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Studies in the History of Accounting

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Greek and Roman Accounting

G. E. M. de Ste. Croix*

(*Note.*—At the request of the editors of this volume I have done my best to make the text of this essay easily intelligible to those who cannot read Greek or Latin and have little or no knowledge of the ancient world. At the same time I have tried to interest specialists in Greek and Roman history, law and literature: the footnotes, giving references to sources and to the modern literature, and the Appendices, are intended mainly for them. Standard abbreviations have been employed in citing ancient and modern works. Any which are unfamiliar to the reader can be identified by a glance at the lists of abbreviations in, *e.g.*, the *Oxford Classical Dictionary*, Liddell and Scott's *Greek-English Lexicon*, Lewis and Short's *Latin Dictionary*, or the *Cambridge Ancient History*.)

THE question has often been asked in modern times how far the Greeks and Romans developed systematic book-keeping, and in particular whether they employed double entry. It will help to put the subject-matter of this essay in better perspective if I make it clear from the start that the Greeks and Romans, far from reaching the advanced stage of accounting at which double entry becomes possible, thought, and kept their books, mainly in terms of receipts and expenditure rather than debit and credit; and furthermore that they never even got as far as the habitual separation of what we should call debit and credit entries by inserting them in two separate columns, let alone on opposite pages of an account. That the Romans, at any rate, regularly wrote debit and credit entries on opposite pages of their accounts has been asserted again and again, without ever (as far as I know) being contradicted; but the whole conception is false, as I shall show. Ancient accounts are not disposed in double columns: they are not even placed precisely in single columns. If, as sometimes happens, the figures are written approximately underneath each other, this is done, as we shall see, not in order to assist computation but merely to give a neater appearance, or to make it easier and less fatiguing to follow the account and trace individual items within it. The Greeks and Romans did develop some quite advanced institutions in the fields of property law and commercial practice; but their book-keeping, minutely detailed as it often was, remained rudimentary in method and never grew into an integrated double-entry complex, with interlocking accounts, or even into a unified single-entry system. Greek and Roman accounting took the form of individual records of

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debts and of receipts and payments, and miscellaneous inventories, rather than accounts in the modern sense. The fundamental reason for this was, of course, that the Greek and Roman economy failed to develop to the point at which an advanced system of book-keeping would have become generally necessary. However, a subsidiary reason for the backwardness of Greek and Roman accounting—important in its own right, in my opinion—was the systems of numeral notation employed in the Graeco-Roman world, a question which will be discussed in detail towards the end of this essay.

A word of warning is necessary at the outset about terminology. If we thoughtlessly use as equivalent to the Greek and Latin terms modern expressions associated with a much more highly developed system of book-keeping, we shall tend to form our ideas of ancient practice after the model of contemporary accounting methods, and this would be a serious handicap. It is above all essential to realise that the very conceptions of debit and credit in the technical modern sense are alien to the thought and practice of the Greek and Roman world. Various Latin words such as *acceptum* and *expensum*, *lucrum* and *damnum*, are often translated "credit" and "debit," and sometimes this is convenient and harmless enough; but we must always remember that the words in question really mean "receipts" and "expenditure," "profit" and "loss." Expressions like *lucro apponere*, *in lucris ponere*,[1] which are often used figuratively, mean "treat it as gain," rather than "enter it to credit." I hope I have said enough, by way of introduction, to indicate that what I have to say here is going to be pitched, so to speak, in a very low key. I must emphasise that I have not tried to give anything like a complete picture of Greek and Roman accounting, but only a general summary, with special attention to some points which have not previously received the attention they deserve.

I. The Sources

The first thing we have to do is to consider the nature of the sources from which our knowledge of Greek and Roman accounting is derived. They are written partly in Greek, partly in Latin. When in this essay I use the expressions "the Greeks" and "the Romans," I shall mean those who wrote in Greek and those who wrote in Latin respectively. For my purposes the Apostle Paul would count as a Greek because he wrote in Greek, although he could also claim to be a Roman citizen and may well have spoken Aramaic at times when in purely Jewish circles. Under the Roman Empire, Greek was the predominant language, for purposes of writing at any rate, in the Asiatic provinces, in the eastern and southern Balkans, and in Egypt,

[1] Hor., *Od.* 1.9.14-15; Cic., *ad Fam.* 7.24.1.

Cyrenaica and Sicily; Latin was the predominant language in the rest of the Empire.

We know very little of Greek civilisation before about 600 B.C., and it is not until the fifth and fourth centuries that our information becomes really plentiful. Nearly all of it, at this period, relates principally to Athens, the most civilised and brilliant of the hundreds of little "city-states" which dotted the shores and islands of the Mediterranean (especially, of course, the Aegean), the Sea of Marmora and the Black Sea. I shall speak of the fifth and fourth centuries B.C. as "the Classical Greek period." So far as the eastern Mediterranean world is concerned, the last three centuries B.C. are always referred to as "the Hellenistic period." At this time Rome was under a republican form of government. With the last generation before Christ, when Augustus consolidated an essentially monarchical rule, there begins the Roman Imperial period.

For convenience I am going to divide the evidence for Greek and Roman accounting into three main branches: legal, literary and documentary. The legal sources, which are partly documentary in character but have been transmitted to us along with the literary texts, are predominantly Roman; we do not possess the texts of many Greek laws dealing with economic questions. By far the most important of the legal sources, for present purposes, is the *Digest*, a compilation of mainly disconnected excerpts from the treatises of the Roman jurists of earlier days, arranged under subject-headings. The *Digest* was issued in 533 and forms part of the Emperor Justinian's great *Corpus Juris Civilis*. It contains a large number of references to accounts. Another of the legal sources which is constantly cited by modern writers on ancient accounting—mainly owing to misunderstanding of a particular passage [2]—is the *Institutes* of Gaius, a textbook of Roman law written in the mid-second century.

My second branch of evidence, the literary, includes all kinds of published literature. For the general history of the Graeco-Roman world, the literary evidence is on the whole the most important; but for economic history it is relatively much less helpful. The Greek and Roman authors in general were not interested in the economic processes of everyday life; they were content, one might say, to take their economics for granted, and even when they were writing history they were much more concerned with political, diplomatic and military affairs—with wars, court intrigues, the exploits of great men, political and dynastic struggles, and so forth. There are a few literary works, however, which give us a certain amount of evidence about financial practices: the most important of these are the speeches of the

[2] See Appendix C, below.

Athenian orators of the fourth century B.C., above all Demosthenes. The speeches of Cicero, from the middle of the last century B.C., deal mainly with political matters, but I shall have occasion to refer to some interesting and illuminating passages in some of his speeches concerning the keeping of accounts.

The last of the three main kinds of evidence, the documentary, is much the most varied. I shall divide it into two branches, and say a little about each: epigraphic evidence (that provided by inscriptions —words written on stone or other durable material), and papyrological evidence (that of papyri and ostraca, almost entirely from Egypt). Epigraphy[3] is the study of verbal inscriptions, most of which, so far as the Graeco-Roman world is concerned, are on stone, although a few are on wood or on metal, mainly bronze or lead. Inscriptions were collected by more than one ancient Greek, and from Renaissance times onwards they have been copied and studied more and more carefully. It is difficult to give an accurate estimate of the total number of Latin and Greek inscriptions which have been edited and published in modern times, but the number runs well into six figures, the Latin inscriptions probably outnumbering the Greek by something like three to one. These inscriptions range from a few words or even letters to hundreds of lines. Comparatively few Latin inscriptions, or Greek inscriptions of the Roman Imperial period, give us much information about financial matters of any sort, but from the Classical Greek and Hellenistic periods (the last five centuries B.C.) we have a mass of material, very useful for our subject, in the form of temple and state accounts and other documents.

The other branch of documentary evidence, and perhaps the most important of all kinds of evidence for our immediate purposes, is the papyrological.[4] In this category are generally classed together the papyri and ostraca (with some parchments) which have been found in modern times in great quantities in Upper Egypt (southern and central Egypt, including for present purposes the Fayum) and also at a few other places. Ostraca, the Greek term for potsherds (broken pieces of

[3] Those unacquainted with the subject who wish for an elementary introduction to it might consult the articles "Epigraphy, Greek" (by M. N. Tod) and "Epigraphy, Latin" (by R. H. Barrow), on pp. 327-331 of the *Oxford Classical Dict.* (1949), where bibliographies will also be found.

[4] There is an excellent short introduction to this subject, *ibid.*, 645-646 ("Papyrology: Greek," by C. H. Roberts). An admirable recent book by Sir Harold Bell (H. Idris Bell, *Egypt from Alexander the Great to the Arab Conquest*, 1948) has an introductory chapter on "Papyri and the Science of Papyrology," and the Bibliography at the end gives a very useful list of the principal editions of Greek papyri and ostraca, with the standard abbreviations by which they are commonly cited. Most of the numerous editions of papyri by English-speaking scholars (*e.g.*, *P. Oxy.*, *P. Ryl.*, *P. Fay.*, *P. Tebt.*) give translations of at least the more important papyri. A handy selection of Greek papyri, with facing English translations, prepared by two leading papyrologists, will be found in the Loeb *Select Papyri* (2 vols., 1932-1934, ed. A. S. Hunt and C. C. Edgar).

pottery), were much used as a writing material in Egypt, after its conquest by Alexander the Great in 332, and inscribed ostraca have been found in large numbers in Upper Egypt. Tax receipts are particularly common, but there are a fair number of accounts, necessarily brief. Very much more important are the papyri—a term which is often used in this connection to include parchments. From at least the sixth century B.C. until the fourth century of the Christian era, papyrus was the main writing material of Greek and Roman civilisation. Pliny the Elder[5] could say that it was papyrus which preserved human achievement from oblivion, and that without it mankind would have little culture and no history. Papyrus had been used in Egypt from at least the third millennium B.C., and our oldest inscribed papyrus is something like 4,000 years old.[6] The papyrus used as a writing material—the manufacture of which was an Egyptian monopoly—was made from the pith in the stem of the papyrus plant, which used to flourish in the swamps of the Nile Delta (where it is now extinct) and grew also in one or two other places, though on a very much smaller scale.[7] There have been a couple of finds of papyri in the Delta and a few outside Egypt. Apart from these, the whole mass of the papyri have come from Upper Egypt, where alone the sandy soil is dry enough to preserve great quantities of this perishable material for centuries; and the great majority have been found in rubbish heaps, ruined buildings, or tombs. Greek papyri have been known since 1778, but the regular flow of publication did not begin until the 1890's, and it is only since then that papyrology has really come into its own. The range of dates of the Greek papyri covers roughly a thousand years, from the late fourth century B.C. until after the Arab conquest of Egypt in A.D. 642. Latin papyri also occur, but they are far fewer in number than those written in Greek, which in Egypt was spoken at first only by the relatively small immigrant Greek population, but long before the Roman conquest in 30 B.C. had become the regular language of the educated upper classes. The known Greek and Latin papyri (including very many fragmentary ones) already number tens of thousands, of which well over 20,000 have been published. Some of the papyri are literary texts, but by far the greater number are documentary, and the variety of these is very great—almost as great as that of ancient inscriptions, but covering a different range of subjects.

And here we come right to the heart of our subject, the nature of

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[5] *NH* 13.68-70: papyrus is the thing "qua constat immortalitas hominum" (§ 70); and "cum chartae usu maxime humanitas vitae constet, certe memoria" (§ 68).

[6] *Papyrus Prisse*, now in Paris.

[7] See F. G. Kenyon, *Books and Readers in Ancient Greece and Rome*[2] (1951) 47 *et seq.*; also 121-125, containing part of the text of Pliny, *NH* 13.68-78 (with trans.), the *locus classicus* on the manufacture of papyrus.

ancient accounting methods, because among the documentary papyri are very large numbers of actual accounts, both public and private. The great majority of the modern writers who have discussed ancient accounting have concentrated entirely upon the literary and legal sources and have tried to infer from them what ancient accounts must have been like, oblivious of the fact that we actually have preserved among the papyri hundreds of pages of accounts kept by the Greeks and Romans over a period of a thousand years, in the exact form in which they were written—not to mention a very large quantity of Greek public accounts recorded in inscriptions on stone. Making false inferences from the legal and literary sources, and ignoring (or at best imperfectly understanding) the massive and conclusive evidence provided by the inscriptions and papyri, these writers have given an entirely false picture of Greek and Roman accounting, which they have represented as much more advanced and nearer to modern practice than in fact it was.

In Appendix A (pp. 66-68 below) I have given an outline of modern work on the subject of Greek and Roman accounting. Most of it is of very little value, but there are a few useful studies of limited scope and one article of outstanding interest.

II. The Absence of "Bilateral Form"

It is a fundamental error to imagine, as writers on this subject habitually have done since at least the seventeenth century,[8] that in Greek and (more especially) Roman accounts receipts and payments were placed on opposite pages. In all Greek and Latin literature, there is just one passage which does appear at first sight to support this conception. It occurs in Pliny the Elder's *Natural History*,[9] written in the seventies of the first century. Emphasising the sovereign power of Fortune, Pliny says, "Huic omnia expensa, huic omnia feruntur accepta, et in tota ratione mortalium sola utramque paginam facit." ("To her account all expenditure and all receipts are entered, and in the account-book of every mortal she alone makes out both pages.") Certainly, *utramque paginam* means not just "each page," but "each of two pages." Taken in conjunction with

[8] Richard Dafforne, in *The Merchants Mirrour* (1635; 3rd ed., 1660), quotes with approval the statement of Simon Stevin, the Dutch mathematician of the early 17th cent., "That the one side of their [the Romans'] Book was used for Debtor, the other for Creditor, is manifest"—from Pliny, *NH* 2.22 (see below). Among many recent writers who have made the same assumption are F. de Zulueta, *The Instt. of Gaius* II 163; P. F. Girard, *Man. élém. de droit rom.*[8] 527; and various authors whose works are cited in Appendix A below, *viz.*: Melis 367, 436; Voigt 531-532, *etc.*; Bergel 173-181; Fruchtl 32; Roby II 291; Murray 126. And see T. Zerbi, *Le origini della partita doppia* (1952) 64, where the passage in Pliny is taken as a reference to "conti a sezioni divise."

[9] 2.22.

the reference to expenditure and receipts in the first part of the sentence, these words have created the almost universal impression that the Romans entered their receipts on one page of their account-books and their payments on the other, as we do today. That is a reasonable enough inference from the wording of this passage alone; but in the light of all our other evidence I can say categorically that it is a wrong inference. I will not enter into details here regarding the physical form of Greek and Roman accounts, a subject which I have treated at some length in Appendix B (pp. 68–72 below): it will be sufficient if I say that in Pliny's day Romans apparently still kept their more formal accounts mainly on waxed tablets, although papyrus, in sheets and rolls, was also used. When he remarks that Fortune makes out "both pages" [10] in the account-book of every mortal, Pliny must mean simply the two pages of an open set of tablets, without there being any implication that one page consists of debit and the other of credit entries. In the whole of Greek and Latin literature, as far as I am aware, there is nothing whatever to suggest that receipts and payments were placed on opposite pages of an account, nor, as far as I have been able to discover, does this particular variety of "bilateral form" appear in any Greek or Latin inscription, tablet or papyrus. The only writing tablet I know containing actual accounts which has survived from antiquity is one from Verespatak in Transylvania (Alburnum Maius in the Roman province of Dacia) [11] giving a list of sums of money received and articles purchased: here there are quite neat columns, and in general the receipts happen to appear on the left-hand leaf, the payments on the right; but the total sum in hand on the last day of April (166 denarii or a little more) is placed at the head of the right-hand leaf, and there is no question of an account with two "sides." Occasionally, as in the case of the Verespatak tablet, we may find some attempt at tabulation in a single column,[12] to assist the eye in running over the account, or a tendency to group together receipts and payments respectively [13]; but such practices, when they do occur, are not carried out rigorously.

As far as my knowledge goes, it is only in one surviving document, a unique papyrus roll of the Roman period from Karanis in the

[10] *Pagina* is used indifferently in Latin for one side of a leaf of a codex or tablet, as here, and for a single column (σελίς in Greek) in a papyrus roll (as in Pliny, *NH* 13.80; Mart. 2.6.2, with 3)—and perhaps also for one side of a single sheet of papyrus.

[11] *CIL* III II, p. 953, no. xv, presumably dating from the early or middle 2nd cent.

[12] It will be well to give some examples, among many others which might be quoted, of papyri containing figures placed in column: *P. Cairo Masp.* I 67,056-67,059 (see pl. xxv-xxvi in that volume); *P. Hamb.* 56; *P. Mich.* IV ("Tax Rolls from Karanis"); *P. Ryl.* IV 627, 629, 630-637, 640-641; *P. Oxy.* IV 737 (see pl. viii in that vol.), a Latin papyrus containing a list of wages paid; and papyri (also Latin) nos. 1 (lines 59-65), 2 (lines 9-13) and 3 in J. O. Tjader, *Die nichtliterar. latein. Pap. Italiens aus der Zeit 445-700* (1955).

[13] See Fig. 1 on p. 24 below, also p. 37 below.

Fayum, to be further discussed later,[14] that we find an ancient account drawn up in "bilateral form"; and here we have the other variety of bilateral form[15]—receipts and payments not on opposite "pages" (the successive columns of a papyrus roll do not naturally fall into pairs) but separately aligned vertically side by side within each column of writing. The peculiar form of this papyrus account is not to be taken as a fundamental advance in book-keeping method, because it can only have been adopted for convenience in perusing the account and identifying individual items within it. Now it may be said that if a particular book-keeper in Egypt was sensible enough to devise one type of bilateral form, suited to accounts kept in independent columns on papyrus, Roman book-keepers may very well have adopted the other type of bilateral form, suited to accounts kept on tablets with pairs of facing "pages." I believe, however, that such an inference would be quite unjustified. Because writing materials in antiquity were not nearly as easy to obtain and as cheap as they are today, the variety of bilateral form in which receipts and payments appear on opposite pages was surely much less likely to be adopted than the variety which we find in the papyrus from Karanis, for the former necessarily takes up more space vertically, except where receipts and payments happen to be recorded in equal quantities of writing—if there are more entries of one sort than of the other, whole pages on one side of the account may be left blank and wasted. This would have been intolerable to ancient book-keepers, who were in general obliged to be more economical of space than are their modern counterparts.

III. The Classical Greek Period

My next task is to discuss some of the more important pieces of detailed evidence for accounting practices which have survived from the ancient world, beginning with the Classical Greek period. I ought first to explain that it was among the Greeks, and as late as the sixth century B.C., that coined money came into general use for the first time in human history. The adoption of money as the normal medium of valuation and exchange made it possible for book-keeping to rise to an entirely new level: all possessions and all transactions could at last be recorded not as so many fields, so many slaves, so many bushels of grain, or the exchange of so many casks of wine against so many pounds of silver, but in every case as so many units of a particular system of currency. All possessions and transactions, then, could be so recorded; but it does not by any means follow that in practice they always were. Although the Greeks and Romans

[14] *P. Goodsp. Cair.* 30. See pp. 35-36 below.
[15] *Cf.* p. 64 below.

usually did reduce all items in their accounts to a common monetary denominator, they often failed to do so. Property might still be hoarded in kind, and reckoned in public or private accounts simply as measures of wheat or units of a foreign currency, instead of being expressed in terms of the prevailing monetary system. There are examples of this among the inscriptions of the Classical Greek period and many among the papyri from Hellenistic and even Roman Egypt: we shall be noticing some of these later.[16] When the units of entry are different from the standard monetary ones, the items concerned are normally placed by themselves in separate accounts, but occasionally (as in the building accounts of the Parthenon, to be considered presently) a few such entries intrude into accounts which are otherwise kept in terms of the local system of currency.

