aliki, Thasos Island)		19			50	Barresi 2003, 168 seq.; *Edictum de pretiis*
	Unknown	Greco scritto	Algeria (Cap de Garde etc.)					50–40	Lazzarini 2010, 488
	Anacasteno	Non existent	Unknown		15,5			40	Barresi 2003, 168 seq.; *Edictum de pretiis*
	Marmor Scyreticum	Scirio	Greece (Kolones, Skyros Island)		15,5			40	Barresi 2003, 168 seq.; *Edictum de pretiis*
	Marmor Proconnesium	Greco fetido	Turkey (Marmara Island)		15,5	0,8		40	Barresi 2003, 168 seq.; *Edictum de pretiis*; Pensabene 2003, 361
Local stone		Limestone of Leptis Magna	Libya (Leptis Magna)			0,2			Pensabene 2003, 361
		Red travertine	Spain (Cartagena)	1,5–2					Soler (in press), 204
		Stone of Mèdol	Spain (Tarragona)	1					Mar – Pensabene 2010, 515
		Stone of Zerhoun	Morocco (Volubilis)				5		Domingo 2012, 381–418

Tab. 2 a: Evolution of the price of grain in Egypt

(Abbreviations: art. = artabae; aur. = aurei; den. = denarii; dr. = drachmae; HS = sestertii; mod. = modii; ob. = obols; tal. = talents)