Before coined money existed, trading was done by barter or in terms of some universally valued unit such as the ox; and when the precious metals were used for purposes of exchange, they were reckoned by weight. The standard measure of value for Homer's Achaeans was the ox, as it was for the early Romans, whose very word for money, *pecunia*, is derived from *pecus*, cattle. At the all-in wrestling match between Ajax and Odysseus at the funeral games of Patroclus in the *Iliad*,[17] the winner was to receive a large tripod, said to be worth twelve oxen, and the loser a woman, worth four oxen.[18] Even the most civilised peoples of the Near East—the Sumerians, Babylonians, Assyrians, Egyptians, Hittites and Phoenicians—had never used coins, in the sense of lumps of metal stamped with the mark of some individual or State as a guarantee of their purity and weight, and intended to be used as currency. Such stamps on pieces of metal from Babylonia and Assyria seem to have attested only the purity of the metal, not its weight, and these pieces therefore are not true coins. No one now disputes that the place of the introduction of coinage was western Asia Minor, but some scholars, for no very good reason, have preferred to credit the Ionian Greeks with the invention, rather than the Lydians, to whom it is attributed not only by Herodotus[19] but also by the philosopher Xenophanes,[20] who wrote at least as early as 500 B.C. The date of the innovation has been the subject of considerable dispute, but E. S. G. Robinson[1] of the British Museum has recently advanced very strong arguments for thinking that the invention of coinage took place not much earlier than about 630 B.C. The evidence is mainly the foundation deposit and later deposits in

[16] See pp. 24 and 31-32 below.
[17] XXIII 700-705.
[18] *Cf. Od.* I 428-433.
[19] 1.94.1.
[20] Fr. 4 in Diels[6] I 130, *ap.* Poll. 9.83.
[1] In *JHS* 71 (1951) 156-167; *cf.* P. Jacobsthal, *ibid.* 85-95.

the temple of Artemis at Ephesus—"Diana of the Ephesians," as our Biblical translators call her. These deposits include a series of extremely primitive coins, some Lydian, some probably Greek, in examining which, as Robinson happily puts it, "one has the feeling of assisting at the very birth of coinage." If, then, we assign the earliest coins of Lydia and the Ionian Greek cities to about 630 B.C. and just after, we shall have to put the coinages of the towns of mainland Greece later still, since the earliest of these are clearly less primitive than the earliest issues from Asia Minor and must have been copied from the latter when they had already passed the rudimentary stage. The earliest coins are of the precious metals, particularly electrum (mixed gold and silver). Small change was slower to appear, and the universal use of coins in the Greek world developed only slowly during the sixth century.

We can now examine some of the evidence for accounting in the Classical Greek period. It is of course too early for documentary papyri, but we have a formidable body of public and sacred accounts on stone[2] and some informative literary passages. The epigraphic evidence at first sight looks quite varied in character, the accounts apparently taking many different forms; but everyone who goes through the material observantly will soon find that the variations are not very important and their range not really very wide. It has not been easy to find representative specimens suitable for reproduction here: most of the accounts are incomplete or fragmentary, and in many cases it is impossible to convey an adequate notion of their form and content without giving long extracts. I have chosen two accounts, the second of which, in pure narrative form, is a much more characteristic specimen than the first, which shows perhaps the highest degree of tabulation I have discovered in any Greek account carved on stone.

The first document[3] is an extract from the building accounts of the Parthenon, covering the Attic (*i.e.*, Athenian) year 434–433 B.C. The erection of this temple of Athena took place between the years 447–446 and 433–432 B.C., and the accounts were then inscribed on a large marble stele, which was set up on the Acropolis of Athens.

[2] Representative specimens of 5th and 4th cent. public accounts of different kinds, mainly but not exclusively Athenian, will be found in M. N. Tod, *Sel. of Gk. Historical Inscr.* I[2] nos. 30, 38, 46–47, 50, 52–56, 62, 64, 69–71, 75, 78–81, 83, 85, 92; II nos. 125, 140, 160, 169, 172. Almost all the 331 quarto pages of *IG* II[2], Pars II, Fasc. 1, are devoted to Athenian public accounts of the 4th cent. Vol. II of *The Athenian Tribute Lists*, by B. D. Meritt, H. T. Wade-Gery and M. F. McGregor, gives the texts of all the surviving documents dealing with the finances of the Athenian Empire of the 5th cent. The accounts of the temple of Delphi in the 4th cent., which survive in considerable quantities, are published in *Fouilles de Delphes* III, Fasc. v (ed. E. Bourguet, 1932); there are lengthy selections in *SIG*[3] I nos. 239–253; and see Bourguet, *L'admin. financière du sanct. pythique au IV[e] siècle av. J.-C.* (1905).

[3] Tod I[2] 52 = *IG* I[2] 352.

Fragments of this inscription have survived, the best preserved portion being that for the year 434–433, of which we have the greater part of the record. I give it in a literal translation which also reproduces the arrangement of the original as closely as possible (Figure 1). I have substituted Arabic numerals for the "old Attic" numeral signs. Square brackets indicate restorations of fragmentary passages, and the sign [– – –] represents portions which cannot safely be restored at all. The monetary units are Attic silver talents, drachmae and obols (6 ob. = 1 dr.; 6,000 dr. = 1 tal.).

Figure 1

The following were the receipts of the fourteenth board of Overseers, whose Secretary was Anticles, the first Secretary of the Council in this year being Metagenes, and Crates being Athenian Archon (*i.e.*, the date is 434–433 B.C.):

1,470 dr.	*balance remaining from the preceding year.*
70	*gold staters of Lampsacus.*
27 1/6	*gold staters of Cyzicus.*
25,000 dr.	*from the Treasurers of the Goddess whose Secretary was Crates of Lamptra* (*i.e.*, those of 434–433 B.C.).
1,372 dr.	*proceeds of sale of gold, weight 98? dr.*
1,305 dr., 4 ob.	*proceeds of sale of ivory, weight ?3? tal., 60 dr.*
	Expenditure:
[– – –]	*purchases.*
[– – –]	
[– – –]	*payments under contract.*
[– – –]	*to quarrymen at Pentelicus and men loading stones on the carts.*
16,392 dr.	*wages to sculptors of the pediment-reliefs.*
1,800? dr.	*to employees paid by the month.*
[– – –]	*balance remaining from this year.*
[*70*	*gold staters of Lampsacus.*]
[*27 1/6*	*gold staters of Cyzicus.*]

The Lampsacene and Cyzicene staters, which were coins foreign to the Athenian monetary system, are recorded in effect as bullion and not in terms of the Attic silver coinage, and they appear unchanged throughout the Parthenon building accounts. Here we have a good example of the tendency referred to earlier, for a Greek account occasionally to express the value of a particular piece of property in units other than those of the system of currency in terms of which the account is being kept.

The second document[4] is a small part of a very long inscription on marble, found at Eleusis in Attica, containing the accounts for the year 329–328 B.C. of the Eleusinian Overseers and the Treasurers of the Two Goddesses (Demeter and Persephone), who were public officials, elected by the Athenian general assembly. The inscription consists of 312 lines, each of 81 letters. It deals separately with each

[4] *IG* II² (ii 1) 1672, lines 1, 114–137.

of the ten " prytanies " into which the Attic year was divided. I can do no more than give extracts from the record of the fifth prytany, which I have again translated literally, following the narrative form of the original (Figure II).

Figure II

(Line 1) *Account of the Eleusinian Overseers and the Treasurers of the Two Goddesses, in the archonship of Cephisophon* (*i.e.*, 329–328 B.C.) . . . (lines 114–116) *in the fifth prytany, that of the tribe Cecropis: balance in the hands of the Treasurers of the Two Goddesses 1,565 dr., 2 3/8 ob.; balance in the hands of the Treasurer of the Two Goddesses Nicophilus of Alopece 42 dr., 3 ob.; balance in the hands of the Eleusinian Overseers 1 5/8 ob.; and the amount distributed to the Overseers by the Apodectae 850 dr. Of this the following has been spent:* . . . (There are now 18 lines, nos. 116–134, containing particulars of expenditure, including) *4 faggots, price 2 ob.* . . . (The account for the prytany ends) *Total of expenditure 950 dr., 1 5/8 ob. Total of money received from the Apodectae 850 dr. Balance in the hands of the Treasurers of the Two Goddesses 1,565 dr., 2 3/8 ob., and in the hands of the Treasurer of the Two Goddesses Nicophilus of Alopece 32 dr. 3 ob.* . . . (line 137) *Account of the Eleusinian Overseers* . . . *in the sixth prytany* (etc.).

This document, in its complete lack of tabulation and the minute details it gives of most items of expenditure, is unfortunately more typical of fifth and fourth century public accounts than the briefer and much better arranged Parthenon account. The two documents represent almost the extremes which are to be found in public accounts of the Classical Greek period. Various intermediate stages appear in other sets of accounts.[5]

Now there can be little doubt that the main reason for recording all this material in permanent form and " publishing " it in expensive inscriptions on stone (usually, as here, marble) was to prove to everyone's satisfaction that the respective treasurers, public or sacred,[6] could account for everything which had passed through their hands, down to the very last fraction of an obol. In some accounts, those of the Parthenon for instance, quite substantial payments are recorded for wages or purchases without much circumstantial detail; but in the fourth century the three main bodies of surviving accounts (from Athens, Delos and Delphi) are almost uniformly detailed, with very few lapses. The Eleusinian accounts nearly always give the most minute particulars of expenditure, including for example details of the clothing bought for the public slaves working under the direction of the Overseers, and even the exact amounts spent on repairing these slaves' sandals, with the price of the studs or nails used, at a mere

[5] *e.g.*, the accounts of the Athenian Amphictyons of Delos in the 4th cent. B.C.: see esp. Tod II 125=*IG* II² 1635.

[6] It was sacred accounts which were most likely to be preserved in permanent form, but at Athens in particular a large number of non-sacred public accounts were also cut on stone, esp. in the 4th cent. B.C.—the navy lists, for example (*IG* II² 1604–1632).

obol per pair of sandals.[7] The concept of "petty cash," in the modern sense, which can be spent up to a certain limit without the necessity for detailed accounting by the person concerned, never really established itself as a regular feature of ancient accounts, although, as we shall see,[8] we do come across items labelled "petty cash" in a few papyrus accounts of Roman times. Greek accounts of the Classical period are normally set out in narrative form, in what seems to us a clumsy and confusing manner: receipts and payments are often intermingled and flow in a continuous stream. If a number of payments follow each other in immediate succession, as they commonly do, this may often be accidental and due to the fact that most treasurers would receive money on only a few occasions, in relatively large amounts, and between each receipt would make many small payments. There is never more than rough tabulation, as in the Parthenon accounts, and even this is infrequent.

One feature of Athenian public finance of the fifth century deserves special mention here. The Athenians in the second half of the fifth century made a habit of depositing surplus public funds with their patron goddess, Athena, under two of her aspects, Athena Polias and Athena Nike, and with the "Other Gods" collectively—"Treasurers of the Other Gods" (that was their official title: ταμίαι τῶν ἄλλων θεῶν) were appointed in 434.[9] The Athenian State then borrowed the money back from the obliging deities at low rates of interest, and ultimately, it would seem, without interest. The evidence for the loans is entirely epigraphic.[10] These borrowings were essentially book-keeping transactions, a mere transferring of public money from one treasury controlled by the State to another. It was the Athenian general assembly, the supreme governing body of the city, which appointed the sacred as well as the ordinary public treasurers, and gave instructions about the making and repayment of the loans. Transactions which in theory were loans were in practice analogous to what we should call transfers from deposit account to current account. The whole policy of building up a large reserve fund in the hands of the gods, upon which the city might draw in an emergency, seems to have been an innovation of the mid-fifth century, the work of Pericles. That statesman himself was surely a sceptic, but what he evidently wanted was to ensure that Athens' reserve fund should become as sacrosanct as possible, and not subject to indiscriminate raids by the general assembly. The best way of doing this, in a world in which most people still had a superstitious reverence for the old gods, was

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[7] *IG* II² 1673, lines 45-51. *Cf.* 1672, lines 70-71, 102-105, 190-191, 230.

[8] See below, pp. 34-35.

[9] Tod I² 51A = *ATL*, D 1.

[10] See Tod I² 51, 64 (with the Addenda, pp. 262-263); *cf.* 75, 81, 83, 92, etc.

to entrust the gods with the money. Once that was done, the money would not in practice be simply reappropriated and spent: that would be impiety. It might, however, be borrowed at interest—of course with the proclaimed intention of repaying it; but the gods could not protect their own property save in so far as the Athenian general assembly chose to do so on their behalf. The Athenian State was the real creditor as well as the debtor. All this explains the very curious Athenian method of State book-keeping (for that is what it really amounts to): only by pretending that they were using borrowed sacred money and had to repay it with interest were the Athenians able to provide themselves with a permanent reminder of the need to put back their funds into reserve as soon as they could possibly afford to do so. They put themselves on their honour, as it were, to pay back to the gods the money they had borrowed. Unfortunately, the vast expenditure occasioned by the Peloponnesian War of 431–404 B.C., followed by the loss of their tribute-paying empire, made it hardly possible for the reserve fund to be built up anew, and in due course the debts to the gods were conveniently forgotten. Some of the more pious Athenians might well have jibbed at borrowing the money at all had they realised that it would never be repaid.

I know of few records of genuine borrowing by the Athenian State from outside sources on any appreciable scale.[11] I may add that public loans in the Greek world were infrequent and seldom important and were never funded. They played no regular part in Greek city finance.

The literary sources give us one or two useful pieces of information about private accounts—which throughout antiquity, there is every reason to believe, were not significantly better kept, from our point of view, than public accounts. The most important passage, from a forensic speech delivered soon after 370 B.C.,[12] gives us the actual text of an entry in the books of a prominent fourth-century Athenian banker, the ex-slave Pasion. The speaker, Apollodorus son of Pasion, describes how a certain merchant, Lycon of Heraclea, a customer of Pasion's bank, cast up his account (διαλογισάμενος) with Pasion in the presence of two witnesses, before setting off on a voyage to North Africa (on which he was killed by pirates), and left instructions for the money standing to his credit, 1,640 drachmae, to be paid out to his partner, Cephisiades, who was away on a voyage at the time. The speech gives the very words of the entry made on that occasion in Pasion's accounts (γραμματεῖον or writing tablet—apparently the

[11] See Tod. II 175 (Tenedos, 339 B.C.); *IG* VII 1737–1738 (Thespiae, 229 B.C.: see W. S. Ferguson, *Hellenistic Athens* 206–207).

[12] Ps.-Dem. 52.6, *cf.* 4.

standard term for a banker's account-books) [13]: "Lycon of Heraclea, 1,640 drachmae, to be paid to Cephisiades. Archebiades of Lamptra will introduce him." Explaining this entry, the speaker says that it is customary with bankers, if they know by sight the person to whom money is to be paid out, just to write down, "To be paid to so-and-so"; but if they do not know him by sight, they add the name of the person who is to identify the payee. This certainly exposes the primitive character of Greek banking, and it is entirely consistent with what we know of Classical Greek financial and commercial practice. All the bankers kept account-books, and would have to be prepared to produce them if they became involved in litigation.[14] All business, however, was done in person and not by writing, and a number of witnesses would attend any important transaction, the details of which would be established in court, not by any written record which might have been made, but by personal testimony. The speaker of Isocrates' *Trapeziticus* [15] says that contracts with bankers were made without witnesses, and many modern writers have innocently repeated this statement as if it were perfectly true. No doubt in practice many banking transactions would take place without anyone except the parties themselves being present. But in the *Trapeziticus* the speaker, who is the plaintiff in a lawsuit against Pasion the banker, is seeking to establish the existence of an alleged contract between himself and Pasion of which there were no witnesses, and anything he says on such a point must be regarded with grave suspicion. His statement is not borne out by what happened at Lycon's settlement with Pasion, at which, as we have seen, two witnesses were present. If Apollodorus was speaking the truth in the action he brought in the 360's B.C. against Timotheus (a leading Athenian general and statesman), Pasion had lent Timotheus various sums of money privately, without requiring witnesses or security [16]; but it is noticeable that Apollodorus, whose case is seriously weakened by the absence of witnesses, does not venture to repeat the assertion of the plaintiff in the *Trapeziticus* that it was normal for bankers' dealings to be carried out without witnesses. Certainly other contracts, loans, repayments and so forth were always made before witnesses. Demosthenes, in one of his private speeches, actually claims the fact that a man had never been to the Crimea as

[13] See also Ps.-Dem. 45.33. *Cf.* 49.59 (ἐν τοῖς γράμμασιν τοῖς τραπεζιτικοῖς). An individual account, as distinct from what it is written on, is a λόγος (Latin *ratio*): see, *e.g.*, Tod. I² 51A.25; II 125.77; Hdts. III 142.5; 143.1; Dem. 8.47; Ps.-Dem. 49.16; *Ev. Matt.* 18.23.

[14] See Ps.-Dem. 49.43 & 59. The entries included ὑπομνήματα (memoranda) giving particulars of each transaction: see *ibid.* 5, 8, 30. Despite κελεύοντος in Ps.-Dem. 49.43, I know of no positive evidence that anyone concerned in litigation against a banker had a legal right to demand production of his books; but refusal or failure to produce them would naturally prejudice the banker's case.

[15] Isocr. 17.2, *c.* 390 B.C.

[16] Ps.-Dem. 49.2.

evidence that he could not possibly have collected a debt payable there.[17] In other ways, too, Greek bankers of the Classical period were quite different from modern ones: for example, there is no clear evidence that they paid interest on money deposited with them. (Roman bankers sometimes did, but those who deposited money with bankers without any agreement for the payment of interest ranked as preferential creditors if the banker suffered *venditio bonorum*, a process which involved the sale of all the property of a debtor and corresponded roughly to bankruptcy in English law. If interest was payable on the deposit, the customer was not given preferential treatment over the creditors.) [18]

No doubt some men of business other than bankers would find it necessary to keep detailed accounts of their operations, if only to make sure that they were not cheated by their slaves or their associates. But to me it seems most unlikely that the ordinary Greek would have felt the need to keep regular books. He was certainly never required to do so for taxation purposes: at no time in the ancient world were taxes assessed upon money incomes. Indeed, as I have already argued elsewhere,[19] it is probable that no Greek ever had occasion to reckon his total income in money; and I see no reason to suppose that the situation was different in the Roman world. Wealth in antiquity was conceived in terms of capital, not income, and the unit of taxation, when it was not the annual produce of a man's land (reckoned in kind and not money), or simply his body (for a poll tax), was his total capital.

One form of account which the ordinary Greek might often keep was a note of debts owing to him or owed by him. In the opening scene of the *Clouds* of Aristophanes, produced in 423 B.C., Strepsiades calls for his list of debts and reads out the records of two of them,[20] the second of which is "Three minas for a chariot and wheels to Amynias." This is doubtless a typical entry, in narrative form. The account-book is spoken of as a γραμματεῖον, a wooden tablet.

In a world which did not recognise signatures as having any special value, it might be dangerous to allow one's debtor to pay the money to anyone not specifically designated at the outset. In the *Curculio* [1] of Plautus (the Greek original of which seems to date from the very end of the fourth century B.C.), a banker has arranged with his customer to pay over the money deposited with him to the person who brings a letter sealed with the customer's ring. Curculio steals the ring, writes out a letter of authorisation on a tablet, seals it with the ring,

[17] Dem. 38.11, *cf.* 12-14. See also 30.19-23; Ps.-Dem. 34.30-32; 49.51-52.
[18] See esp. *Dig.* 16.3.7.2; 42.5.24.2 *Cf.* 16.3.24, 28.
[19] In *Classica et Mediaevalia* 14 (1953), at p. 41.
[20] Lines 21-23, 31.
[1] II iii 61-69; III 36-84; IV iii, esp. 19-20.

and gets the money from the banker. The customer tells the banker he is a fool to pay any regard to tablets, but the banker retorts that all public and private business is transacted by means of them [2]—and the customer evidently realises he has no claim.

This raises the whole question of signatures in Greek and Roman documents—or rather, their absence.[3] The Greeks and Romans never signed letters or documents with their names: a man dictating a letter to his slave or subordinate might write some formula of farewell at the end with his own hand (*subscripsi, vale*, ἔρρωσο), but he might not do even this, and in any event the genuineness of the letter would be guaranteed not at all by the style of the handwriting but by other means—doubtless in many cases by the personality of the man bringing the letter. Seals were often used to authenticate documents,[4] but it is difficult to tell just how common this practice was. We may often be puzzled as to how the recipient of a letter authorising him, for example, to pay out money deposited with him could be certain that the letter came from the right person. Various expedients might be adopted by cautious business men. For example, in a Berlin papyrus [5] of A.D. 277–278 we find an order to a banker to pay out a sum of money to a third person. The document purports to be an idiograph of the writer—that is, a document written entirely in his own hand. In place of a signature, there is what appears to be a certificate by a man named Sarapion, described as a διαστολεύς and probably an accredited agent of the writer, that the order was genuine. We must remember, too, that many humble folk in the ancient world were illiterate; and although most of these may have had few possessions, there were certainly some illiterates who were property-owners [6] and might therefore need to enter into transactions involving written documents. In

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[2] An exaggeration, of course. Probably the great majority of business transactions at Athens in *c.* 300 B.C., as at Rome in Plautus's day, a hundred years later, were personal and not written. During the Hellenistic period business practices certainly developed to some extent, and banking in particular attained a higher level of organisation, especially perhaps in Ptolemaic Egypt; but I cannot understand the statement of M. Rostovtzeff (*Soc. & Econ. Hist. of the Hellenistic World* I 405) that "one of the most striking novelties [in Ptolemaic banking] in comparison with the practice of the Greek banks was the *complete change* from oral management (*partly* used in the Greek cities) to written management of banking business" [my italics].

[3] See H. Steinacker, *Die antiken Grundlagen der frühmittelalterlichen Privaturkunde* (1927) 106–122; H. F. Jolowicz, *Historical Introd. to the Study of Roman Law*[2] 430–431.

[4] See Pliny, *NH* 33.8 *et seq.*, esp. 21, 23, 25, 28; 37.8–10.

[5] *BGU* IV 1064. See F. Preisigke, *Girowesen im griech. Aegypten* (1910) 204–205; Kiessling in Pauly-Wissowa, *Realenc.*, Suppl. IV (1924) 707–708.

[6] See *Cod. Just* 10.32(31).6, of A.D. 293, stating that there was nothing to prevent illiterates from being conscripted for the duties of the decurionate ("expertes litterarum decurionis munera peragere non prohibent jura"). The decurions were those members of the curial class (see p. 48 below) who actually became local councillors.

the Egyptian papyri we very often find documents subscribed on behalf of illiterates, especially by husbands for their wives.

It is also interesting to find that when a debt or other liability is discharged or remitted, any written evidence of it is normally destroyed altogether, instead of a receipt or acknowledgment being indorsed on or annexed to the original document or given separately. This is true even of public debts due to the Athenian State.[7] The principal evidence of the discharge of the liability would be the personal testimony of eye-witnesses who saw payment being made. Written receipts do not seem to have become usual until the Hellenistic age. By at any rate the Roman period (and no doubt in fact earlier) it was quite usual to acknowledge the discharge of an obligation by drawing lines criss-cross (χιάζειν) over the face of the document embodying the original contract,[8] and that document itself was often handed back to the person who had undertaken the obligation.[9]

IV. The Hellenistic Period

For accounting in the Hellenistic period further epigraphic evidence is available,[10] not significantly different from that provided by the earlier inscriptions, and in addition we begin to have papyrus accounts from Ptolemaic Egypt in considerable numbers.[11] By far the most important single body of private accounts from the Hellenistic period is contained in the "Zenon archive" from the mid-third century B.C.: here we find the extraordinarily detailed accounts of the great private estate in the Fayum of the chief finance minister of Ptolemy II, Apollonius, whose personal agent Zenon was.[12] Zenon's accounts are far more elaborate and varied than any earlier ones we have, but the system of accounting remains essentially the same as in former times. We may notice that just as the Ptolemaic State collected its revenue and stored its surpluses in grain as well as money, and its accounts are therefore divided into those relating to

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[7] Arist., *Ath. Pol.* 47.5, 48.1; 59.3; Ps.-Dem. 58.50-51.

[8] A good example is *P. Ryl.* IV 601, as shown in the photograph (pl. 3) in that vol.

[9] As, e.g., in *P.Ryl.* II 174, lines 9-14, 21-25; 174a, lines 9-15. The document is usually said to be given up εἰς ἀπόχησιν καὶ ἀκύρωσιν.

[10] For the great series of temple accounts from Delos, from the late 4th cent. to 166 B.C., see J. A. O Larsen in *Econ. Survey of Ancient Rome* (ed. Tenney Frank) IV 334-357, where detailed references will be found. See also W. A. Laidlaw, *Hist of Delos* (1933) 139 (with 161, note 1), 153-157 (with 163, note 13). Most of the extant material (ed. F. Durrbach) is in *IG* XI ii (1912); and *Inscr. de Délos : Comptes des hieropes* nos. 290-371 (1926), 372-498 (1929), 1400-1479 (1935).

[11] Among many interesting papyrus accounts it is worth mentioning *P. Tebt.* III ii 890 (2nd cent. B.C.), part of the accounts of a bank: see on this Rostovtzeff, *op. cit.* (in note 2 above) II 1276-1277, 1284-1285.

[12] See Elizabeth Grier, *Accounting in the Zenon Papyri* (*cf.* p. 68 below). For useful descriptions of the background of the Zenon papyri, see Claire Préaux, *Les grecs en Egypte* (1947); Rostovtzeff, *A Large Estate in Egypt in the 3rd Cent. B.C.* (1922).

the State granaries and those relating to the State banks, so in the Zenon accounts we can distinguish between accounts kept in terms of money and accounts kept in terms of grain (ἀργυρικοὶ λόγοι and σιτικοὶ λόγοι).[13]

It has been suggested[14] that Zenon may have kept "ledgers" which were taken over by his successor, or the State, and were thus separated from the remaining records which Zenon retained among his personal papers. There may conceivably have been some special accounts with individuals which have not come down to us, distinct from Zenon's general accounts and corresponding roughly to what we call ledger accounts. We do find occasional evidence of such accounts in other papyri of the Hellenistic and Roman periods.[15] It would be a mistake, however, to think of these as "ledger accounts" in anything like our sense of the term, for they certainly did not form part of a unified system of book-keeping. The essential point is that even if a banker or merchant or estate owner did think it worth while to keep separate individual accounts for particular persons, the existence of any such accounts would necessitate no special entries in his other accounts. At all costs we must avoid the tendency to think in terms of an integrated system: that is just what was lacking in all ancient accounting. Elaborate and minutely detailed as the Zenon accounts are, their purpose was very much more limited than that of comparable estate accounts today: it was not to enable Apollonius to draw up at regular intervals complete "profit and loss accounts" and "balance sheets" (nothing of this sort appears in antiquity), not to assist him to obtain the highest possible rate of profit out of his estate, but simply to prevent theft, embezzlement, fraudulent conversion and other avoidable losses due to carelessness and the like. This, indeed, was the one major aim of all ancient accounting. The great man might occasionally make a snap check of cash in hand, and in one papyrus[16] we find a correspondent warning Zenon that Apollonius, finding seven talents missing from a chest, had ordered two of his clerks to produce their accounts for his inspection. Evidently large numbers of clerks were employed in the accounting offices on Apollonius's estate. The wages of some of them seem to have been little higher than those paid to unskilled labourers.[17]

In one or two papyri of the Hellenistic period containing lists of payments due from or made by different individuals there is some attempt to put the names in alphabetical order—a feature which we

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[13] *Cf.* pp. 21-22 above.
[14] Grier, *op. cit.*, 14.
[15] See, *e.g.*, *UPZ* I 83, 97, 99, 101, 103-105; *P. Oxy.* X 1289; IV 739; *P. Tebt.* I 241, 250.
[16] *PSI* IV 411.
[17] Grier, *op. cit.*, 11-12.

also find in some papyrus accounts of the Roman period, but which I rather think took some time to re-emerge after the Dark Ages.[18] The practice, however, is sometimes conspicuous by its absence just where we might reasonably have expected to find it; and even where it does occur, the order is not rigorously kept.

Bureaucracy, always endemic in Egyptian State administration even under the Pharaohs, grew steadily during the Hellenistic age, both in Ptolemaic Egypt and (if to a smaller extent) in the kingdoms of the other successors of Alexander. The Greek cities, in which bureaucracy never really flourished before the Roman period, developed quasi-bureaucratic features in their attempts to check corruption in public administration. Cicero,[19] in his speech for Flaccus, delivered in 59 B.C., permits himself some heavy sarcasm—which has a curiously modern ring—about the municipal bank of the city of Temnos, in north-west Asia Minor: the town, he says, is " very businesslike, and most proficient in paper-work (*acerrima et conficientissima litterarum*). Not a farthing can change hands without the intervention of five praetors, three quaestors and four bankers, elected there by the people."

The fact that I have devoted very little space to accounting in the Hellenistic age, compared with the Classical Greek and Roman periods, must not be taken to imply that our knowledge of accounting in Hellenistic times is relatively small or that Hellenistic accounting is relatively uninteresting. On the contrary, owing to the survival from the Hellenistic period of so many accounts (mainly private) on papyrus, in addition to sacred or public accounts on stone, we have a far greater variety of actual accounts from Hellenistic than from Classical Greek times; and, as we shall see, no very important general advances in method can be traced in the Roman period.

V. Roman Accounting

We can conveniently consider at one time accounting at Rome during the late Republic (the last two centuries B.C.) and throughout the Graeco-Roman world in the Roman Imperial period (the early centuries of the Christian era). Our sources of information in this field are rather different in character from the sources for the Hellenistic period. The epigraphic evidence becomes negligible, but we have documentary papyri from Egypt in even greater numbers than before, including now a few in Latin,[20] the legal sources become

[18] The Hellenistic examples are *P. Tebt.* I 93, 94 (*c.* 112 B.C.). The Roman ones are *P. Fay.* 153 (1st cent. C.E.); *BGU* II 659 (A.D. 228-229); *P. Lond.* I p. 142, no. 119 (2nd cent.); *P. Col.* II, (2nd cent.). See Preisigke in *Arch. Pap.* 4 (1908), at p. 103.

[19] *Pro Flacc.* 19.44.

[20] See esp. pp. 38-40 and Figure IV below.

available, and the literary evidence is richer again. Our main texts are now the papyri, the Roman law books (especially of course the *Digest*), some speeches and other works of Cicero, and the *scriptores rei rusticae*, the writers on estate management—Cato, Varro and Columella. The information we can derive from these sources is fragmentary, but surprisingly copious when all the little pieces are put together. It is impossible in this outline of Greek and Roman accounting to give more than a brief summary of it, and draw attention to some of the more important pieces of evidence.

Although there is perhaps some advance in method and precision during the period we are now considering, there is no fundamental change. Bureaucracy continues to increase, and with it the further multiplication of public accounts. (In the year 194 we even find a local scribe and acting *strategus* writing an official letter[1] from himself in one capacity to himself in another capacity: he addresses himself as "my dearest friend" and politely says goodbye to himself at the end.) Certain improvements in method are visible here and there: some of them will be described presently. However, in accounts of the Roman period in general there is no really significant advance in the system of accounting: capital and income are still not properly separated; the conceptions of credit and debit, although they may seem to make fitful appearances now and again, especially in records of debts, never actually materialise as permanent features of accounting; a system of interlocking accounts with double entry, of course, is undreamt of; and the basic purpose of accounting remains what it always was in antiquity—to expose losses due to fraud or inefficiency on the part of the proprietor's servants and others. For this purpose ancient book-keeping was probably quite efficient, if at a great cost in clerical manpower. We must not belittle the intelligence of the Greeks and Romans because they did not try to do what the nature of their economic system made it unnecessary for them to attempt.

Improvements in methods of accounting during the Roman period, when they do appear, are not consistently maintained and are confined to isolated papyri or groups of papyri. Three such improvements are worth special mention. In a few accounts from Roman Egypt we find certain small items of expenditure described by some such term as λεπτὴ δαπάνη,[2] which we may fairly translate "petty cash." However, this does not mean that the modern notion of petty cash which can be spent as such without detailed explanation has become a regular

[1] *W. Chr.* 52=A. S. Hunt and C. C. Edgar, *Select Papyri* (Loeb) II no. 301, pp. 312-314.

[2] *e.g.*, λεπτῆς δαπάνης in *P. Goodsp. Cair.* 30, col. xxxvii, line 17; and probably in *P. Oxy.* III 522, line 29. *Cf.* λεπτῶν in *P. Oxy.* VI 920, line 4. Contrast pp. 25-26 above.

feature of Graeco-Roman accounting: the papyri in question are exceptional, and the more usual practice is still to insert separately every individual disbursement, however small. Again, in at least one papyrus,[3] of the first century, we find what must be cross-references to another account. Our papyrus contains a banker's list of taxpayers, arranged more or less alphabetically, with the instalments of tax paid through the bank entered against the names. Preisigke has demonstrated that the abbreviation K° with a numeral, against each entry, must stand for κολλήματος[4] and must denote the appropriate numbered column of the "cash-book" (if we may call it that—it would actually have been a papyrus roll) in which the banker evidently entered up all payments of this particular tax in chronological order.[5] But the presence of cross-references in the papyrus we are considering does not imply that the account it contains was in any way integrated with others in a unified system of accounts: as I have said before, that was a stage of development which ancient accounting never reached, even if occasionally two or more individual accounts are found to be connected in one way or another.

The third and most interesting of the advances in accounting method which are observable in the Roman period is the adoption of bilateral form in the account from Karanis referred to above,[6] dating apparently from the years 191–192 and contained in a papyrus roll having forty-seven columns of writing, each of which must be a little under four inches wide. Unfortunately the editor, Goodspeed, did not provide a photograph of any part of the papyrus, but we must assume that his text is a faithful transcription of the original, in form as well as substance. The particulars given against each entry are mostly very brief indeed: "From Arches" or "For meat," or at most "To Pamounis, for the rope-makers" or "Food for 5 asses to Memphis." The account was evidently drawn up not as each transaction occurred but on the basis of other material, apparently consisting of some general day-to-day records, described in a marginal note[7] as χειρόγραφα, supplemented by odd memoranda, one of which is also referred to in the same note as a πιττάκιον, presumably a tablet. The existence of further details in the rough records, so long as these were preserved, would make up for the brevity of the entries in the roll; but I should mention that very many other papyrus accounts have similarly imprecise and uninformative entries.

The unique characteristic of this account, which is the private cash

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[3] *P. Fay.* 153: see Preisigke, *op. cit.* in note 18, p. 33 above; *cf.* C. Wessely, *Stud. Pal.* IV (1905) 119–121.
[4] See p. 69 below.
[5] *P. Cornell* 21 is a specimen of this kind of "cash-book."
[6] *P. Goodsp. Curr.* 30: see pp. 20–21 above.
[7] Col. iv, line 5.

account of the manager of an estate in the Fayum, is that all the figures representing receipts and payments respectively, and the explanatory verbal entries, are separately aligned vertically within each column of writing on the roll. Another interesting feature of the same account is the fact that entries in the receipts column are frequently balanced by the entry or entries next following in the payments column. I have set out, in a literal translation (Figure III),

Figure III

From Dioscorus	*36 dr.*	
	To Antonas for the price of [- - -]	*36 dr.*
From Dioscorus	*72 dr.*	
	To Paseinicus	*12 dr.*
	,, me for a symbole	*8 dr.*
	,, Sempronius for wheat	*52 dr.*
From Dioscorus	*100 dr.*	
	To Agrippinus for vegetables	*100 dr.*
From Dioscorus	*18 dr. 2 ob.*	
	To Pamounis	*18 dr. 2 ob.*
(Date) *From Dioscorus*	*56 dr.*	
	To Soterichus for Antinous	*?56 dr.*
(Date) *From Dioscorus*	*124 dr.*	
	To Soterichus for Copres	*124 dr.*
From Dioscorus for 4 jars of wine 64 dr.		
	To Antonas for 2 (measures) of oil	*32 dr.*
	,, Agrippinus for 2 (measures) of vegetables	*32 dr.*
From Dioscorus for 10 jars of wine for me at 16 dr. each		
160 dr.	*To me for drink*	*160 dr.*

the first nineteen lines of column xxiv, the portion of the account in which this procedure is most consistently employed. Elsewhere in the account, although there are plenty of similarly corresponding entries, there are also many independent items which appear in one column only, without our being able to connect them with any particular entries in the other column; and I can see no trace of any attempt to make the two columns "balance." There are no totals in the body of the account: whether there were at the end we cannot tell, as the final column is entirely illegible. The editor of the papyrus jumped to quite unwarrantable conclusions when he used the expressions "a method much like modern double-entry bookkeeping," and "spasmodic double-entry accounting." Before we can speak of "double entry," of course, we must have entries in two different accounts, not merely two sides of a single account.