Chronology	Egypt			Bibliography
	Area	Price	HS/modii castrenses[1]	
18 B.C.	Euhemeria	3 dr. 2 ob./art.	1	Johnson 1936, 310–312; P. Fayum 101; Segrè 1922, 102 seq.
13 B.C.	Upper Egypt	4 dr./art.	1,2	Johnson 1936, 310–312
10 B.C.	Thebes	2 dr. 3 ób/art.	0,7	Johnson 1936, 310–312
9 B.C.	Upper Egypt	2 dr. 3 ob./art.	0,7	Johnson 1936, 310–312
5 B.C.	Tebtunis	2 dr./art.	0,6	Johnson 1936, 310–312; P. Tebt. II, 459; Segrè 1922, 102 seq.
4 B.C.	Coptos	3 dr. 3 ob./art.	1	Johnson 1936, 310–312
3 A.D.	Philadelphia	3 dr./art.	0,9	Johnson 1936, 310–312
45–46 A.D.	Tebtunis	8 dr./1 5/6 art.	1,3	Johnson 1936, 310–312
45–46 A.D.	Tebtunis	20 dr./3 ½ art.	1,7	Johnson 1936, 310–312
45–46 A.D.	Tebtunis	8 dr./1 1/10 art.	2,2	Johnson 1936, 310–312
45–46 A.D.	Tebtunis	16 dr./2 1/10 art.	2,3	Johnson 1936, 310–312
45–46 A.D.	Tebtunis	12 dr./1 ½ art.	2,5	Johnson 1936, 310–312
46–47 A.D.	Tebtunis	16 dr./1 5/6 art.	2,7	Johnson 1936, 310–312
56 A.D.	Thebes	4 dr. 2 ób/art.	1,3	Johnson 1936, 310–312
56 A.D.	Thebes	5 ób/1/6 art.	1,3	Johnson 1936, 310–312
65 A.D.	Coptos	2 dr. 1 ob./art.	0,6	Johnson 1936, 310–312
69–79 A.D.	?	20 dr./art.	6,1	P. BM 896; West 1916, 307
78–79 A.D.	?	11 dr./art.	3,4	P. BM 131; West 1916, 307
78–79 A.D.	?	10 dr./art.	3	P. BM 131; West 1916, 307
79 A.D.	Hermoupolis	8–11 dr./art.	2,4–3,4	Johnson 1936, 310–312; Segrè 1922, 102 seq.; P. Lond. I, 131
99 A.D.	?	16 dr./art.	4,9	Duncan-Jones 1990, 146
2nd c. A.D.	Hermoupolis	7 dr./art.	2,1	P. Amherst 113; Segrè 1922, 102 seq.
2nd c. A.D.	?	8 dr./art.	2,5	Segrè 1922, 102 seq.
120–121 A.D.	?	7 dr. 1 ob./art.	2,2	B.G.U. 834; Segrè 1922, 102 seq.
125 A.D.	?	7 dr. 1 ob./art.	2,2	B.G.U. 834; West 1916, 307
149 A.D.	?	7 dr./art.	2,1	Segrè 1922, 102 seq.; P. Tebt. 3094; West 1916, 307
153 A.D.	Thebes	12 dr./art.	3,7	Johnson 1936, 310–312
155 A.D.	Theadelphia	8 dr./art.	2,5	Johnson 1936, 310–312
138–161 A.D.	Heracleopolite	6 dr./art.	1,8	Johnson 1936, 310–312
183 A.D.	?	8 dr./art.	2,5	B.G.U. 200; West 1916, 307
191–192 A.D.	Karanis	18–20 dr./art.	5,5–6,1	Johnson 1936, 310–312; Duncan-Jones 1990, 145; P. Goodspeed col. 15
246 A.D.	?	24 dr./art.	7,3	Duncan-Jones 1990, 147
254 A.D.	Theadelphia	12 dr./art.	3,7	Johnson 1936, 310–312; P. Lond. III 1126; Segrè 1922, 102 seq.
255 A.D.	Memphis	16 dr./art.	4,9	Johnson 1936, 310–312; West 1916, 307
255–300 A.D.	?	19 dr./art.	5,8	Grenfell, Gk. Pap. I, 51; West 1916, 307
256 A.D.	Theadelphia	12 dr./art.	3,7	Johnson 1936, 310–312
2nd–3rd c. A.D.	Thebes	8 dr./art.	2,5	Johnson 1936, 310–312
2nd–3rd c. A.D.	Tebtunis	12 dr./art.	3,7	Johnson 1936, 310–312
2nd–3rd c. A.D.	?	19 dr. 3 ob./art.	5,9	P. Grenf. II, 51; Segrè 1922, 102 seq.
3rd c. A.D.	?	12–20 dr./art.	3,7–6,1	Johnson 1936, 310–312
4th c. A.D.	?	1 aur./13 art.	2,4	Palladius, Asceticum 11; West 1916, 307
4th c. A.D.	?	1 aur./5 ½ art.	5,6	Palladius, Asceticum 11; West 1916, 307
4th c. A.D.	?	26–30 tal./art.	1591–1836	P. Rainer AN 289. 295; West 1916, 307
301 A.D.	?	100 den./mod.	400	Edict of Diocletian
314 A.D.	Hermoupolis Magna	10.000 dr./art.	3060	PER E 2000; Segrè 1922, 104 seq.; West 1916, 302. 307
330–340 A.D.	Hermoupolis Magna	20 tal.	1224	PER AN 289 col. III; Segrè 1922, 104 seq.
330–340 A.D.	Hermoupolis Magna	26 tal.	1591	PER AN 295 I.6; I.13; Segrè 1922, 104 seq.
338 A.D.	Oxyrrhynchos	24 tal.	1469	P. Oxy. I 84 col. IV; Segrè 1922, 104 seq.
350 A.D.	?	50 tal./art.	3060	P. BM 427; Segrè 1922, 104 seq.; West 1916, 307

[1] For the conversion of different values to HS/mod. we have taken the following equivalences: 1 Egyptian silver drachma = 1 HS (Segrè 1922, 119; Barresi 2000, 339; Serafino 2009, 48); 1 tetradrachma = 1 denarius (Barresi 2000, 339); 1 talent = 200 drachmae (Segrè 1922, 119); 1 drachma = 7 obols (West 1916, 295); 1 as = 0,25 HS; 1 denarius = 4 HS; 1 aureus = 100 HS; 1 Ptolemaic artaba = 4,5 modii Italici → reduced proportion by Romans to 1 artaba = 3 3/11 modii castrenses = 4,5 modii Italici → 1 modius castrensis = 1,5 modii Italici (Boyaval 1974, 173–178; Duncan-Jones 1976a, 43–52; Duncan-Jones 1976b, 53–62. Hultsch 1864/66, 165 considers the equivalence of 1 artaba = 3 1/3 modii Italici; this proportion, however, has interpretation problems as already exposed by R. Duncan-Jones).

Tab. 2 b: Evolution of the price of grain in Africa, Italy and Spain

(Abbreviations: as. = asses; den. = denarii; HS = sestertii; mod. = modii[1])

Chronology	Africa			Italy			Spain			Bibliography
	Area	Price	HS/ modii	Area	Price	HS/ modii	Area	Price	HS/ modii	
1st c. B.C.[2]				Rome		3				Cic. Verr. 70, 163; 74, 173–175; Segrè 1922, 70
1st c. A.D.				Pompeii	18 as./1,5 mod.	3				CIL IV 1858; Mrozek 1975, 11
1st c. A.D.				Pompeii	1 den./mod.	4				CIL IV 5380; Mrozek 1975, 11. 14
1st c. A.D.				Pompeii	30 as./mod.	7,5				CIL IV 4811; Mrozek 1975, 14
1st c. A.D.				?	20 as./mod.	5				Mrozek 1975, 11. 14; Plin. nat. 18, 20, 90[3]
1st c. A.D.				Rome		8–10				Plin. nat. 18, 20, 90
5 A.D.				Rome	5,5 den./mod.	22				Hier. chron. 170; Mrozek 1975, 14
64 A.D.				Rome	3 nummi/mod.	3				Mrozek 1975, 10. 14; Tac. ann. 15, 39
68–69 A.D.	?	100 den./mod.	400							Mrozek 1975, 14; Szaivert-Wolters 2005, 332; Suet. Galba 7
2nd c. A.D.				Forum Sempronii		4[4]				CIL XI 6117; Mrozek 1975, 12
2nd c. A.D.				?	1 den./mod.	4				CIL XI 2861; Mrozek 1975, 14
2nd c. A.D.				?		50				CIL IX 2861; Mrozek 1975, 14
2nd c. A.D.	Thuburnica	10 den./mod.	40							CIL VIII 25703. 25704; Mrozek 1975, 13. 14
101 A.D.							Bilbilis	4 as./mod.	1	Mart. 12, 76; Mrozek 1975, 12. 14
180 A.D.	Thuburnica		40							CIL VIII 25703. 25704; Duncan-Jones 1974, 111

1 For the conversion of different values to HS/mod. we follow the same equivalence indicated in Tab. 2a.

2 The 1st century B.C. was a very confusing time, so prices must have probably been in constant evolution and change: Segrè 1922, 79.

3 »[...] pretium hinc annona media in modios farinae XL asses.«

4 In this case, the inscription showing the price of wheat reveals how the city erected a monument to a benefactor, a procurator Augusti, probably in gratitude of his offering wheat at a lower price, perhaps because of a shortage: Mrozek 1975, 12.

Tab. 3: Salaries of workers involved in the building activity[1]

(Abbreviations: as. = asses; den. = denarii; dr. = drachmae; HS = sestertii; ob. = obols; tal. = talents)