Nevertheless, this papyrus does seem to me to represent in some ways the high-water-mark of ancient book-keeping. The disposition of the figures in two separate columns could only have been a matter of convenience, not a point of principle, as in modern accounting; but it would obviously have been a great help to anyone checking the account or trying to identify particular entries, even if, for reasons arising out of the nature of the Greek numeral system (to be explained in section VI of this essay), the alignment of the figures in

columns would not make it any easier to add up the figures, as it would if Arabic numerals had been employed. As I have said, I know of no other example of bilateral form in any other ancient account, among the hundreds which have survived. Our papyrus cannot, of course, have been the only one of its kind; but even if a few others should turn up, it would still be true to say that bilateral form was an exceptional and incidental feature found in only an insignificant proportion of ancient accounts. Often one finds a tendency to group together receipts and payments respectively, but the arrangement is seldom rigorous, and as a rule all that happens is that little blocks of receipts and payments follow each other, with totals given at the end of each block.[8]

The complete difference between ancient and modern objectives and methods in estate accounting has been emphasised by the Finnish scholar, Gunnar Mickwitz, in a brief but profound analysis[9] of the aims and achievements of the book-keeping of Graeco-Roman landowners, a study based upon a thorough knowledge of the papyri and of the treatises on farming methods of Cato, Varro and Columella. Mickwitz points out that it was hardly possible for a large Roman landowner who went in for different kinds of agricultural activity to tell which kinds paid best, because his inadequate accounting system did not permit separate costing. The corn grown on the estate which was given as wages to hired vine-dressers, or fed to slaves doing this work, would not be entered in the vineyard accounts, and hence the landowner would not know the net income attributable to vine-growing and corn-growing respectively, nor could he assess the financial consequences of employing less or more labour in his vineyard. In the elaborate estate accounts included in the Heroninus papyri of the third century, for instance, the wine produced on the estate is treated as an item of stock and records are kept of the quantities sold or given to employees as wages; but the wine accounts do not contain any information about the value of wine given to employees or even the amounts realised from the sale of the wine, which must have been entered separately; and thus the landowner could never properly estimate the profitability of his vine-growing

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[8] See, *e.g.*, *P. Oxy.* XVIII 2195. (For the many errors of calculation in this account, see the editors' notes on pp. 166-167 of *P. Oxy.* XVIII.) Another interesting example is *P. Amh.* II 126-127. Here the ultimate balances are right (126) or only 1 obol out (127), but in each case the individual totals both of receipts and of payments are wrong. I suggest that the reason for this is that the clerk concerned always kept running balances checked against the cash in hand, and hence got his final results right, and that only when he was completing the accounts did he give individual totals of receipts and expenditure, which remained unchecked.

[9] "Economic Rationalism in Graeco-Roman Agriculture," in *Eng. Hist. Rev.* 52 (1937) 577-589. The neglect of this important paper, especially by historians of accounting, may be due partly to its rather unfortunate title.

from the information in his accounts.[10] It is not surprising to find that the Roman agricultural writers never think of advising a man who is buying a farm to examine the vendor's accounts.[11]

Columella,[12] who wrote about A.D. 60, tries to make a conservative estimate of the profits to be derived from vine-growing; but he takes into account, in making his calculations, nothing but the cost of the land, of the slave vine-dresser, and of vines and stakes and setting them out, with interest at 6 per cent. on this expenditure—he ignores the amortisation of the vine-dresser, the cost of maintaining him, and of fertilisation, the hiring of casual labour, and all other current expenses. It is interesting to find that the items which Columella ignores are just those which the ancient accounting system ignored. Even the distinction, elementary to us, between capital and income, without which profits and losses cannot be accurately computed, was never thoroughly understood in ancient times, and only to a limited extent do ancient accounts recognise the distinction.[13] It would be impossible for the ancient landowner to estimate in advance, or even calculate in retrospect, from the material contained in his accounts, the profitability of making capital improvements. Mickwitz is certainly right, in my view, in claiming that recent opinion has tended to overestimate the extent to which Graeco-Roman farming can be considered to have been "scientifically managed." We must always remember, however, that the whole purpose of ancient accounting was not to measure the rate of profit or loss but to keep accurate records of acquisitions and outgoings, in money and kind, and to expose any losses due to dishonesty or negligence.[14] In this respect, private accounts came much closer to public accounting than a modern accountant would have expected; and indeed the methods of Greek and Roman public and private accounting are strikingly similar, in the main indistinguishable, their objectives being much more nearly identical than in modern times.

Of the scores of public and private accounts of the Roman period preserved on papyrus the vast majority are in Greek, but there are a few in Latin, and fortunately one of these[15] is particularly suitable for reproduction here. A photograph of the original papyrus is given

[10] Mickwitz (pp. 580, 588 589) claims that there was no fundamental change in accounting method in these respects until after the appearance in 1770 of Arthur Young's *A Course of Experimental Agriculture*.

[11] And see Mickwitz, *op. cit.*, 583-584.

[12] *RR* 3.3.

[13] And see p. 29 above.

[14] See Cic., *pro Font.* 2.3: "res ipsa tamen ac ratio litterarum confectioque tabularum habet hanc vim, ut ex acceptis et datis quidquid fingatur aut surripiatur aut non constet appareat."

[15] *P. Gen. Lat.* 1=J. Nicole and Ch. Morel, *Archives militaires du Ier siècle* (1900). See also Th. Mommsen, *Ges. Schr.* VI 118-127 (=*Hermes* 35, 1900, 443-452); A. von Premerstein, in *Klio* 3 (1903) 1-46. Premerstein's date, A.D. 80-81, may be right.

in Plate III. The document contains, among other things, the official pay-sheets of two Roman soldiers (almost certainly legionaries) stationed in Egypt, probably in 83–84, the third year of the reign of the emperor Domitian. I give in Figure IV first a transcript of the two pay-sheets as they appear in the papyrus. I have restored the passages which are now illegible, relying at many points on the original editors of the papyrus. Nearly all the entries are repeated several times over, and in most cases an indecipherable entry can be restored with certainty by comparison with similar ones which can still be read. In the transcript a full stop after a word indicates that it is an abbreviation. Next I give a separate translation of each soldier's account, with Arabic numerals in place of the Roman ones, and with the three successive instalments of pay placed side by side instead of vertically, to save repetition of the explanatory entries. It will be seen that the method of accounting is elementary, each instalment of pay being treated separately. I may add that in regard to both method and lay-out this account is if anything an improvement on most papyrus accounts: with the exception of the papyrus roll from Karanis which has been discussed above, I know of none which is significantly better in either respect, and few are as good.

Figure IV

Q. IULIUS PROCULUS ?DAM.?

Accepit stip. I an. III Do. ex eis	*dr. ccxlviii*
faenaria	*dr. x*
in victum	*dr. lxxx*
caligas fascias	*dr. xii*
Saturnalicium k.	*dr. xx*
in vestitorium	*dr. l.*
expensas	*dr. clxxxii*
reliquas deposuit	*dr. lxvi*
et habuit ex priore	*dr. cxxxvi*
fit summa	*dr. ccii*

Accepit stip. II anni eiusd. ex eis	*dr. ccxlviii*
faenaria	*dr. x*
in victum	*dr. lxxx*
caligas fascias	*dr. xii*
ad signa	*dr. iv*
expensas	*dr. cvi*
reliquas deposuit	*dr. cxlii*
et habuit ex priore	*dr. ccii*
fit summa omnis	*dr. cccxliv*

Accepit stip. III anni eiusd. ex eis	*dr. ccxlviii*
faenaria	*dr. x*
in victum	*dr. lxxx*
caligas fascias	*dr. xii*
in vestimentis	*dr. cxlvi*
expensas	*dr. ccxlviii*
habet in deposito	*dr. cccxliv*

C. VALERIUS GERMANUS TYR.

Accepit stip. I an. III Do. ex eis	*dr. ccxlviii*
faenaria	*dr. x*
in victum	*dr. lxxx*
caligas fascias	*dr. xii*
Saturnalicium k.	*dr. xx*
in vestimentum	*dr. c*
expensas	*dr. ccxii*
reliquas deposuit	*dr. xxvi*
et habuit	*dr. xx*
fit summa omnis	*dr. xlvi*

Accepit stip. II anni eiusd. ex eis	*dr. ccxlviii*
faenaria	*dr. x*
in victum	*dr. lxxx*
caligas fascias	*dr. xii*
ad signa	*dr. iv*
expensas	*dr. cvi*
reliquas deposuit	*dr. cxlii*
habuit ex priore	*dr. xlvi*
fit summa omnis	*dr. clxxxviii*

Accepit stip. III anni eiusd. ex eis	*dr. ccxlviii*
faenaria	*dr. x*
in victum	*dr. lxxx*
caligas fascias	*dr. xii*
in vestimentis	*dr. cxlvi*
habet in deposito	*dr. clxxxviii*

Q. Julius Proculus, from ?Damascus?

First instalment of pay, third year of Domitian		*dr. 248*	*Second instalment*	*dr. 248*	*Third instalment*	*dr. 248*
Deduct						
hay	*dr. 10*		*dr. 10*		*dr. 10*	
food	*,, 80*		*,, 80*		*,, 80*	
boots and straps	*,, 12*		*,, 12*		*,, 12*	
camp Saturnalia(?)	*,, 20*		- -		- -	
clothing	*,, 60*		- -		*,, 146*	
?burial club?	- -		*,, 4*		- -	
Total deductions		*,, 182*		*,, 106*		*,, 248*
Balance deposited		*,, 66*		*,, 142*		- -
Brought forward		*,, 136*		*,, 202*		
Total on deposit		*,, 202*		*,, 344*		*,, 344*

C Valerius Germanus, from Tyre

First instalment of pay, third year of Domitian		*dr. 248*	*Second instalment*	*dr. 248*	*Third instalment*	*dr. 248*
Deduct						
hay	*dr. 10*		*dr. 10*		*dr. 10*	
food	*,, 80*		*,, 80*		*,, 80*	
boots and straps	*,, 12*		*,, 12*		*,, 12*	
camp Saturnalia(?)	*,, 20*		- -		- -	
clothing	*,, 100*		- -		*,, 146*	
?burial club?	- -		*,, 4*		- -	
Total deductions		*,, 222*		*,, 106*		*(,, 248)*
Balance deposited		*,, 26*		*,, 142*		- -
Brought forward		*,, 20*		*,, 46*		
Total on deposit		*,, 46*		*,, 188*		*,, 188*

In what follows more use will be made of the legal and literary sources than of the papyri, from which it is difficult to extract more than negative generalisations.

First, it will be desirable to clear out of the way a misconception which has appeared again and again in the works of modern writers on Roman accounting[16]: the supposed evidence for double-entry book-keeping in the form of the Roman "literal contract" (*obligatio litteris* or *litterarum*). As this subject involves some highly technical questions of Roman law, I have dealt with it separately in Appendix C (pp. 72–74 below) and need not enter into any discussion here. I will only say that the literal contract certainly provides no evidence of the existence in Roman times of double-entry book-keeping or any anticipation thereof.

[16] Most recently C. A. Smith, "Speculations on Roman Influence on the Theory of Double-Entry Book-keeping," in *Accounting Research* 5 (1954) 335-342.

It is worth spending a little time on some of the references in Cicero to the keeping of accounts in his own day. His speech for Q. Roscius, the famous actor, dating from about 77 B.C., is concerned with a financial transaction; and here we have an interesting description—the only one I know of in ancient literature—of the accounts which the ordinary well-to-do Roman would keep.[17] It seems that two kinds of account-books were distinguished—if not as emphatically as Cicero makes out: he has particular reasons in this speech for exaggerating the difference between the two varieties of record and for belittling one variety.[18] First, there were *adversaria*[19] (the Greek ἐφημερίδες), which were rough records or memoranda. There is no harm in referring to them as "day-books" or "waste-books," but in order to avoid inapposite comparisons with modern accounting practices it is better to keep to some non-technical term like "memoranda." I know of no certain evidence as to what the memoranda were written on: waxed tablets often, no doubt, and possibly parchment codices, but usually, I fancy, papyrus, in loose sheets or rolls, probably as a rule the back (*verso*) of sheets or rolls already used on the front (*recto*) for other purposes. In a sculptured relief (see Plate 1) on a funeral monument from Serbia (Pannonia)[20] we find a slave reading from a papyrus roll to his master, a banker perhaps, who sits holding a writing-tablet at a table on which lies a bag of coins. It seems very likely that both the papyrus roll and the writing-tablet were intended to represent accounts, the papyrus perhaps containing the *adversaria*. Secondly, there were the *tabulae* proper, which are referred to indifferently by Cicero in the same passage (not to mention many others) as *tabulae*,[1] *tabulae accepti et expensi*,[2] *codex*,[3] *codices*,[4] *codex accepti et expensi*.[5] Obviously a man's permanent accounts might be called by any of these names; they might equally well be referred to as *rationes*, a term which Cicero and other writers tend to employ more in the abstract sense (corresponding to the Greek Λόγοι), using *tabulae* and *codex* for the actual physical objects on which the accounts were kept. It is quite fantastic to try to distinguish, as Voigt

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[17] Cic., *pro Q. Rosc. com.* 1.1 to 3.9.

[18] See the latter part of note 14, p. 74 below.

[19] For which see Corn. Nep., *Attic.* 13.6; Propert. III xxii (*Ergo tam doctae*) 19-20; Ovid. *Am.* 1.12.25-26; Sen., *Ep.* 123.10. *Diarium* in this sense appears only in Asellio *ap.* Gell. 5.18.8. *Cf.* perhaps the χειρόγραφα mentioned on p. 35 above; also in *P. Mich.* IV i 225, lines 3024, 3350; *P. Oxy.* X 1257, line 10; *Stud. Pal.* IV p. 57 (col. IV, line 1); XX 85[v], line 1 (p. 76).

[20] See M. Rostovtzeff, *Soc. and Econ. Hist. of the Roman Emp.*, pl. xxxiii 1. The original is in the Belgrade Museum.

[1] *Pro Q. Rosc. com.* 1.1 (4 times); 1.2; 1.3; 1.4 (twice); 2.5 (twice); 2.6; 2.7 (twice); 3.8 (twice); 3.9; 4.12; 4.13 (twice) = 19 times.

[2] *Ibid.*, 1.2 only.

[3] *Ibid.*, 1.1; 1.4; 2.5; 2.6 (twice); 2.7 = 6 times.

[4] *Ibid.*, 1.4; 5.14 = twice.

[5] *Ibid.*, 1.4; 2.5; 3.8; 3.9 = 4 times.

did,[6] between a *codex rationum* or *tabulae rationum* on the one hand and on the other a special *codex accepti et expensi*—an expression found nowhere but in the speech for Roscius,[7] although the term *tabulae accepti et expensi* also occurs once in that speech and in one or two other places.[8] It is abundantly clear that *codex* (or *tabulae*) *accepti et expensi* was simply another name for the permanent accounts kept by a Roman, or the portion of those accounts recording the receipt and payment of money—as distinct, for example, from special accounts with individuals, schedules of property and the like, which might also form part of a man's account-books. The terminology is untechnical and indiscriminate: no Latin word or phrase is known to us as having been consistently applied in a technical sense to any particular kind of account or account-book, except *kalendarium* (*kalendarii liber*),[9] an expression which seems always to have denoted a man's record of outstanding debts, the name being derived from the fact that the date at which the debt became due would be specified in the record. As we have just seen, Voigt would oppose to the *codex* (*tabulae*) *accepti et expensi* a *codex* (*tabulae*) *rationum*, as the general account-book of every Roman. But the expression *codex rationum*, as far as I can discover, never occurs at all in Latin literature and is found only once in the legal sources [10]: there it refers to the accounts of bankers (*argentarii*), who would always need to keep accounts on a considerable scale, as the ordinary Roman would not. There is in fact no reason to believe that all Romans kept detailed accounts.[11] Voigt's *codex rationum domesticarum*,[12] the private account-book which he believed every Roman kept, appears to be entirely his own invention: the expression seems not to be used in any surviving source. If we take the earliest surviving portion [13] of Cicero's speech for Q. Roscius, we find the term *tabulae* by itself used nineteen times, *codex* by itself six times, *codex accepti et expensi* four times, *codices* twice, *tabulae accepti et expensi*

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[6] See pp. 66-67 below. According to Voigt (pp. 541 *et seq.*) the *codex accepti et expensi* was nothing but "das Litteralgeschafts-Journal des Burgers," *i.e.*, it recorded only transactions coming under the heading of *obligatio litteris* (on which see Appendix C below). The unwary reader who does not verify Voigt's references may not realise that his theory about the *codex accepti et expensi* is entirely devoid of foundation.

[7] 1.4; 2.5; 3.8; 3.9.

[8] *Ibid.*, 1.2; *II Verr.* ii 76.186; Auson., *Grat. actio ad Gratian. imp. pro cons.* 23 (ed. R. Peiper, p. 359). In Plaut., *Most.* I iii 147 we find "ratio accepti atque expensi," but this is a metaphor ("bene igitur ratio accepti atque expensi inter nos convenit: tu me amas, ego te amo").

[9] See Mart. 8.44.11, and many passages in the *Digest*, *e.g.*, 31.1.88.pr.; 33.8.23.pr.; XXXII 34.1; 41.6; 64; 91.pr. An action for interest might be called *actio kalendarii*: *ibid.*, 26.7.39.14.

[10] In *Dig.* 2.13.10.2.

[11] *Cf.* p. 44 below.

[12] Voigt, *op. cit.*, 533-535.

[13] 1.1 to 5.15.

once.[14] Except as I have already indicated in regard to the use of *codex* (*tabulae*) *accepti et expensi* in a sense roughly equivalent to our "cash book," it is impossible to draw any general distinction between these terms, in the speech for Q. Roscius or elsewhere, and I shall translate them all "accounts" or "account-books," sometimes using "cash book" for *codex* (*tabulae*) *accepti et expensi*.

In the lawsuit in which Cicero was briefed for the defence of Roscius the actor, the plaintiff C. Fannius Chaerea claimed that Roscius owed him a large sum of money. "We demand your accounts," Cicero[15] says to Fannius, "and we don't object to having the action decided by them. Why don't you produce them? Doesn't he keep accounts? Indeed he does, most diligently. Doesn't he enter even trifling accounts in his books? He does indeed: everything. Is this a small and trivial account? It's 100,000 sesterces." And so on. Fannius claimed, it appears, that the vital entry was in his memoranda, his *adversaria*, though not in his permanent cash book, his *codex accepti et expensi*. Cicero pours scorn on this. "Have you such an overblown conceit of yourself," he asks, "that you expect people to pay money on the strength not of your account-books but of your memoranda? . . . If memoranda have the same force, precision and authority as proper accounts, what's the use of keeping books? . . . Why do we write up our memoranda carelessly, but keep our accounts diligently? Why? Because the former are intended to last for a month only, the latter for ever; the former are expunged immediately, the latter religiously preserved"—and so forth. "Therefore," Cicero goes on, "no one ever produced his memoranda at a trial; one produces one's books and reads out the accounts. . . . I ask you, Fannius, how long is it since you made this entry in your memoranda? He blushes. He doesn't know what to answer. He's at a loss for anything to invent offhand. 'It's two months ago,' you will say. Still, it ought to have been entered in your cash book. 'It's more than six months.' Why then is it left so long in your memoranda? What if it is more than three years ago? How is it that when everyone who keeps accounts enters up his books more or less monthly, you let this entry remain in your memoranda more than three years?"

It is nearly always dangerous to accept the statements of a Greek or Roman forensic orator at their face value; but here it seems fairly safe to conclude that men of property at Rome often did write up their permanent account-books (or rather, get their slaves to do this, and then check the result) about every month, from their *adversaria*, as indeed Cicero's friend Atticus apparently did.[16]

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[14] See notes 1-5 above.

[15] *Pro Q. Rosc. com.* 1.3-3.8.