Chrono-logy	Type	Egypt		Italy		Dacia		Edict of Diocletian		Bibliography
		Salary	HS/ day	Salary	HS/day	Salary	HS/day	Salary	HS/ day	
1st c. B.C.	Workman (Rome)			12 as./day	3					Cic. Q. Rosc. 10, 28; West 1916, 295
Augustan	Workman			3,5; 4 + 6 as./day	0,9–1–1,5					West 1916, 294 f.
1st c. A.D.	Workman	4 ob./day	0,6							O.P. 985; West 1916, 304
1st c. A.D.	Workman (Pompeii)			1 den./day	4					CIL IV 6877. 8566; Mrozek 1975, 70–75
1st c. A.D.	Workman (Pompeii)			1,25 HS/day	1,25					CIL IV 4000; Mrozek 1975, 70–75
105 A.D.	Workman	6 ob./day	0,9							Grenfell – Hunt – Hogarth 1900, 102; West 1916, 304
125 A.D.	Workman	9 ob./day	1,3							Grenfell – Hunt – Hogarth 1900, 331; West 1916, 304
140–145 A.D.	Workman (Mons Claudianus)	47 dr./day + lunch	1,5 + lunch							Serafino 2009, 43–52
143 A.D.	Workman	8 ob./day	1,1							B.G.U. 99; West 1916, 304
154 A.D.	Workman	8 ob./day	1,1							B.G.U. 391; West 1916, 304
160 A.D.	Workman	8 ob./day	1,1							P.B.M. 296; West 1916, 304
162 A.D.	Workman	8 ob./day	1,1							B.G.U. 704; West 1916, 304
163 A.D.	Miner (Alburnus maior)					1,5 HS/day + lunch	1,5 + lunch			Serafino 2009, 43–52
163 A.D. approx.	Miner (Alburnus maior)					2,5–3 HS/day	2,5–3			Serafino 2009, 43–52
164 A.D.	Miner (Alburnus maior)					1,5 HS/day + lunch	1,5 + lunch			CIL III, p. 924–959; Mrozek 1975, 70 seq.
168 A.D.	Workman	8 ob./day	1,1							P. BM 337; West 1916, 304
172 A.D.	Workman	40 dr./1000 bricks = 2 dr./day	2							P. Teb. 42; Barresi 2000, 338
178–179 A.D.	Workman	8 ob./day	1,1							B.G.U. 359; West 1916, 304
2nd c. A.D.	Stone carver	4 dr./day	4							P. Oxy. 488; Johnson 1936, 308
2nd c. A.D.	Construction assistant	2 dr./day	2							B.G.U. 699; Johnson 1936, 308
2nd c. A.D.	Stone tranport	1,5 dr./day	1,5							B.G.U. 699; Johnson 1936, 308
3rd c. A.D.	Carpenter	3 dr. 3 ob./day or 4 dr./day	3,4–4							C.P.H. 127; Johnson 1936, 310
215 A.D.	Bricklayer	2,5 dr./day	2,5							B.G.U. 362; Segrè 1922, 116 seq.
215 A.D.	Bricklayer assistant	2 dr./day	2							B.G.U. 362; West 1916, 297. 305
255 A.D.	Bricklayer	6–9 dr./day	6–9							B.G.U. 14; West 1916, 305
258–259 A.D.	Workman	2 dr./day	2							P. BM 1170; West 1916, 305
end 3rd c. A.D.	Workman	4 dr./day	4							Segrè 1922, 118 seq.; Wessely Pal. St. V 127
301 A.D.	Workman							25 den./day	100	Edictum Diocletiani 7.1
301 A.D.	Bricklayer							50 den./day	200	Edictum Diocletiani 7.2
314 A.D.	Workman	400 dr./day	400							Pap. Rainer, E, 2000; West 1916, 300. 305
314 A.D.	Workman	500 dr./day	500							Pap. Rainer, E, 2000; West 1916, 305
314 A.D.	Workman	650 dr./day	650							Pap. Rainer, E, 2000; Segrè 1922, 118 seq.
314 A.D.	Bricklayer	500 dr./day	500							Pap. Rainer, E, 2000; Segrè 1922, 118 seq.
314 A.D.	Bricklayer	400 dr./day	400							Pap. Rainer, E, 2000; Segrè 1922, 118 seq.
340 A.D.	Workman	12 tal./month	80							B.G.U. 21; West 1916, 305
340 A.D.	Workman	15 tal./month	100							B.G.U. 21; West 1916, 305
340 A.D.	Workman	25 tal./month	166							B.G.U. 21; West 1916, 305
4th c. A.D.	Workman assistant	60 tal./month	400							Pap. Rainer, AN, 295; West 1916, 305
4th c. A.D.	Workman	200 tal./month	1333							Pap. Rainer, AN, 289; West 1916, 300. 305
4th c. A.D.	Workman assistant	60 tal./month	400							Pap. Rainer, AN, 289; West 1916, 305

[1] For the conversion of different values to HS/day we follow the same equivalences noted in Tab. 2a.

Tab. 4: Comparison between the price of grain and wages

Period	Egypt			Italy			Spain	Dacia	Africa
	grain HS/modii	wage HS/day	number of modii included in wage	grain HS/modii	wage HS/day	number of modii included in wage	grain HS/modii	wage HS/day	grain HS/modii[1]
2nd half 1st c. B.C.	0,6–1,2			3	3	1			
1st half 1st c. A.D.	0,9–2,7	0,6	0,6–0,2	3–10[2]	0,9–4	0,3–0,4			
2nd half 1st c. A.D.	0,6–4,9	0,6	1–0,1	3–10	0,9–4	0,3–0,4			
1st half 2nd c. A.D.	2,1–2,5	0,9–1,5 + lunch	0,4–0,6 + lunch	4			1		
2nd half 2nd c. A.D.	1,8–6,1	1,1–2	0,6–0,3	50				1,5 + lunch – 3	40
1st half 3rd c. A.D.	7,3	2–2,5	0,3						
2nd half 3rd c. A.D.	3,7–5,8	2–9	0,5–1,5						
1st half 4th c. A.D.	400	400–650[3]	1–1,6						400

1 In the second half of the 1st century A.D. we have a reference available that shows a price of 400 HS/mod., a very high figure that may respond to a period of great shortage: Mrozek 1975, 14; Suet. Galba 7.

2 A reference from year 5 A.D. shows a price of 22 HS/mod., a value that duplicates the rest, and therefore must be the result of a shortage period: Hier. chron. 170; Mrozek 1975, 14.

3 In three cases, documented in 340 A.D., much lower salaries are cited, between 80–166 HS/day: B.G.U. 21; West 1916, 305.

BIBLIOGRAPHY

Adam 2001 C. E. P. Adam, Who bore the Burden? The Organization of Stone Transport in Roman Egypt, in: D. J. Mattingly – J. Salmon (eds), Economies beyond Agriculture in the Classical World (London 2001) 171–192.

Barresi 2000 P. Barresi, Architettura pubblica e munificenza in Asia Minore. Ricchezza, costruzioni e marmi nelle provincie anatoliche dell'Impero, MedAnt 3, 1, 2000, 309–368.

Barresi 2002 P. Barresi, Il ruolo delle colonne nel costo degli edificio pubblici, in: M. De Nuccio – L. Ungaro (eds), I marmi colorati della Roma imperiale (Rome 2002) 69–81.

Barresi 2003 P. Barresi, Provincie dell'Asia Minore. Costo dei marmi, architettura pubblica e committenza (Rome 2003).

Barresi 2004 P. Barresi, Anfiteatro flavio di Pozzuoli, portico in summa cavea. Una stima dei costi, in: E. De Sena – H. Dessales (eds), Metodi e approci archeologici. L'industria e il commercio nell'Italia antica (Oxford 2004) 262–267.

Barresi 2010 P. Barresi, I teatri di Aphrodisias e di Nicea. Marmi e committenza nell'Asia Minore di età imperiale, in: S. Camporeale – H. Dessales – A. Pizzo (eds), Arqueología de la Construcción II. Los procesos constructivos en el mundo romano. Italia y provincias orientales, Congreso, Siena, 13–15 de noviembre de 2008 (Madrid 2010) 337–350.

Borgia 2010 E. Borgia, I cantieri delle vie colonnate nell'oriente romano, in: S. Camporeale – H. Dessales – A. Pizzo (eds), Arqueología de la Construcción II. Los procesos constructivos en el mundo romano. Italia y provincias orientales, Congreso, Siena, 13–15 de noviembre de 2008 (Madrid 2010) 281–299.

Boyaval 1974 B. Boyaval, Une tablette metrologique, ZPE 15, 1974, 173–178.

Breglia 1950 L. Breglia, Circolazione monetale ed aspetti di vita economica a Pompei, Pompeiana. Raccolta di Studi per il secondo centenario degli scavi di Pompei = Biblioteca della parola del passato 4, 1950, 41–59.

Cailleaux 1985 D. Cailleaux, Les comptes de construction des Célestins de Sens (1477–1482): Edition et commentaire, in: O. Chapelot – P. Benoit (eds), Pierre et Métal dans le bâtiment au Moyen Age (Paris 1985) 117–156.

Camporeale – Papi – Passalacqua 2008 S. Camporeale – E. Papi – L. Passalacqua, L'organizzazione dei cantieri a Volubilis (Mauretania Tingitana). Iscrizioni e opere pubbliche. La Maison aux deux Pressoirs e l'arco di Caracalla, in: S. Camporeale – H. Dessales – A. Pizzo (eds), Arqueología de la Construcción I. Los procesos constructivos en el mundo romano. Italia y provincias occidentales, Congreso, Mérida, 25–26 de octubre de 2007 (Mérida 2008) 285–308.