[16] See Corn. Nep., *Attic.* 13.6. *Cf. P. Ryl.* IV 629, 630-638, part of the private accounts of Theophanes, a Roman civil servant of fairly high position in Egypt

There are some interesting references to book-keeping in the "Verrine orations," Cicero's great speeches dating from 70 B.C. against Verres, the iniquitous governor of the province of Sicily during the years 73 to 70. In the first of the five speeches of the so-called *Actio Secunda in Verrem*,[17] Cicero is accusing Verres of having appropriated and not bought certain statues which he had somehow acquired during his governorship. He lays great stress on the fact that Verres cannot show any entry in his accounts relating to the purchase of the statues. "Show in your accounts (*in tabulis*), or in your father's, that any one of them was bought, and you have proved your case." Cicero speaks as if Verres had claimed that he had kept personal accounts up to the year 73 but had then ceased to do so. Naturally Cicero makes great play with this, claiming it as proof of the concealment of villainy. "We hear," he says, "that some men have never kept accounts. There may be people who behave like this, but it's not at all proper (*minime probandum*)." But to keep accounts for a time and then suddenly stop—Cicero finds it easy to ridicule this.

It is often asserted that every Roman *paterfamilias*[18] was legally bound to keep proper accounts. The passage I have just quoted[19] shows that this is an exaggeration: Cicero simply says it is "not done" not to keep accounts, and there is nothing in the sources to make one think that there was any legal duty in this respect, except of course as regards bankers (*argentarii*), who in practice were obliged to keep books, properly dated, and to produce them in legal proceedings whenever they were required to do so. There were quite elaborate and very sensible rules governing the production of bankers' books, which will be found in the chapter of the *Digest* headed "De Edendo."[20] Only a banker, then, would be certain to keep formal accounts. Other people might be equally strict, however; and we find Cato[1] advising the landowner to go over the cash accounts and the inventories[2] of grain, fodder, wine and oil every time he arrived

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in the early 4th century: here we find totals of expenditure given for each day, each period of five days, and each month, a procedure which seems to be without parallel among known papyri. There is another interesting feature of the accounts in the Theophanes archive: in addition to the fair copies, rough drafts of some of the accounts (nos. 630 638) also survive, not significantly different from the final versions in form or content. There are no financial memoranda belonging to a preliminary stage in the accounting.

17 Cic., *II Verr.* i 23.60-61. The speeches of the *Actio Secunda* were not actually delivered, and they now appear in the form in which Cicero afterwards wrote them up for publication.

18 No one *in potestate* would keep accounts, according to Cic., *pro Cael.* 7.17.

19 Cic., *II Verr.* i 23.60.

20 *Dig.* II xiii: see in particular 4 (esp. pr., 1, 4); 6 (esp. 3, 6, 7, 8); 8 pr.; 9.2; 10.pr., 1, 2. And see *Cod. Just.* 2.1.

1 *RR* 2.5; 5.4. It was Cato, according to Plutarch (*Cato Maj.* 21), who declared that a man showed admirable and indeed positively godlike qualities if it appeared from his accounts at his death (ὡς ἀποθάνοι . . . ἐν τοῖς λόγοις) that he had acquired even more property than he had inherited.

2 Cato, of course, uses the same word: *rationes.*

on his farm, and frequently to check the account of his slave steward (*vilicus*). Sometimes we hear of special accounts: for instance, a master's private account,[3] an account as between guardian and ward,[4] or husband and wife.[5] A wealthy man would have an inventory or inventories of his property in which different possessions were entered up under different headings[6]: these inventories might be collectively known as the *libellus familiae*.[7] The owner of a large estate might have a running record kept for him in narrative form, containing notes of interesting occurrences on the estate as well as matters of financial importance[8]: this would probably go by the name of *commentarii*. Anyone who had money out on loan would keep records of it in a *kalendarium* (*kalendarii liber*).[9] Practice evidently varied greatly, however, from person to person, and each man kept only such accounts as he felt to be necessary.

In the second speech of the *Actio Secunda in Verrem* there is a brilliant denunciation of Verres for having entered into shady transactions with tax-farmers under a false name.[10] While examining the accounts of Carpinatius, local manager in Sicily of a tax-farming company, Cicero came across a number of entries in which the name C. Verrutius appeared. "Holding the accounts in my hands," says Cicero, "I suddenly noticed entries which bore the traces of recent wounds inflicted upon them (*quaedam vulnera tabellarum recentia*)"; and he goes on to show that C. Verrutius is an afterthought, replacing the name of the wicked governor himself. "Come out into the middle of the court," he says to the clerk, "and open up the copy of the accounts, so that everyone can see, not merely the traces of that man's avarice, but the very bed in which it lay."

Perhaps the most important of all the passages in the *Verrines* which have to do with accounting is the one in which Cicero reads out, with a scornful commentary, the accounts which Verres gave in to the Roman State, as required by law, in respect of his quaestorship in 84 B.C., when he was attached to the consul Cn. Papirius Carbo, operating in Gaul. This is an extraordinary document. It gives no details at all, but simply says, "I received 2,235,417 sesterces. I spent on army pay, corn, the legates, the proquaestor and the praetorian cohort 1,635,417 sesterces. I left at Ariminum 600,000 sesterces. The account rendered to P. Lentulus and L. Triarius,

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[3] *Dig.* 40.1.6.
[4] *Dig.* 26.7.46.5.
[5] *Dig.* 23.3.9.3 (really an inventory).
[6] See esp. *Dig.* 33.10.7.2.
[7] *Dig.* 32.99.pr.; *cf.* 33.10.3.5.
[8] See Petron., *Sat.* 53—an entertaining passage.
[9] See p. 42 above.
[10] Cic., *II Verr.* II 76.186 to 77.190.

urban quaestors, in accordance with a decree of the Senate." [11] It is true that this account was handed in during a confused and revolutionary period, and that Cicero inveighs bitterly against the extraordinary impudence of a man who could hand in accounts as brief as this—" Is this rendering accounts? Did you or I, Hortensius, or anyone else ever submit accounts in this fashion? What have we here? What impertinence! What audacity! What parallel is there for this among all the accounts that have ever been rendered? " Nevertheless, some thirteen or fourteen years had passed, and Verres' accounts had evidently been accepted.

More than one writer, including Beigel,[12] has speculated about the form in which these accounts were actually handed in. This is absurd. There is no doubt about the form of the account: it was submitted and filed in the exact words which appear in the speech. Cicero is reading from the document itself or an office copy: this is clear from the inclusion of the official formula at the end of the account: " P. Lentulo, L. Triario quaestoribus urbanis, res rationum relatarum, ex Senatus consulto." The document is in narrative and not tabular form—but that is exactly what we must expect of Greek and Roman accounts.

Before we go on to our last section, dealing with Greek and Roman numerals, we may glance at the terminology of Roman book-keeping and notice some of the expressions which habitually recur in the sources. A few references must suffice for illustration, out of a far greater number of almost equal interest which might be given.

The usual expression for making what we should call a credit entry is *acceptum* (or *accepto*) *referre*,[13] or *ferre* [14]; for a debit entry *expensum* (or *expenso*) *ferre* [15]—not (or very rarely) *referre*, although at least once [16] we have *nomen referre* in the sense of *expensum referre*. An account is a *nomen*,[17] and the same term can be applied to any individual entry in an account.[18] *Nomen* can also mean a

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[11] *II Verr.* i 14.36-37. *Cf.* Cic., *ad Att.* 7.1.6. from which it appears that Cicero's staff expected him to distribute among them the whole surplus (HS 1,000,000) of the official funds he had received as proconsul of Cilicia. Evidently these official accounts would give only the most general particulars of expenditure, and nothing like " vouchers " would be required.

[12] *Op. cit.*, on p. 67 below, 177 *et seq.*

[13] Cic., *II Verr.* i 36.92,93; 39.100,102; ii 70.170; *pro Caec.* 6.17; *pro Font.* 2.3; Suet., *Tib.* 15.2; *Dig.* 23.3.48.1; 32.29.2; 35.1.82; 40.1.6.

[14] *Dig.* 13.7.35; 20.5.12.1; 21.2.4.1; 26.7.39.18; 26.7.56; 32.91.4,6; XLVI iii 1; 3; 5.2; 102.2; *Cod. Just.* 5.37.3.

[15] Cic., *pro Q. Rosc. com.* 1.1,2; 4.13; 5.14; *II Verr.* i 39.102; ii 70.170; *pro Caec.* 6.17; Corn. Nep., *Attic.* 13.6; *Auctor ad Herenn.* 2.13.19; Livy 6.20.6; Val. Max. 8.2.2; *Dig.* 20.4.12.5; 33.10.10; 36.1.23.4; *CIL* II 5042.7 8.

[16] Cic., *pro Q. Rosc. com.* 2.5.

[17] What is " in nominibus " is what is owed " in tabulis ": Cic., *Top.* 3.16. " Nomine liberare " is to discharge a debtor: *Dig.* 34.3.28.9.

[18] Cic., *II Verr.* ii 77.188.

debt,[19] and so a debtor: a good debt or debtor can be called a *bonum nomen*,[20] and *nomina facere* can mean "make loans," "give credit," as well as "make entries."[1] An account, but not an individual entry therein, is also a *ratio*.[2] And so we have *rationem computare* or *putare*,[3] or *subducere*,[4] or *dispungere*,[5] to complete an account and obtain what we should call a "balance"—although of course the notion of "balancing" two "sides" of an account is misleading if applied to Greek and Roman accounting. Ulpian[6] put it very nicely when he said that *dispungere* was "to compare receipts and payments." When a man examined and agreed accounts with another he was said *parem rationem facere*[7] or *adscribere*,[8] or *paria facere*,[9] *pariare*.[10] When a man was satisfied with accounts so dealt with, he might make a note on them accordingly, for future reference: he was then said *subscribere rationes*.[11] To close an account was literally to expunge it: *rationem expungere*.[12]

Carefully kept accounts were of course dated.[13] Anything left out could be inserted later, with the note *AFPR*[14] or *AGPR*[15] (*ante factum*, or *gestum*, *post relatum*).

The heyday of Roman book-keeping was evidently the last two centuries B.C. and the first two of our era. After that, references become thinner, even when we make allowance for the smaller quantity of later literature in which we might expect to find mention of book-keeping. From the fifth century we have a very interesting

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[19] From the point of view of creditor (Cic., *Ibid.* i 10.28) or debtor (Cic., *ad Att.* 5.6.2). See also *Dig.* 40.7.40.8.

[20] Cic., *ad Fam.* 5.6.2; *Dig.* 14.6.1.pr.; 17.1.26.2.

[1] Cic., *ad Fam.* 7.23.1; *de Offic.* III 14.59; *II Verr.* i 36.92; Colum., *RR* 3.3.9; Sen., *de Vit. Beat.* 24.1; *de Benef.* 1.1.2; 2.23.2; 3.15.2; *Dig.* 2.14.9.pr.; 15.1.4.1; 15.1.52.pr.; 26.7.16; 40.5.41.17.

[2] Defined in *Dig.* 2.13.6.3. For a *ratio implicita* (an involved account), see 2.14.47.1. *Rationibus inferre* is to make entries in one's accounts: Suet., *Div. Jul.* 47; *Dig.* 40.7.40.pr. A well-known passage is Plaut., *Trinumm.* II iv 18: "ratio . . . apparet, argentum ablatum." For the diminutive *ratiuncula*, see, *e.g.*, Plaut., *Curc.* III 1.

[3] Gell. 7.5.7; Plaut., *Aul.* III v 53, *cf.* 55; *Most.* I iii 142 (*cf.* 147); *Trin.* II iv 16; Cato, *RR* 2.5; 5.4; Cic., *ad Att.* 4.11.1; *Dig.* 2.14.47.1; 18.1.7.pr.; 40.5.47.2; *Cod. Just.* 2.5.1.

[4] Plaut., *Capt.* I ii 83 84; *Curc.* III i; Cic., *ad Att.* 5.21.12; *Dig.* 34.9.17.

[5] Sen., *de Benef.* 4.32.4, *Dig.* 40.7.6.7; 50.16.56.pr.; also 42.5.15.1 (*dispunctio*).

[6] In *Dig.* 50.16.56.pr.

[7] Sen., *Ep.* 19.10; *Dig.* 44.4.17.3.

[8] *Dig.* 40.4.22.

[9] Colum., *RR* 1.8.13; 11.1.24; *Dig.* 40.7.40.8. Frequent in metaphor, as, *e.g.*, Sen., *de Benef.* 2.30.2; 3.9.3; *de Tranq. An.* 7.2; *Ep.* 9.6; 81.3.

[10] *Dig.* 40.1.4.5. Also *pariatio* (12.6.67.3), *pariator* (35.1.81), *pararius* (Sen., *de Benef.* 2.23.2; 3.15.2).

[11] *Dig.* 34.3.12; 35.1.82; 40.5.41.10,17; 40.7.40.3—all particularly interesting.

[12] Plaut., *Cist.* I in 41; *Dig.* 44.3.13.1; 50.8.10(8).

[13] Cic., *II Verr.* ii 77.188; *Dig.* II xiii 1 2; 6.6.

[14] Cic., *de Orat.* II 69.280.

[15] Fronto, *Ep. ad Ant. imp.* 1.5.1 (ed. van den Hout, I p. 94).

statement by the anonymous scholar known to us as Pseudo-Asconius,[16] who wrote a commentary on Cicero's *Verrines*, to the effect that the custom of keeping full and exact accounts, which used to flourish once, had entirely ceased. The reason given is interesting: men were condemned in the courts on the evidence of their own account-books (*ex suis quisque tabulis damnari coepit*). This is plausible enough but requires explanation here. The local units of the Roman Empire were the *civitates*, sometimes mere tribal areas, but normally and increasingly towns, with their surrounding territory. Each *civitas* was administered by magistrates and a council (*senatus*, *βουλή*), who came eventually to be drawn from a hereditary class of *curiales*, consisting of all the wealthiest members of the *civitas* who were not members of the senatorial and equestrian orders, the imperial aristocracy. Now of all those inhabitants of the Empire who had sufficient property to need to keep regular accounts, the vast majority would belong to the curial class. And by a gradual process extending from the second to the sixth century the *curiales* were squeezed dry by taxation and the imposition of hereditary burdens attaching to their property, from which there was no legal escape.[17] Concealment of property became a necessity, and accounts revealing the extent of one's "invisible property" (loans on mortgage or bottomry, for instance) might prove a serious embarrassment, and lead to condemnation in the courts, or at least to the acquisition of new fiscal burdens. It is not surprising if formal private accounts came to be kept less and less, except by bankers.

The question is often asked how far the Greeks and Romans made use of cheques, or of book transfers of credit (*giro*). This is a very difficult problem,[18] and it is impossible to deal with it adequately here, although something must be said about it, if only because at least one of the texts which is sometimes quoted as evidence of book transfer is actually part of the accounts of a bank in Ptolemaic Egypt.[19] The more important evidence is almost entirely papyrological,[20] but there are one or two inscriptions [1] and some literary

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[16] Ps.-Ascon., *in Verr. II* i 60 (p. 175 Baiter).

[17] See A. H. M. Jones, *The Greek City from Alexander to Justinian* (1940) 179-210.

[18] The most useful modern works on the subject are F. Preisigke, *Girowesen im griech. Aegypten* (1910); Kiessling, *s.v.* "Giroverkehr," in Pauly-Wissowa, *Realenc.*, Suppl. IV (1924) 696-709; W. L. Westermann, "Warehousing and Trapezite Banking in Antiquity," in *Jnl. of Econ. and Business Hist.* 3 (1930-1931) 30-54; E. H. Vogel, "Zur Gesch. des Giralverkehres im Altertum," in *Vierteljahrschr. für Soz.- u. Wirtschaftsgesch.* 29 (1936) 337-359.

[19] *P. Tebt.* III ii 890; see Rostovtzeff, as cited in note 11, p. 31 above.

[20] See the works of Preisigke and Kiessling cited in note 18 above.

[1] *IG* VII 3172 (the Nikareta inscription from Orchomenus, of *c.* 200 B.C., on which see Kiessling, as cited); XI ii 287 A 134-135 (Delos, 249 B.C.).

passages,[2] virtually all relating to individual transactions, the real nature of which is often not fully known to us. It was evidently a not uncommon practice for depositors in banks to give the banker written instructions (διαστολικόν) for money standing to their credit to be paid over to a third party[3]; and it also seems to have been possible for a depositor to give a written order to his banker for money to be transferred from his own account to the credit of a third party.[4] We cannot tell, however, how usual such transactions were. There is perhaps no harm in our referring loosely to the διαστολικά mentioned above as "cheques"[5]; but although they did to a very limited extent perform the same function as the modern cheque, they were fundamentally different from our cheques, in that there was no question of endorsement or negotiability—concepts which were entirely unknown in the ancient world.[6]

In the sphere of Roman State finance we find payments being made on written warrant. Transporting coin for long distances was a risky business, and so the government preferred to arrange for tax-money to be used locally as far as possible. Warrants were issued, authorising officials and others to draw upon money in the provincial treasuries or in the hands of tax-farmers; these warrants were known in the late Republic as *publicae permutationes* and in the later Empire

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[2] *e.g.*, Ps.-Dem. 52.6, *cf.* 4; Polyb. 32.13.7 (31.27.7); and the passages referring to *permutatio*, *e.g.*, Cic., *ad Att.* XII 24.1 and 27.2 (Cicero's son); V 13.2; 15.2; XI 1.2; 24.3; XV 15.4; XVI 1.5; *ad Q. fr.* I 3.7; *pro Rab. Post.* 14.40; *Dig.* 50.16.76.

[3] Among the best examples are *P. Fay.* 100 and *BGU* IV 1063 (A.D. 99 and 100). The same practice is even better attested in relation to deposits in the state granaries of Egypt: see esp. Westermann, as cited in note 18, p. 48 above.

[4] The clearest example is *BGU* IV 1064 (A.D. 277–278). The verb used is μεταβάλλειν. There is again evidence of the same practice in connection with deposits in granaries: see, *e.g.*, *P. Lips.* I 114–115 (A.D. 133).

[5] *P. Gen.* 2 is said to be "almost a cheque" by Preisigke, *op. cit.* (in note 18, p. 48 above), 209–210; but he is probably right in thinking it was not addressed to a banker. If we are to confine the class of "cheques" strictly to those instructions to bankers which are handed over to the payees, then I know of no example of a "money-cheque" to equal the surviving "grain-cheques" (see notes 3 and 4 above), *e.g.*, *P. Oxy.* III 516 (A.D. 160).

[6] Mr. C. H. Roberts (to whom I am grateful for making several valuable suggestions) has drawn my attention to two papyri of the last century B.C., one of which (*P. Mich. Inv.* 6051: see A. E. R. Boak in *Aegyptus* 13, 1933, 107–112) records a loan but leaves the name of the lender blank, and the other (*P. Ryl.* IV 580) apparently assigns a funeral benefit (ταφικόν) without naming the assignee. The editors of both documents suggest that they were intended to be "negotiable." This, however, is surely misleading: the word "negotiable" is a technical legal term, and no document can properly be called negotiable unless it is one of a class of negotiable instruments recognised as such by statute or by mercantile usage. Negotiability is far from being the same thing as assignability: see, *e.g.*, W. R. Anson, *Principles of the Eng. Law of Contract* (19th ed., by J. L. Brierly, 1945) 275–284; G. C. Cheshire and C. H. S. Fifoot, *The Law of Contract*[4] (1952) 421–424.

as *litterae delegatoriae*.[7] We might expect such transactions to involve rather complicated book-keeping entries, but I should be surprised if in practice they did. Unfortunately I know of no evidence on the point. It is sometimes said that Roman bankers transacted "discount business," one of the elements in the "classical" definition of a banker in modern times. This seems to have no better foundation than Cicero's statement[8] that a man named Vettienus had offered to purchase at half its value a debt due to Cicero from some unfortunate whose property had been confiscated by the State—a debt which was likely to prove partly if not wholly irrecoverable.