Carcopino 1937 J. Carcopino, Note sur la Tablette de Cluj, RPhil (Serie 3) 11, 1937, 97–104.

Carton 1891 M. M. Carton, Thuburnica, BAParis 1891, 161–192.

Corbier 1978 M. Corbier, Dévaluations et fiscalité (161–235), in: Les «devaluations» à Rome. Époque républicaine et impériale, Colloque, Rome, 13–15 novembre 1975, Collection de l'Ecole française de Rome 37 (Rome 1978) 273–309.

Corbier 1985 M. Corbier, Dévaluations et évolution des prix (Ier–IIIe siècles), RN 27, 1985, 69–106.

Corbier 1986 M. Corbier, Svalutazione, inflazione e circolazione monetaria nel III secolo, in: A. Giardina (ed.), Società Romana e Impero Tardoantico I. Istituzioni, ceti, economie (Rome 1986) 489–533.

Cuvigny 2005 H. Cuvigny, L'organigramme du personnel d'une carrière impériale d'après un ostracon du Mons Claudianus, Chiron 35, 2005, 309–353.

de la Hoz Montoya 2011 J. de la Hoz Montoya, Circulación monetaria romana en la cuenca minera de Ríotinto, in: J. A. Pérez Macías – F. J. García Delgado – A. Delgado Domínguez – J. M. Pérez López (eds), Río Tinto. Historia, Patrimonio Minero y TurismoCultural, Actas del Congreso del 23 al 27 de noviembre de 2009 (Huelva 2011) 143–170.

DeLaine 1997 J. DeLaine, The Baths of Caracalla. A Study in the Designs, Construction and Economics of Large-scale Building Projects in Imperial Rome (Portsmouth 1997).

DeLaine 2001 J. DeLaine, Bricks and Mortar. Exploring the Economics of Building Techniques at Rome and Ostia, in: J. B. Salmon – D. J. Mattingly (eds), Economies beyond Agriculture in the Classical World (London 2001) 230–268.

Domingo 2012 J. Á. Domingo, Los costes de la arquitectura romana: el Capitolio de Volúbilis (Mauretania Tingitana), ArchClass 63, 2012, 381–418.

Duncan-Jones 1974 R. Duncan-Jones, The Economy of the Roman Empire. Quantitative Studies (Cambridge 1974).

Duncan-Jones 1976a R. P. Duncan-Jones, The choenix, the artaba and the modius, ZPE 21, 1976, 43–52.

Duncan-Jones 1976b R. P. Duncan-Jones, The Size of the modius castrensis, ZPE 21, 1976, 53–62.

Duncan-Jones 1978 R. P. Duncan-Jones, Two possible Indices of the Purchasing Power of Money in Greek and Roman Antiquity, in: Les «devaluations» à Rome. Époque républicaine et impériale, Colloque, Rome, 13–15 novembre 1975, Collection de l'Ecole française de Rome 37 (Rome 1978) 159–168.

Duncan-Jones 1990 R. P. Duncan-Jones, Structure and Scale in the Roman Economy (Cambridge 1990).

Etienne 1966 R. Etienne, La vie quotidienne à Pompéi (Paris 1966).

Fear 1989 A. T. Fear, La Lex Ursonensis y los apparitores municipales, in: J. González (ed.), Estudios sobre Urso. Colonia Iulia Genetiva (Sevilla 1989) 69–78.

Frank 1940 T. Frank, Rome and Italy of the Empire, in: T. Frank (ed.), An Economic Survey of Ancient Rome V (Baltimore 1940).

Frézouls 1977 E. Frézouls, Prix, salaires et niveaux de vie: quelques enseignements de l'Edit du Maximum, Ktema 2, 1977, 253–268.

Giacchero 1970 M. Giacchero, Prezzi e salari dell'antica Roma, StRom 18, 1970, 149–162.

Giacchero 1974 M. Giacchero, Edictum Diocletiani et Collegarum de pretiis rerum venalium (Genoa 1974).

Giacchero 1980 M. Giacchero, Economia e società nell'opera di Seneca. Intuizioni e giudizi nel contesto storico dell'età giulio-claudia, in: Philias charin. Miscellanea di Studi Classici in onore di Eugenio Manni III (Rome 1980) 1085–1136.