VI. Greek and Roman Numerals

I said at the very beginning that the Greeks and Romans never reached the stage of separating what we should call debit and credit entries by putting them in separate columns or on two "sides" of an account, and I went on to say that they never even put their figures in precise columns at all. Here, it seems to me, we have our best clue to one important contributory reason for the backwardness of Graeco-Roman accounting. I shall now try to show that this lies in the nature of the systems of numeral notation used by the Greeks and Romans.

I must first make it clear that when I distinguish between the various numeral notations (or scripts) of the Greeks and Romans and our own I do not imply that the Greeks and Romans used a different system of numbers from ours. It was only their way of writing down their numbers which was different from our own. They counted in exactly the same way as we do, on the decimal system: that is to say, they took the number ten and its multiples as their basic units. The decimal system is, of course, the most common numerical system the world over, simply because all men have ten fingers and find it useful to count on them, and hence tend to construct their number systems in such a way as to make the fullest use of the digital reckoning apparatus which nature has conveniently provided.[9] If man had twelve fingers, we should doubtless now be thinking numerically in terms of a duodecimal system, in which numbers would be grouped in twelves, with the numbers 12, 144 and 1,728 filling the role given in our decimal system to 10, 100 and 1,000. Our numeral script would also have been fashioned differently, to fit the duodecimal system, with two additional symbols of one digit each for 10 and 11, the number 12 represented by the unit sign combined with the zero,

[7] Cic., *ad Fam.* 3.5.4 (*publica permutatio*); *cf. II Verr.* iii 70/71, 163-165; Plut., *Pomp.* 25. See A. H. M. Jones in *JRS* 40 (1950) 22 *et seq.* For the later Empire, see, *e.g.*, Cassiod., *Var.* XI 33, 35; *Cod. Theod.* 7.4.22; *cf.* Marc. Diac., *Vit. Porph.* 54.

[8] *ad Att.* 12.3.2.

[9] This was realised by Aristotle (*Probl.* 15.3, 910b23-911a4).

the number 144 by the unit sign combined with two zeros, and so on—but that is an entirely different matter.

Any given numerical system can of course be written down in various notations, some of which will be more efficient than others. An inefficient notation will tend to obstruct all calculations not simple enough to be performed without the aid of writing, by making it unnecessarily difficult to write them down easily and quickly. The notation, however, can have no direct effect upon the purely mental part of our calculations, or upon operations performed with the aid of an abacus. This simple fact is often overlooked. We reckon not with numeral signs but with the words for the numbers they represent.[10] Thus, whether we are adding 1,011 and 1,309, or MXI and MCCCIX (or, for that matter, ,αια and ,ατθ, in the Greek alphabetic notation), what we do is to say, "Nine and one are ten and ten are *twenty*; and *three hundred*; and one and one are *two thousand*" —2,320, or MMCCCXX (or ,βτκ). We disregard the notation and—our numerical system being a decimal one—mentally grasp the numbers according to powers of ten. If we are not very good at mental arithmetic, and find a calculation too difficult to be done entirely in the head, with or without the aid of the fingers, we may use an abacus of some kind: this will provide a frame, so to speak, in which the different powers of ten can be kept distinct.

About the Roman numeral notation I need say little, as it is very well known to everyone. Its one great advantage, compared with the alphabetic Greek system, is that it uses very few different signs —only seven basic ones, in fact: those for 1, 5, 10, 50, 100, 500 and 1,000, although other symbols, in bewildering variety, were added in ancient times for larger numbers.[11] We ourselves, of course, use ten different signs, including the zero. In the acrophonic Greek notation, which we shall come to next, there are also ten signs (six simple and four compound), while in the other Greek system, the alphabetic, there are twenty-eight. The Roman system, like the Greek acrophonic, is very clumsy indeed. The number 4,999, for example, which we write with four digits, requires no less than nineteen (MMMMDCCCCLXXXXVIIII) in the standard Roman system, and ten (MMMMCMXCIX) even in the abbreviated form—which, incidentally, is much rarer than the other in inscriptions, though not in papyri, which sometimes use the longer forms, sometimes the shorter, and sometimes both.[12] The worst defect of the Roman

[10] See T. L. Heath, *Hist. of Gk. Mathematics* (1921) I 38–39.

[11] See R. Cagnat, *Cours d'epigr. lat.*[4] (1914) 30–32. For fractions, see *ibid.* 32–34.

[12] For instance, to mention only military accounts: (a) only the shorter forms are used in *P. Gen. Lat.* 1 (see note 15, p. 38 above), A.D. 83–84; (b) both forms in the rather later *P. Gen. Lat.* 4 (see J. Nicole in *Arch. Pap.* 2, 1903, 63–69), and in *P. Berl.* 6,866 (see R. Marichal, *L'occupation rom. de la Basse Egypte*, 1945), of the 190's; (c) only the longer in *P. Fay.* 105 (see Marichal, *op. cit.*), *c.* 180.

system, compared with ours, is that it knows nothing of place-value (position-value). A numeral notation which lacks place-value must inevitably have at least one of two defects: either, like the Roman and the Greek acrophonic scripts, it will repeat individual symbols with much greater frequency than is necessary in using a script possessing place-value; or, like the Greek alphabetic notation, it will use a far greater number of different symbols than the ten which suffice, on a decimal system, for a script in which place-value is present.

We can now turn to the Greek numeral scripts.[13] Quite a number of these are known from inscriptions, but if we ignore some unimportant local aberrations such as the peculiar script of Cyrene [14] we can divide all the notations into two main varieties: acrophonic and alphabetic. The first, the acrophonic, consists of a whole related group of scripts, but one of these appears in our surviving records very much more frequently than the rest, and I shall treat it as representative of the group and ignore the others.[15] This notation bears a very striking family resemblance to the Roman, although it must have developed entirely independently. It is sometimes called the "old Attic" notation, because it is best known in inscriptions from Attica, the district of Athens; sometimes the "Herodianic," because it is described in a passage attributed to Herodian, a Greek grammarian of the second century of the Christian era; and sometimes the "acrophonic" (the most suitable name), because the symbols it employs, other than the 1, are the initial letters (in an early form) of the Greek names of the respective numbers—a *delta* (Δ) for ten, for instance, because the Greek word for ten, δέκα (in the original capitals, ΔΕΚΑ), begins with a *delta*, and so on. This script may go back to the earliest days of Greek writing, in the eighth century B.C., but the date of its origin does not concern us here. The earliest precisely datable document containing this notation which I know of is the first Athenian tribute quota-list,[16] of 453 B.C., but there are one or two others [17] which may be earlier. The acrophonic script was

[13] See esp. Sterling Dow, "Gk. Numerals," in *AJA* 56 (1952) 21-23, with bibliography; W. Larfeld, *Griech. Epigraphik*[3] (=Iwan von Muller's *Handb. d. Altertumswissenschaft* I v, 1914) 290 *et seq.*; M. N. Tod, "The Gk. Numeral Notation," in *BSA* 18 (1911-1912) 98-132; "Three Gk. Numl. Systems," in *JHS* 33 (1913) 27-34; "Further Notes on the Gk. Acroph. Numls.," in *BSA* 28 (1926-1927) 141-157; "The Gk. Acroph. Numls.," in *BSA* 37 (1936 1937) 236-258; "The Alphabetic Numl. Syst. in Attica," in *BSA* 45 (1950) 126 139.

[14] See Tod in *BSA* 37 (1936-1937), at pp. 255-257.

[15] They are mostly less efficient. See, *e.g.*, the clumsy script employed in *IG* IV² i 102, an inscription of the early 4th cent. B.C., from Epidaurus, where 9,800 appears as XXXXXXXXXΘΘΘΘΘΘΘΘ (line 47). In the old Attic script this would have been 𐅄XXXX𐅄HHH—nine instead of seventeen digits.

[16] Tod I² 30.

[17] *IG* IV 553, from the Argolid. *SIG*³ 46 can hardly be earlier than *c.* 450 B.C. and is probably later.

used to express cardinal numbers only, not ordinals.[18] It works on exactly the same principles as the Roman, except that it lacks the abbreviated forms, and 4,999 cannot be written with less than nineteen digits (XXXX𐅅HHHH𐅅ΔΔΔΔ𐅄IIII). Place-value is absent. To express sums of money, the symbols were sometimes slightly modified: sums in talents, for instance, might incorporate the letter T in each sign, so that 161 talents would be 𐅃𐅅ϟT. The longest individual set of figures I have been able to find in a Greek inscription contains no fewer than twenty-nine digits. It occurs in a long Athenian inscription[19] of the year 422 B.C., recording in talents, drachmae and obols the loans made to the Athenian State treasury during the years 426–422 by the gods of the city. The Greek figures are 𐅅𐅆𐅅ϟϟϟ𐅅TTTTXXXX𐅅HHH𐅅ΔΔΔΔ𐅄ⵑⵑⵑ. We should write this as 5,599 t., 4,897 dr., 1 ob.

The acrophonic script is known to have been used in Attica and (with various modifications) in many other parts of the Greek world from before the middle of the fifth century until the last century B.C.[20] In this notation were inscribed on stone the great series of Athenian public and sacred accounts, large portions of which have been recovered in modern times and reconstructed by epigraphists. In the quota-lists and assessment decrees relating to the tribute of the Athenian Empire in the fifth century B.C., the sums of money are often arranged in columns with what seems at first sight great precision; but this is done purely for aesthetic reasons and not at all for convenience of addition, as can be seen from the following specimen,[1] opposite which I have given the value of each of the sums of money concerned: —

X	=	1,000 dr.
𐅅	=	500 dr.
𐅅T	=	6 tal. (36,000 dr.)
TT	=	2 tal. (12,000 dr.)
XXXX	=	4,000 dr.
H	=	100 dr.

The other main variety of Greek numeral script, the alphabetic, which was used for ordinal as well as cardinal numbers,[2] seems to me a very much better notation than either the Roman or the Greek acrophonic, although I must admit that this is a matter of dispute among mathematicians.[3] Some scholars believe the alphabetic system

[18] See Tod in *BSA* 45 (1950), at pp. 129-134.
[19] Tod I² 64, line 122. *Cf.* pp. 26 27 above.
[20] There are a few later archaizing survivals: see, *e.g.*, *P. Ryl.* III 540.
[1] Extracted from A 9 in *ATL* II p. 43, col. II, lines 138-152.
[2] *Cf.* above and note 18.
[3] Against the alphabetic notation are Moritz Cantor, *Vorlesungen uber der Gesch. der Mathematik* I² (1907) 129-130; Jas. Gow, *Short Hist. of Gk. Mathematics* (1884) 46; H. Hankel, *Zur Gesch. der Math.* (1874) 36; W. W. Rouse Ball, *Short Account of the Hist. of Maths.*⁴ (1901) 131-132; Florian Cajori, *Hist. of*

was invented at Miletus (or at any rate in south-west Asia Minor) in the eighth or seventh century B.C.; but this is disputed, and again we need not concern ourselves with the origin of the script. The two earliest surviving occurrences of the alphabetic numerals that I have been able to discover in formal documents are in a rather mysterious Athenian inscription[4] which seems to date from about the third quarter of the fifth century B.C., and an inscription of Halicarnassus in Caria (south-west Asia Minor), dating from the latter part of the same century.[5] (The latter document is also, as it happens, one of our earliest pieces of evidence for the acrophonic system: it uses both notations.) Even earlier than these inscriptions are certain odd scribblings on Athenian vases, apparently recording quantities and prices,[6] some of which appear to be of the early fifth century. There is little evidence for the use of the alphabetic notation during the Classical Greek period, but during the third century it came into general use in the Greek world, and in the last century B.C. it entirely replaced the acrophonic system, even at Athens, where the old notation lingered longest.

The alphabetic notation takes the twenty-four letters of the Greek alphabet, with three other letters which in Classical times had become obsolete, for the digits from 1 to 9, the tens up to 90 and the hundreds up to 900. Intermediate numbers are represented by combinations of these letters, and thousands by the same letters with strokes against them. Thus the first three letters of the alphabet, α, β and γ, are 1, 2 and 3, while ,α, ,β, ,γ[7] are 1,000, 2,000, 3,000; ι, κ, λ are 10, 20, 30; and ρ, σ, τ are 100, 200, 300; so that 111 is ρια (three different letters, it will be noticed), 2,323 is ,βτκγ, and 3,232 is ,γσλβ. The letter M was usually borrowed from the acrophonic notation to represent 10,000, the number of tens of thousands being then given by putting the appropriate letter above the M (*e.g.*, $\overset{\delta}{M}$ = 40,000). Sometimes the letters might appear in a different order, but we need not confuse the issue now by taking notice of this or the many other variations which are to be found in the papyri. The highest figure

Maths. (1894) 64; *Hist. of Mathl. Notations* I (1928) 25-26. More favourable is Heath, *op. cit.* I 37-39. The best defence of the alphabetic system is by J. G. Smyly, "The Employment of the Alphabet in Gk. Logistic," in *Mél. J. Nicole* (1905) 515-530.

[4] *IG* I³ 760.

[5] *SIG*³ 46.

[6] See R. Hackl, "Merkantile Inschriften auf attischen Vasen," in *Munchener archaol. Studien dem Andenken A. Furtwänglers gewidmet* (1909) 1-106. Even if some of the *graffiti* are of 6th cent. date, I do not think that those letters which are certainly numerals need be older than the 5th cent. One of the *graffiti* is illustrated in J. Kirchner, *Imagines Inscr. Attic.* (2nd ed. by G. Klaffenbach, 1948), pl. 11, no. 23. See also Mabel Lang, "Numerical Notation on Greek Vases," in *Hesp.* 25 (1956) 1-24, with references to other recent publications, including those of Amyx and Jongkees.

[7] Distinguish figures with strokes against them in a different position, to the right and above: this was the commonest way of representing fractions (γ′ = 1/3, ι′β′ = 1/12, etc.).

which could be represented in the ordinary Greek alphabetic notation was 99,999,999.[8] The number of the hundred million angels of *Revelation* V, 11,[9] was therefore literally inexpressible—by ordinary symbols: it could be stated only in words, as "ten thousand times ten thousand" (μυριάδες μυριάδων, literally "ten thousands of ten thousands"), an expression which consequently became a standard phrase for "a number which no man could count." Whenever a number up to 9,999 can be represented in our notation without using a zero, it will be expressed by exactly the same number of digits in the Greek alphabetic notation. The number 3,333, for example, is ,γ=λγ. Whenever we have to use a zero, however, the two sets of symbols are visibly different. In the Greek notation there is nothing corresponding to our zero, so that 100, for instance, is ρ alone, 103 is ργ, and 40,001 is Μα.

Thus the Greek alphabetic notation has a minor drawback peculiar to itself and a major defect which it shares with the Roman and the Greek acrophonic systems. The minor failing is that it has as many as twenty-eight different signs, three or four times as many as the other two ancient scripts and our own—enough to make it distinctly harder to learn, but not so many (when we remember that our alphabet has twenty-six letters) as to present any real difficulty to a person of reasonable intelligence. The serious defect is that the alphabetic notation (like the other two ancient systems) knows nothing of place-value. However, as will become apparent shortly, this notation has certain qualities which to some extent compensate for this defect—sufficiently so, at any rate, to prevent the Greeks from becoming aware that the defect existed.

It is the practical consequences (especially for accounting) of the lack of place-value in the three numeral scripts of the Greeks and Romans and its presence in our own that I now wish to discuss. I intend to put forward two theses: first, that the habitual arrangement of figures in columns in our notation is not an intrinsic virtue of that notation but, on the contrary, an incidental defect, due, somewhat paradoxically, to the combination of its two greatest virtues, namely place-value and the small number of symbols it employs; but secondly, that this very defect (the necessity for the arrangement of figures in columns) has, paradoxically again, provided a very useful stimulus towards the evolution of the advanced concepts of debit and credit (positive and negative entries), by producing accounts kept first in one

[8] Apollonius of Perga (late 3rd cent. B.C.), however, devised an extension of the system, covering all numbers which can be expressed by anything up to 40,000 digits in our notation. His elder contemporary Archimedes went far beyond this, producing a further extension which at a fairly early stage, it seems, would provide an equivalent for some nine hundred million digits in our notation (Smyly, *op. cit.* in note 3 above, 527-530).

[9] And see *Daniel* VII 10.

column and then in two, the separation of the figures into columns being of material assistance in bringing about that distinction between two "sides" of an account which was an essential preliminary to a co-ordinated system of book-keeping by double or even single entry.

I cannot proceed any further without undertaking a criticism of the conception of Greek numerals which seems to prevail generally nowadays, and is stated clearly in Sir Thomas Heath's *History of Greek Mathematics* (1921),[10] the standard work on its subject. After saying that the real defect of the alphabetic notation is the absence of a zero symbol, Heath goes on to assert that "if there had been a sign or signs to indicate the absence in a number of a particular denomination, *e.g.*, units or tens or hundreds, the Greek symbols could have been made to serve as a position-value system scarcely less effective than ours"; and he then proceeds to show how the Greeks must have tried to compensate for the lack of place-value in their numeral notation. He takes it for granted that the Greeks, when they were operating with their alphabetic numerals, wrote down the units, tens, hundreds, thousands and ten-thousands in separate vertical columns. Thus Heath assumes, for instance, that in adding together 12,281 and 30,030, to make 42,311, a Greek would have proceeded to write the sum as follows: —

$$\begin{array}{r} \text{M}, \beta\sigma\pi\alpha \\ \text{M} \quad \lambda \\ \hline \text{M}, \beta\tau\iota\alpha \end{array}$$

He gives no authority for this statement: he simply says, "There is no doubt that, in writing down numbers for the purpose of these operations, the Greeks would keep the several powers of ten separate in a manner practically corresponding to our system of numerals."[11] Now in relation to the ancient world the expression "there is no doubt that" is often a kind of euphemism for "there is no evidence that"; and so it is here. Heath, I should say, was trying in effect to smuggle into Greek arithmetic (of course without the slightest intention to deceive) a partial substitute for the place-value which is missing from the numeral notation, involving the use of a blank space corresponding to our zero. The whole conception, however, is fundamentally wrong, both on factual grounds and because it is based on a misconception of the functioning of the alphabetic numeral notation.

First, Heath is wrong on the facts. We cannot simply take it for granted that the Greeks "must have" adopted the procedure he so confidently describes; we must look for evidence as to whether they

[10] I 37–39, 52.
[11] *Op. cit.* I 52, repeated in slightly different words in *Manual of Gk. Maths.* (1931) 28.

actually did so or not. As far as I can discover, there is no trace of any such arrangement as Heath postulates, with gaps between the alphabetical digits, or any other substitute for a zero, in any Greek inscription or papyrus. It may be dangerous to assert a negative in such a case as this, where the field of possible evidence is very large; but it can at least be said with absolute confidence that no such practice as Heath assumes was at all usual or characteristic. The Greeks, like the Babylonians, did have zero-signs, including an 0 just like our nought, but they seem to have employed these symbols only in sexagesimal fractions,[12] which could have been known only to a limited circle of mathematicians and were not used consistently except in astronomy and pure mathematics.[13] The very fact that the figures in Greek inscriptions and papyri are never—or not normally—arranged in precise columns is dead against Heath's theory. And there is a valuable piece of evidence from a literary source, the only ancient treatise I know of in which multiplication sums [14] are set out in full in the text, in figures.[15] This is a commentary written in the sixth century by Eutocius of Ascalon on Archimedes' *Measurement of a Circle* (κύκλου μέτρησις, third century B.C.). In the standard Teubner text, edited by Heiberg, there is no attempt to arrange the numerals in strict columns, and it seems quite certain that they cannot be so arranged in the manuscripts. This, with the other evidence, seems conclusive.

Secondly, Heath was mistaken about the way the alphabetic notation operated. It may be rash for one who is not a mathematician to suggest that one of the highest authorities on Greek mathematics did not fully grasp the simple structure of the Greek alphabetic numeral system; but mathematicians are often uninterested in elementary arithmetical questions, and in any event we are dealing here with plain matters of common sense. The essential point which Heath failed to see is that the symbols in the Greek alphabetic notation have a quality which is in many respects a substitute for place-value and prevented the Greeks from even noticing the absence of place-value in the full sense, let alone regretting it and trying to compensate for it. In a most valuable article which was published sixteen years before the appearance of Heath's *History of Greek*

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[12] See Heath, *Hist. of Gk. Maths.* I 44–45; O. Neugebauer, *The Exact Sciences in Antiquity* (1951) 10–22, and pl. II, showing part of an astronomical papyrus: *P. Lund Inv.* 35a.

[13] Neugebauer, *op. cit.* 17.

[14] I believe that similarly there is only a single surviving example of a division sum worked out at length, in Theon's *Commentary* on the *Syntaxis* of Ptolemy, and this is in the sexagesimal notation: see the text and trans. in Ivor Thomas, *Gk. Mathl. Works* (Loeb) I 50–53; *cf.* Smyly, *op. cit.* (in note 3 above) 526–527.

[15] There are nice examples of multiplication sums written out in words in Dem. 22, *Hypoth.* 2. 4 6: *e.g.* (§ 5) 12×29½ is solemnly written out (in words) as 10×20= 200, 2×20=40, 10×9=90, 2×9=18, ½×12=6.

Mathematics but apparently remained unknown to Heath, the classical scholar and papyrologist J. G. Smyly demonstrated [16] that the symbols of the alphabetic numeral system (twenty-seven in number, if we ignore the extraneous M which is 10,000) were conceived as arranged in four rows (*versus* [17] in Latin; the original Greek term is not known), each containing nine symbols, the fourth *versus* being of course a repetition of the symbols of the first, with the addition of a short stroke against each. The symbols of the first *versus* represent units up to nine, those of the second *versus* tens, of the third hundreds and of the fourth thousands. In the minds of the Greeks the symbols would naturally arrange themselves in this order, just as our figures fall into place in our minds in "rows" of ten. For the Greeks, ten was the first number of the second row, one hundred the first of the third row, and one thousand of the fourth, whereas with us ten completes the first row, and so on, there being ten numbers in each row instead of nine. Here, it seems to me, the alphabetic notation can be harshly criticised. It is at the very least inelegant, and I should say clumsy and muddling, for a decimal numerical system to be expressed by symbols grouped in nines. The only way out, for the Greeks, would have been to employ a symbol corresponding to our zero; and this they never did, in ordinary arithmetic. (The absence of the zero from the alphabetic notation is not as strange as many people might think. The zero, however natural it may appear to us, is actually an advanced concept which very few numeral systems have evolved.) But the Greek did have one advantage over us: he never needed to write down his figures in columns. If this had been suggested to him, the Greek might reasonably have retorted that it was quite superfluous: he, like the Roman, could add numbers in any position equally well. (We need not consider multiplication and division separately: if one knows one's tables, multiplication and division then resolve themselves into mere addition and subtraction—and it appears from a chance remark of Aristotle's that in his day it was considered advisable to know the multiplication tables up to "ten times." [18]) To the Greek, a number was immediately recognisable as a member of a particular *versus*. Smyly [19] is surely right in saying that when adding numbers together a Greek first added up mentally any numbers belonging to the first *versus*, and then went up through the other *versus* in turn. Thus, in adding 281, 30 and 8 (σπα, λ and η) a Greek would instantly pick out the α and η, add one to eight, and write down θ (9). He would next take the π and λ, and

[16] *Op. cit.* 516-518.

[17] Smyly (*loc. cit.*) refers to the use of this term by Martianus Capella 7.745 (ed. Eyssenhardt, p. 265) and Favonius Eulogius, *in Somn. Scip.* p. 22.

[18] *Topica* 8.14, 163b. The procedure in multiplication and division is explained by Smyly, *op. cit.* 522-525.

[19] *Op. cit.* (in note 3, p. 54 above) 520-521.

add eighty to thirty, making a hundred and ten (ρι): of this he would write down the ι (10) and carry a hundred (ρ), adding it to σ (200) to make three hundred, *i.e.*, τ. His answer would be τιθ (319).[20] Operating in this way, one would obviously never think of writing down the numbers of each *versus* underneath each other—it would have been a waste of time. The Greek was not liable to confuse hundreds with thousands or tens or units: he used a completely different set of symbols for each denomination. He might reasonably have told us that the difficulty most people experience in adding Arabic numerals, in any quantity, without first writing them down in a column, is a minor defect and not a virtue of our notation. This is true, but against this we must set the far smaller number of numeral signs which we have to learn, and the very much greater flexibility of our notation, which is decidedly superior to the Greek alphabetic script in the range of calculations for which it can be used. Decimals, as far as I can see, could not be expressed at all in the alphabetic notation without some radical departure from its principles. And fractions evidently created great difficulties in practice for the users of the alphabetic script: they were dealt with in a clumsy manner [1] and must have made calculation much more difficult. Mistakes in operating with fractions are particularly common in papyri. But it is sometimes difficult to tell how far deficiencies observable in ancient arithmetical calculations are due to the nature of the scripts used and how far to the comparative indifference of the Greeks and Romans to extreme precision in such matters as the calculation of interest on loans.[2]

It has often been asserted that the Greeks and Romans could hardly have performed even the simplest arithmetical calculations without recourse to an abacus.[3] This has been flatly denied by

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[20] There is just one text which makes me a little uneasy about this reconstruction: Hdts. 2.36.4 says, "Greeks write, and reckon with counters (καὶ λογίζονται ψήφοισι), by moving the hand from left to right, Egyptians from right to left." The ψήφοι are undoubtedly the counters used with the abacus, as in Aristoph., *Vesp.* 656; Dem. 18.227; Polyb. 5.26.13 (and see Liddell & Scott, *Gk.-Eng. Lexicon*[9], *s.v.* ψῆφος II 1 a). Now the surviving abaci (see note 3 below) must surely have been operated from right to left, from smaller to larger numbers. The reverse would have entailed going back unnecessarily, to add on figures which had to be carried over. I cannot understand what H. means, unless 5th-cent. abaci had the column representing units on the left.

[1] It seems to me that the Greeks were quite unnecessarily clumsy in expressing fractions in their alphabetic script. I cannot see that fractions need have created such difficulties for them.

[2] For the inexact reckoning of interest in the records of the loans made to the Athenian State by the sacred treasuries in the late 5th cent. B.C. (pp. 26-27 above), see B. D. Meritt, *The Athenian Calendar in the 5th Cent.* (1928) 30-37. See also *ibid.* 48-50, 69-70 for mistakes in calculation in these accounts. *Cf.* G. Glotz in *REG* 23 (1910) 280-281 for inaccuracies in the Delian accounts.

[3] On the abacus in general, see D. E. Smith, *Hist. of Mathematics* II (1925) 156-192. On the abacus in antiquity, see A. Nagl, "Die Rechentafel der Alten" = *Sb. Ak. Wien* 177.5 (1914), and *s.v.* "Abacus" in Pauly-Wissowa, *Realenc.*, Suppl. III (1918) 4-18.

Smyly,[4] for the Greeks who used the alphabetic notation; and there can be no doubt that he is right. Certainly, the abacus is referred to occasionally in Greek and Latin literature,[5] and it is quite possible that it was widely used by the Greeks as well as the Romans. But this does not of itself prove that Smyly has overrated the Greek alphabetic numeral system. Abaci are regularly used to this day in certain countries (Russia, for example) by people who reckon with Arabic figures. The fact—if it is a fact—that the Greeks often used abaci does not prove that they could not have managed quite well without them.

Now one might think that through the use of the abacus, with its natural arrangement in columns according to powers of ten, and an empty column to represent zero in each denomination, the idea of place-value, in our sense, might have spilled over, so to speak, into the Greek numeral notation; but as I have already shown, the evidence of the papyri and inscriptions proves that it did not. The figures in a numeral script need not correspond individually, as ours would, with the columns of an abacus: this is very obvious in regard to Roman numerals.

At last we can go back to Greek and Roman accounting. My argument, in a nutshell, is that owing to the absence of place-value from their numeral notations the Greeks and Romans never needed to put the figures of an account in a precise column. We have discussed the question of simple calculation with the Greek alphabetic notation. The facts are even plainer in regard to the Roman and the Greek acrophonic notations. If one wants to add, say, 1,011 and 1,309, writing down MXI and MCCCIX, or XΔI and XHHHΓIIII, one underneath the other does not help in the slightest degree. As the Greeks and Romans did not use even one column, of course they did not normally separate debits and credits (or receipts and payments) into two columns. This surely helped to prevent the advanced antithetical concepts of debit and credit from emerging. And without the fully developed notions of debit and credit there can of course be no question of double entry. I would not claim that this is the principal reason for the failure of the Greeks and Romans to devise a more advanced system of book-keeping. Much more fundamental was the relatively primitive character of the Graeco-Roman economy, in which

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[4] *Op. cit.* (in note 3, p. 54 above) 521.

[5] *e.g.*, the passages cited in note 20, p. 59 above, also Diog. Laert. 1.59; Plut., *Cat. Min.* 70; Juv., *Sat.* 9.40–41; probably also Aesch., *Agam.* 570; Eurip. *Rhes.* 309–310; Dem. 18.227, 229; Plut., *Mor.* 812e. Apart from references to abaci in connection with the more advanced kind of mathematical calculation (as in Plut., *Cat. Min.* 70, cited above; also Pers. 1.131; Apul., *Apol.* 16) or the learning of arithmetic by children, I have found surprisingly few passages in Greek or Latin literature in which the abacus is mentioned. This makes me suspect that even the users of the much more cumbrous Roman numeral notation may not have been so dependent upon the abacus as many moderns have supposed.

credit was not highly developed. In a system which dealt largely in cash and in kind, the need for a technique such as double entry would seldom arise, and the small men who carried on most of the trade of the ancient world managed quite well without it. Even they, however, would obviously have benefited from a better numeral notation and the separation of debit and credit items; and owners of great estates, tax-farmers, large-scale moneylenders, bankers, and the few important merchants, might even have been glad to use double entry, had it been available to them.

VII. Arabic Numerals and the Rise of Modern Accounting

It seems appropriate that I should conclude by saying something about the subsequent history of the Greek and Roman numeral systems and their ultimate supersession by our own numerals, commonly called Arabic, but sometimes, more properly, Hindu-Arabic, since their origin was Indian, although their diffusion towards the West was due to the Arabs. A most interesting passage in the *Chronicle* of the Byzantine historian Theophanes [6] tells us that in A.D. 699, more than half a century after Egypt and Syria had fallen under Muslim rule, the Ummayad Caliph Walid ordered the scribes of the public treasury to use only Arabic instead of Greek characters, except for numerals, the Greek signs for which might still be employed owing to the poverty of the Arabic numeral notation—which at this time, then, was evidently not the modern one. Theophanes adds that for this reason Christian clerks were still serving under the Muslims in his own day, the early ninth century.

At this point my knowledge of the sources fails, as I am not a medievalist, and for the rest of this section I have had to rely largely on the works of modern scholars, although I have examined as much published source material as possible, including all the documents I have mentioned here. The notation we use today, complete with place-value and a zero symbol (certainly taken over by the Arabs from India),[7] began to come into use in the Muslim world during the ninth century, just after the time of Theophanes. In the first half of that century the Persian mathematician Al-Khwarazmi wrote an arithmetical treatise in Arabic in which the modern numeral notation, expressly attributed by him to the Hindus, is said to appear complete [8];

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[6] *Chronographia*, *s.a.* A.D. 699 (ed. Classen, in the Bonn *Corp. script. hist. byzant.* XXVI. i, p. 575).

[7] See esp. the admirable work of D. E. Smith and L. C. Karpinski, *The Hindu-Arabic Numls.* (1911), particularly Chaps. i, vi.

[8] *Ibid.* 4-5, 97.

and ninth-century Arabic manuscripts[9] are known which use the zero, the great innovation of this script. The new system seems to have been slow to prevail in the Muslim area: as late as about 1025 we hear that most people still preferred to use the old Arabic notation.[10]

The introduction of the Hindu-Arabic numerals into Christian Europe, through Muslim Spain, was even longer delayed. So far as I can discover, the oldest extant documents of Christian Europe using the new numerals (the *gobar* numerals,[11] as they were called at first) are Spanish manuscripts of the later tenth century, the earliest datable one being of 976.[12] About this very time, Gerbert (later Pope Sylvester II) was the first man in Christendom to give a proper description of the new numerals; but it appears that he did not know the zero—usually represented in Arabic script then, as now in Arab lands, by a dot.[13] In the first half of the twelfth century Al-Khwarazmi's arithmetical treatise was translated into Latin by an Englishman, possibly Adelard of Bath or Robert of Chester,[14] under the name "Algoritmi de numero Indorum"; and from about the same time, in 1138, we have the earliest known official document inscribed with the new numerals: a coin of Roger, the Norman king of Sicily[15] —where, however, the date occurs as part of an Arabic inscription. It was another three to five hundred years before the Arabic notation became general throughout Europe, and accounts seem to have been kept mainly in Roman figures until at least the sixteenth century.

Now it appears to be universally agreed that double-entry book-keeping had made its appearance beyond any doubt before 1340, by which time the system—wherever it may have been invented—had established itself in the official books of the *Massari* at Genoa.[16] Recently two Italian scholars, the philologist Castellani and the historian of accounting Melis, have traced the origin of double entry

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[9] The earliest seems to be of 873: *ibid.* 56 and note 2, *cf.* 138, note 3.

[10] *Ibid.* 98.

[11] *Ibid.* 65 70.

[12] *Ibid.* 116 and note 2, 137 138, 140; G. F. Hill, *The Development of Arabic Numls. in Europe* (1915) 28-29; "On the Early Use of Arabic Numls. in Eur.," in *Archaeologia* 62 (1910) 137-190, at p. 170.

[13] See Smith and Karpinski, *op. cit.* (in note 7 above) 112-117, *cf.* 53-56.

[14] Each of whom translated into Latin a work of Al-Khwarazmi's: see L. C. Karpinski, *Robert of Chester's Latin Trans. of the Algebra of Al-Khowarizmi* (1915). According to Karpinski, the Latin translation of the arithmetical work (the *Algoritmi*) was published in 1857 by B. Boncompagni, *Trattati d'aritmetica* I 1-23; but I have not been able to find a copy of this in any library to which I have had access. See also Smith and Karpinski, *op. cit.*, 5, 97, 126. A. Clerval, *Les Écoles de Chartres au Moyen-Age* (=*Mems. de la soc. archeol. d'Eure-et-Loir* 11, 1895) 238, mentions the appearance of the zero in the *Heptateuchon* of Thierry of Chartres (before 1150). But see C. H. Haskins, *Stud. in the Hist. of Mediaeval Science*[2] (1927) 90-91.

[15] Hill, *DANE* (see note 12 above) 16, note 1=*EUANE* 146, note 1.

[16] For these accounts, see F. Melis, *Storia della ragioneria* 527 *et seq.*, with refs.

still further back. Both Melis [17] and Castellani [18] believe that the system can be found in the accounts of the Florentine merchant Rinieri Fini and his brothers, whose books relating to dealings at the fairs of Champagne survive for the years 1296 to 1305 [19]; and Melis (who also believes that the books of other Florentine merchants, from the year 1299 onwards, are in double entry) is a strong advocate of the view that double entry actually originated in the towns of Tuscany.[20] However that may be, we shall be safe in concluding that book-keeping by double entry had established itself in the towns of northern Italy by the very end of the thirteenth century or the first half of the fourteenth century at the latest. This was the climax of a process of evolution the earlier stages of which we cannot trace with any certainty, owing to the extreme paucity of material. We need consider only commercial accounts, for it seems to be a fact (which I have not been able to verify at first hand except to a very limited extent) that no significant advances in technique took place independently in non-commercial accounts, such as (in England) those of manors, religious houses and colleges, and the Pipe Rolls and other financial records kept by departments of State and other authorities, specimens of which survive from as early as the twelfth century and are quite plentiful from the thirteenth century onwards. Apart from a few fragments dating from the year 1157,[1] the earliest commercial account which has survived from the European Middle Ages seems to belong to 1211.[2] Not very many commercial accounts of any sort have survived from the thirteenth century; but by the late thirteenth and early fourteenth centuries two kinds of evolution in commercial accounting can be traced [3]: in some accounts, debit and credit entries respectively are arranged together in groups, and the two groups are placed either one below the other or in two different parts of the book [4]; and in some other accounts debit and credit entries are posted

[17] Melis, *op. cit.* 381 *et seq.*

[18] Arrigo Castellani, *Nuovi testi fiorentini del Dugento* (1952) I 8-10; II 674-696, no. 22. Raymond de Roover, in his review-article, "New Perspectives in the Hist. of Accounting," in *Accounting Review* 30 (1955) 405-420, at pp. 406-407, discusses this work and Melis's and also Tommaso Zerbi, *Le origini della partita doppia. Gestioni aziendali e situazioni di mercato nei secoli XIV e XV* (1952). This last is a long and difficult book, which I was not able to consult until this essay was completed. As far as I could see at a brief inspection, it contains little that is relevant to what has been said here.

[19] See Castellani, *loc. cit.*; Melis, *op. cit.* 481-485 and pl. xxxiii.

[20] An earlier article by de Roover on the origin of double entry is still valuable: "Aux origines d'une technique intellectuelle. La formation et l'expansion de la comptabilité à partie double," in *Annales d'hist. écon. et soc.* 44 (1937) 171-193; 45 (1937) 270-298.

[1] From Genoa. See de Roover, *op. cit.* in the preceding note, 174.

[2] From Florence. See Melis, *op. cit.* 392-395, with photograph, pl. xxviii.

[3] See de Roover, *op. cit.* in note 20 above, 179-182; Melis, *op. cit.* 385-437.