Guarducci 1940 M. Guarducci, Il primo frammento scoperto in Italia dell'Editto di Diocleziano, RendPontAc 16, 1940, 11–24.

Grenfell – Hunt – Hogarth 1900 B. P. Grenfell – A. S. Hunt – D. G. Hogarth, Fayûm Towns and Their Papyri (London 1900).

Haywood 1938 R. M. Haywood, Roman Africa, in: T. Frank (ed.), An Economic Survey of Ancient Rome IV (Baltimore 1938) 1–119.

Hultsch 1864/66 F. Hultsch, Metrologicorum scriptorum reliquiae I/II (Leipzig 1864/66).

Humphrey – Oleson – Sherwood 1998 J. W. Humphrey – J. P. Oleson – A. N. Sherwood, Greek and Roman Technology. A Sourcebook (London 1998).

Jasny 1944 N. Jasny, Wheat Process and Milling Costs in Classical Rome, Wheat Studies of the Food Research Institute 20, 4 (1944).

Johnson 1936 A. C. Johnson, Roman Egypt to the Reign of Diocletian, in: T. Frank (ed.), An Economic Survey of Ancient Rome II (Baltimore 1936).

Kahrstedt 1958 U. Kahrstedt, Kulturgeschichte der römischen Kaiserzeit (Bern 1958).

Mar 2008 R. Mar, La construcción pública en las ciudades hispanas. Los agentes de la construcción, in: S. Camporeale – H. Dessales – A. Pizzo (eds), Arqueología de la Construcción I. Los procesos constructivos en el mundo romano. Italia y provincias occidentales, Congreso, Mérida, 25–26 de octubre de 2007 (Mérida 2008) 175–190.

Mar – Pensabene 2010 R. Mar – P. Pensabene, Finanziamento dell'edilizia pubblica e calcolo dei costi dei materiali lapidei. Il caso del Foro Superiore di Tarraco, in: S. Camporeale – H. Dessales – A. Pizzo (eds), Arqueología de la Construcción II. Los procesos constructivos en el mundo romano. Italia y provincias orientales, Congreso, Siena, 13–15 de noviembre de 2008 (Madrid 2010) 509–537.

Meneghini – Bianchi 2010 R. Meneghini – E. Bianchi, Il cantiere costruttivo del Foro di Nerva, in: S. Camporeale – H. Dessales – A. Pizzo (eds), Arqueología de la Construcción II. Los procesos constructivos en el mundo romano. Italia y provincias orientales, Congreso, Siena, 13–15 de noviembre de 2008 (Madrid 2010) 71–79.

Mrozek 1975 S. Mrozek, Prix et rémunération dans l'occident romain (31 av. n.è.–250 de n.è.) (Gdańsk 1975).

Pegoretti 1869 G. Pegoretti, Manuale pratico per l'estimazione dei lavori architettonici, stradali, idraulici e di fortificazione per uso degli ingegneri ed architetti 2 (Milan 1869).

Pensabene 1974–75 P. Pensabene, Sull'impiego del marmo di Cap de Garde. Condizioni giuridiche e significato economico delle cave in età imperiale, Studi Miscellanei 22, 1974–75, 177–190.

Pensabene 1978–79 P. Pensabene, Stele funeraria a doppia edicola dalla via Latina, BCom 86, 1978–79, 17–38.

Pensabene 2003 P. Pensabene, La Porta Oea e l'Arco di Marco Aurelio a Leptis Magna: contributo alla definizione dei marmi e del loro costo, delle officine e delle committenze, QuadALibya 18, 2003, 341–367.

Pensabene 2004 P. Pensabene, Il tempio di Roma e Augusto a Ostia. Decorazione architettonica e costi del marmo, in: S. F. Ramallo (ed.), La decoración arquitectónica en las ciudades romanas de occidente. Actas del congreso internacional, Cartagena, 8 y 10 de octubre de 2003 (Murcia 2004) 73–84.

Pensabene – Mar – Cebrián 2012 P. Pensabene – R. Mar – R. Cebrián, Funding of Public Edifices and Calculation of the Costs of the Stone Materials. The case of the Forum of Segóbriga, IX International Conference ASMOSIA, Tarragona, 8–13th June 2009 (Tarragona 2012) 161–175.

Poinssot 1983 C. Poinssot, Les ruines de Dougga (Tunis 1983).

Prisset 2008 J.-L. Prisset, Les besoins en matériaux, les contraintes d'approvisionnement et la durée d'un chantier de construction. Réflexions à partir du portique nord de Saint-Romain-en-Gal (France), in: S. Camporeale – H. Dessales – A. Pizzo (eds), Arqueología de la Construcción I. Los procesos constructivos en el mundo romano. Italia y provincias occidentales, Mérida, 25–26 de octubre de 2007 (Mérida 2008) 125–139.

Segrè 1922 A. Segrè, Circolazione monetaria e prezzi nel mondo antico ed in particolare in Egitto (Rome 1922).

Serafino 2009 C. Serafino, Cave, miniere, salari: il caso del Mons Claudianus, in: A. Storchi Marino – G. D. Merola (eds), Interventi imperiali in campo economico e sociale. Da Augusto al Tardoantico (Bari 2009) 43–53.

Soler 2012 B. Soler, Planificación, producción y costo del programa marmóreo del teatro romano de Cartagena, in: V. García Entero (ed.), El marmor en Hispania: explotación, uso y difusión en época romana (Madrid 2012) 193–228.

Szaivert – Wolters 2005 W. Szaivert – R. Wolters, Löhne, Preise, Werte. Quellen zur römischen Geldwirtschaft (Darmstadt 2005).

Volpe 2010 R. Volpe, Organizzazione e tempi di lavoro nel cantiere delle terme di Traiano sul colle Oppio, in: S. Camporeale – H. Dessales – A. Pizzo (eds), Arqueología de la Construcción II. Los procesos constructivos en el mundo romano. Italia y provincias orientales, Congreso, Siena, 13–15 de noviembre de 2008 (Madrid 2010) 81–91.

West 1916 L. C. West, The Cost of Living in Roman Egypt, ClPhil 11, 1916, 293–314.

INHALTSVERZEICHNIS

Theun-Mathias Schmidt
Königssöhne als Zugochsen ihrer Mutter (Pol. 22, 20) – Mythologische Bildung und allegorisches Weltverständnis im Pergamenischen Reich und in den Bildern des Pergamonaltares 1

Holger Schwarzer
Heiligtümer der Aphrodite Paphia in der antiken Münzprägung 19

David Ojeda
A Colossal Cuirassed Statue from Seleucia Pieria 47

Konrad Hitzl – Andreas J. M. Kropp
Das Heiligtum von Olympia im 2. Jh. n. Chr. – Alte und neue Impressionen 53

Constanze Höpken
Ein blattförmiges Silberblech aus dem Iuppiter Dolichenus-Heiligtum bei Doliche 91

Ulrich Gehn
Eine Gruppe attischer Porträts im mittleren und späten 3. Jh. n. Chr. – Eine Neubetrachtung 99

Javier Á. Domingo
The Differences in Roman Construction Costs: The Workers' Salary 119

Klaus Fittschen
Lesefrüchte V 145

Helke Kammerer-Grothaus
Nikomedeia/Izmit – Kaiserliche Residenz und Kunstlandschaft in Bithynien 171

Hugo Brandenburg
Disiecta membra. Die Baudekoration der *basilica maior* von S. Laurentius und von S. Paul vor den Mauern in Rom – Bemerkungen zu einem Neufund spätantiker Baudekoration 199

Sylvia Diebner
Im Schatten der Peterskuppel und eines berühmten Archäologen – Gedanken zum Grab der »Universitätsprofessorsgattin« Edith Curtius (1885–1932) 213

Aus Westfalen

Tobias Runkel
Ein unbekannter Griffspiegel mit Darstellung der Dioskuren – Bemerkungen zu einer spätetruskischen Spiegelgruppe 237

Jan-Pieter Löbbing
Eine Glassammlung aus Grevenbroich im Archäologischen Museum der WWU Münster 251

SCRIPTORIUM

Historisch-Archäologische Publikationen und Dienstleistungen
Trappweg 12
34431 Marsberg/Padberg

ISBN 978-3-932610-52-3