[4] Italian *conti a sezioni sovrapposte*. For the accounts of the Peruzzi of Florence, 1282-1343, see de Roover, *op. cit.* in note 20 above, 179-181; Melis, *op. cit.* 405-411, and 387, note 10. De Roover, *op. cit.* in note 18 above, 411-412, agrees with Melis that these books (at any rate those of 1335-1343) are in double entry.

in columns side by side, in "bilateral form."[5] The earliest known "bilateral" accounts appear in two different varieties: the two "sides" of the account may be placed either on the same page or on opposite pages. The former type of "bilateral" account, with debits and credits on the same page, is that of our earliest surviving examples, which happen to come from towns of Tuscany other than Florence,[6] and it seems to have been adopted also in Genoa and the towns of Lombardy and Emilia.[7] The latter type, with debits and credits on opposite pages, was evidently associated particularly with Venice (whether or not it was actually invented there), for it is described in the late fourteenth and in the fifteenth century as accounting "alla veneziana."[8] There is no evidence that, as Besta[9] maintained, double entry was first evolved at Venice: unfortunately no Venetian commercial documents seem to be extant of an earlier date than the beginning of the fifteenth century.[10]

The idea that the rise of the advanced modern form of book-keeping was closely connected with the introduction of Arabic numerals has found no advocates for a long time, as far as I am aware, and nowadays it is generally rejected out of hand,[11] apparently on two grounds. First, although double-entry book-keeping makes its appearance not later than the first half of the fourteenth century, virtually all[12] the surviving accounts down to about the end of the fifteenth century are kept in Roman numerals, even where dates and folio numbers are in Arabic figures.[13] (It seems to have been thought, rightly or wrongly, that Roman numerals are less easy to alter.) Secondly, it is claimed that with the aid of an abacus calculations could be made very efficiently and quickly, so that a person doing the

[5] Italian *conti a sezioni contrapposte*, German *Gegenüberstellung*, Dutch *scontro-vorm* (de Roover, *op. cit.* in note 20 above, 181, note 2). *Cf.* pp. 19-21 above.

[6] These are (a) the cash accounts of a firm of merchants and bankers at Siena, 1281; (b) the cash accounts of Cepperello Diotaiuti of Prato, 1288; (c) the accounts of the Gallerani company of Siena, 1305-1308; and (d) the accounts of Principalle Manni, Geri Burlamacchi and company, silk merchants of Lucca, 1332-1336: see Melis, *op. cit.* in note 16 above, 429-433; *cf.* de Roover, *op. cit.* in note 20 above, 181-182.

[7] See Melis, *op. cit.* 433, 435, 527-531.

[8] See de Roover, *op. cit.* in note 20 above, 181; F. Besta, *La ragioneria*[2] III 328-329; Melis *op. cit.* 427-437, 535-537. The earliest known occurrence of this expression, as far as I can discover, is in the account-books, opened in 1382, of the Florentine merchant Paliano di Falco, where we read, "Questo libro . . . scriverollo alla viniziana, cioè nell'una carta dare e a rimpetto l'avere" (Melis, *op. cit.* 427).

[9] *Op. cit.* III 342-349.

[10] See de Roover, *op. cit.* in note 20 above, 181-182; Melis, *op. cit.* 532-535.

[11] As by Melis, *op. cit.* 382 ("assai poco influenti"); Besta, *op. cit.* III 338.

[12] The earliest exception I know of is the Badoer accounts of 1436-1439, a product of the commercial intercourse between Venice and Constantinople: see Besta, *op. cit.* II 434; III 310-313; Zerbi, *op. cit.* (in note 18 above) 396-412; Melis, *op. cit.* 534-535 and note 354; T. Bertelè, "Il libro dei conti di Giacomo Badoer," in *Byzantion* 21 (1951) 123-126.

[13] As in the Barbarigo accounts of 1430: see Melis, *op. cit.* 533-534, with photograph, pl. xliii. See also Besta, *op. cit.* II 434; III 297.

sums would not have felt the lack of a place-value system with figures disposed in precise columns and added or subtracted on the actual page itself. Both these points are valid, but to my mind they are not decisive. I should like to draw attention to two pieces of evidence which have made me suspect that the rise of modern book-keeping may in fact be bound up with the introduction of Arabic figures.

First, as early as 1299 the rules of the *Arte dei cambi* (the guild of moneychangers) at Florence forbade the use of Arabic numerals in accounts.[14] This shows that Arabic figures were in fact being used in accounting at Florence in the thirteenth century, the very time when commercial accounting was evidently making a great advance, and double-entry was on the point of emerging, if indeed it had not already appeared, in the accounting practice of merchants of Florence itself.

My second piece of evidence is a very remarkable and highly original book, the *Liber Abbaci*,[15] written as early as 1202 by the greatest mathematician of the time, Leonardo Fibonacci of Pisa (Leonardo Pisano, or Leonard of Pisa). Leonardo was the son of a man who acted as official notary to the merchants of Pisa operating on the Barbary coast, at a place which must be the modern Bougie in Algeria; and in his youth he himself had travelled as a merchant from end to end of the Mediterranean.[16] He was taught the Hindu-Arabic numerals (which he calls *figurae Indorum*) by his father, and his express aim in writing the *Liber Abbaci* was to encourage their general use for all purposes, including commercial accounting, a subject to which he devotes a great deal of attention in this book. He actually sets out an account,[17] with a full explanation, in both Roman and Arabic numerals, the Roman figures in the text and the Arabic ones drawn out in columns in the right-hand margin—a most striking demonstration of the superior value of the new system for accounting purposes. Leonardo has justly been recognised as a major figure in the history of accounting.[18] His admirers, however, have paid scant

[14] *Rubrica* 101 of the *Statuto dell'arte dei cambi in Firenze*: see Besta, *op. cit.* II 434; de Roover, *op. cit.* in note 20, p. 63 above, 191, note 3.

[15] The standard edition is that of B. Boncompagni (1857). For a discussion of this fascinating work from the point of view of an historian of accounting, see Melis, *op. cit.* (in note 16, p. 62 above) 585-592.

[16] *Liber Abbaci*, p. 1: "Cum genitor meus a patria publicus scriba in duana Bugee pro Pisanis mercatoribus ad eam confluentibus constitutus preesset, me in pueritia mea ad se venire faciens, . . . tibi me studio abbaci per aliquot dies stare voluit et doceri. Ubi ex mirabili magisterio in arte per novem figuras Indorum introductus, scientia artis in tantum mihi pre ceteris placuit, et intellexi ad illam, quod quicquid studebatur ex ea apud Egyptum, Syriam, Greciam, Siciliam et Provinciam cum suis variis modis, ad que loca negotiationis tam postea peragravi per multum studium et disputationis didici conflictum."

[17] *Liber Abbaci*, 21-22.

[18] Melis, *op. cit.* 591, agrees with P. Bariola (*Storia della ragioneria ital.* 48) that the *Liber Abbaci* is "l'opera che delineò l'orizzonte della moderna computisteria."

attention to his insistence on the great superiority of Arabic over Roman numerals as the medium of accounting.

Leonardo's father was using the Arabic notation well before the end of the twelfth century. At that time, and even more of course during the thirteenth century, there must have been many other merchants who, like Leonardo and his father, perceived the usefulness of the Arabic numerals for purposes of book-keeping. I suggest that it was these men who were responsible for the introduction into Europe of the practice of arranging figures—Arabic figures—in accounts in regular columns, a practice which was surely important in its own right, in that it would lead naturally to further developments as the economy of the high Middle Ages expanded and made them increasingly desirable. Once figures began to be disposed in a *single* column, instead of being scattered all over the page and reduced to order only outside the account-book, on the abacus or in the mind, the advantages of having *two* clearly separated columns, simply to facilitate computation, would very quickly become apparent; and this would of itself result in the emergence of the bilateral form of account, with debits and credits visibly distinguished. The final step, the further advance to double entry, could then equally well be made by those (no doubt still the large majority) who continued to employ Roman numerals. All that I am claiming for the users of Arabic figures is a very probable priority in disposing figures regularly and visibly on the page first in one and then in two columns, a procedure which, as I see it, would have been a decided stimulus to the emergence of the developed concepts of debit and credit, and which the more conservative users of Roman (or Greek) numerals would be far less likely to initiate, because the nature of their script did not invite it, their tabulation being done (if at all) separately on the abacus, although once they did adopt it they might be responsible for further developments just as easily as the others. I believe that this whole question would repay thorough investigation by a medievalist.

Appendix A. Recent Work on Ancient Accounting

Moritz Voigt's *Über die Bankiers, die Buchführung und die Litteralobligation der Römer*,[19] published in 1887 and translated into Italian four years later,[20] at a time when documentary papyri had scarcely begun to come to general notice among scholars, is impressive on a superficial reading, if only by the mere number and length of its laborious footnotes, and it has been cited again and again as one of the standard works on Roman book-keeping. Voigt's main theses, however, were fundamentally

[19] *Abhandl. der phil.-hist. Classe der Königl. Sächsischen Gesellschaft der Wissenschaften* [Leipzig] X vii (1887) 515-577.

[20] *I banchieri, la tenuta dei libri e l'obbligazione letterale dei Romani*, tr. G. Carnazza (Catania, 1891).

mistaken. They were conclusively refuted by Th. Niemeyer in a long review published in 1890,[1] and no serious Roman historian would now accept them. It is a great pity that Voigt's conclusions should have been taken over entire by (among others) Federigo Melis, in his recent *Storia della ragioneria* (1950),[2] an impressive work which is now, and is likely to remain for some time to come, the standard book on the history of accounting. Melis's volume deals only summarily with Greek accounting of the Classical period (pp. 349–359), in a chapter which, curiously enough, comes after instead of before the section on accounting in Hellenistic and Roman Egypt (pp. 314–348); and unfortunately the latter subject is discussed quite separately from Roman accounting (pp. 360–373), although of course a very large part of the evidence for Roman accounts consists precisely of Greek and Latin papyri from the Roman province of Egypt. However, Melis does give in translation the text of several papyri; his conclusions, except when he is reproducing Voigt on Roman Accounting, are on the whole cautious and reasonable; and his long bibliography is useful, if hardly complete.

Before the appearance of Melis's book the best general work on the history of accounting was Fabio Besta's *La ragioneria*.[3] This deals briefly in its second and third volumes with aspects of Greek and Roman accounting, but Besta seems to have known nothing of Greek and Latin inscriptions and he shows very little acquaintance with the papyri: he refers to only two collections and makes poor use of them.

R. Beigel's *Rechnungswesen und Buchführung der Römer* (1904), the only full-length study of Roman book-keeping to appear since Voigt's, is based on an altogether inadequate acquaintance with the original sources and is quite unscholarly in method.[4] The other general books on the history of accounting have very little to say about our subject that is both true and significant, and they all over-estimate the extent to which the Greeks and more especially the Romans developed systematic book-keeping. David Murray, *Chapters in the History of Bookkeeping, Accountancy and Commercial Arithmetic* (1930), and A. C. Littleton, *Accounting Evolution to 1900* (1933), make no reference to papyri or inscriptions. Edward Boyd, in his chapter on "Ancient Systems of Accounting" in the *History of Accounting and Accountants*, edited by Richard Brown in 1905, does show awareness of the existence of one or two inscriptions, but he evidently had no real understanding of the possibilities of epigraphic and papyrological evidence. Albert Dupont, *La partie double avant Paciolo* (1926), pp. 1–19, is entirely inadequate. Plinio Bariola, dealing briefly with Roman book-keeping in his *Storia della ragioneria italiana* (1897), pp. 229–240, merely follows Voigt; and

[1] In *Zeitschr. der Savigny-Stiftung für Rechtsgesch.* XI (=*Zeitschr. für Rechtsgesch.* XXIV), 1890, ii (*Rom. Abt.*) 312–326.

[2] For an appraisement by a leading authority of the later portions of this book, dealing with accounting in medieval and modern times, see de Roover, *op. cit.* in note 18, p. 63 above. The remarks about Roman book-keeping on p. 410 of that article, however, are not based (as is the remainder of the article) on first-hand knowledge of the original sources, and the erroneous view is accepted there (as by Melis) from Voigt, that Roman account-books included a *codex accepti et expensi* as well as a *codex rationum*. Against this, see Niemeyer, *op. cit.*, and pp. 42–43 above.

[3] 2nd ed., 3 vols., Milan, 1920–1932.

[4] See esp. the crushing review by C. Bardt in *Wochenschr. für klass. Philol.* 22 (1905) cols. 14–21. And Bardt does not even mention Beigel's inexcusable failure to use other forms of evidence than that of the literary and legal sources!

Alois Früchtl, *Die Geldgeschäfte bei Cicero* (1912), in his section on "Buchführung" (pp. 31–41), simply reproduces Beigel. Perhaps the least misleading treatment of Roman book-keeping, which does at any rate utilise the evidence of the literary and legal sources in a sensible manner, is the short section on "Litterarum obligatio" in H. J. Roby's *Roman Private Law*" (1902)[5]; and even this takes no account whatever of the papyri.

Of a quite different character are some scholarly studies of particular papyri. Friedrich Preisigke's *Zur Buchführung der Banken*[6] is excellent so far as it goes, but it is of much more limited character than its title might lead one to suppose: in fact it is little more than a study of certain special accounts relating to a particular tax, kept by a particular banker in the Fayum area in the first century. Another special monograph, *Accounting in the Zenon Papyri* (1934), by an American classical scholar, Elizabeth Grier, disappoints by its failure to deal adequately with some of the fundamental questions of ancient accounting method.[7] Other publications, notably a long article by Lydia Bandi[8] on the private accounts in the papyri, and an article by M. Schnebel[9] on the papyrus accounts of a large estate in Egypt dating from the seventh century, have made useful contributions to our knowledge of specific accounts in the papyri,[10] without giving much information about Greek and Roman accounting methods in general.

The one study in modern times which has some really penetrating things to say about the ancient system of accounting and its economic consequences is the article by Mickwitz to which reference has already been made.[11]

Appendix B. The Physical Form of Ancient Accounts

Many of the problems presented by ancient writing materials which have long been obscure are now being gradually elucidated as a result of discoveries in various parts of the Graeco-Roman world and the persistent researches of papyrologists and palaeographers.[12]

Papyrus (*βύβλος* or *βίβλος*, *charta*) came first in importance among ancient writing materials until well into the Roman Imperial period, when

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[5] II 279–296.

[6] In *Arch. Pap.* 4 (1908) 95–114, on *P. Fay.* 153.

[7] Miss Grier's statement (p. 7) that "there is very little progress over the Greek and Roman systems shown in accounting until the 19th cent. after Christ" is quite mistaken: for example, a great advance was made in the 13th–15th cents.—see pp. 62–64 above.

[8] "I conti privati nei papiri dell'Egitto greco-romano," in *Aegyptus* 17 (1937) 349–451. This contains a list of ninety relevant documents (pp. 351–353, and see 353–354).

[9] "An Agricultural Ledger in *P. Bad.* 95," in *JEA* 14 (1928) 34–45.

[10] Among other works of this kind is E. R. Hardy, *The Large Estates of Byzantine Egypt* (=*Columbia Univ. Stud. in Hist., Econ. & Public Law*, no. 354, 1951) 94–101

[11] pp. 37–38 above.

[12] The most authoritative and scholarly work on the subject is a recent article by a leading papyrologist, C. H. Roberts, "The Codex," in *Proc. of the Brit. Acad.* 40 (1954) 169–204, where references to the earlier literature will be found. Sir Fredk. G. Kenyon has given useful introductions to the subject in his article, "Books, Greek and Latin," in the *Oxford Class. Dict.* 141–143 and his short book, *Books and Readers in Ancient Greece and Rome*[2] (1951)—cited below as *BRAGR.*[2] W. Schubart, *Das Buch bei den Griechen u. Römern*[2] (1921) is less up to date, but still useful.

it was superseded by parchment,[13] or vellum (διφθέρα, *membrana*), made from the skins of animals,[14] the transition taking place by degrees during the third and fourth centuries. When more than one sheet of papyrus (κόλλημα, *charta*) was required for single purposes, the sheets[15] were stuck together to form a roll (τόμος, *scapus*; when written upon, βυβλίον or βιβλίον, *volumen*). Until the papyrus codex began to come into use, from about the early second century onwards, the roll was the regular form in which papyrus was employed in bulk, for ordinary documents as well as literary texts. A literary roll might be anything up to about 40 feet long,[16] a size sufficient for, say, Luke's Gospel, written in an average hand; documentary rolls might sometimes be even longer. The writing is in columns (σελίδες, *paginae*) which are often independent of the sheets and can vary greatly in width, especially in documentary (*i.e.*, non-literary) papyri.

For accounts papyrus was undoubtedly much used, but wooden tablets were employed probably even more often, except in Egypt. The wood was either whitened to receive ink from a pen or, more usually, covered with wax on which writing could be scratched with a *stilus*[17]—and then if necessary obliterated, and the tablet used again and again. A complete set of tablets would be made up of two or more wooden leaves, pierced at the edges and held together by thongs: two or three leaves were particularly common, but four or five were not unusual, and we know of tablets with as many as ten leaves,[18] though not more. Various expressions are used for a set of tablets: in Greek they are often δέλτος, δελτάριον, γραμματεῖον, γράμματα, in Latin *tabulae*, *tabellae*, *pugillares*,[19] even (because wax was normally employed) *cerae*,[20] and sometimes *codex* (originally, it seems, *caudex*), an expression which was being used as equivalent to *tabulae* at least as early as the first half of the second

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[13] The origin of parchment used to be attributed to Eumenes I (263-241 B.C.) or II (197-160/159) of Pergamum, on the strength of Varro, *ap.* Plin. *NH* 13.70; but the discovery at Dura Europus of parchments dating from the earliest years of the 2nd cent. B.C. has made many scholars think that (to quote Kenyon) "what Eumenes did was to develop for literary purposes the use of a material already in existence."

[14] Esp. lambs, calves and kids. The process of preparation is quite different from the making of leather, which was not used for writing purposes by the Greeks and Romans but was widely employed by other peoples of antiquity (*cf.* Hdts. 5.58.3), notably those of Syria and Palestine.

[15] Of about 9-13 inches in height and 5-10 inches in width: Kenyon, *BRAGR*[4] 49 *et seq.*

[16] "The extreme limit of a normal Greek literary roll" is about 35 feet, according to Kenyon, *BRAGR*[4] 53-55, 64-65; but see *P. Oxy.* XXII 2333, 2336. According to Pliny (*NH* 13.77) there were never more than twenty sheets in a roll, and the roll would therefore not exceed 10-15 feet in length (acc. to the width of the individual sheets), but Pliny must be referring to rolls which could be purchased in Italy—it was always possible to stick together two or more rolls.

[17] For a contrast between the two types of γραμματεῖον, see Ps.-Dem. 46.11 (where the emphasis, of course, is on αἰσχύνην κατεσκευασμένον).

[18] See, *e.g.*, Mart. 14.6.1 (*triplices nostros*); 14.4.2 (*quinciplici cera*); *P. Fouad* 74 (τελτάριον . . . δεκάπτυχον, 4th cent.); G. Plaumann, "Antike Schultafeln aus Agypten," in *Amtl. Berichte aus d. konigl. Kunstsammlungen* (Berlin) 34 (1912-1913) 210-223, where a wooden tablet of nine (originally, it seems, ten) leaves, each about 7 inches by 4 inches, is illustrated in figs. 96, 98-100. For an early (5th cent. B.C.) reference to many-leaved tablets, see Eurip., *Iph. in Taur.* 727.

[19] See, *e.g.*, Pliny, *NH* 13.69.

[20] As in Plaut., *Curc.* III 40; Cic., *II Verr.* i 36.92; Quint., *Inst. Or.* 10.3.31-32; Gai. 2.104; *Dig.* 48.10.1.4.

century B.C.[1] and is often found in Cicero, applied in particular to business documents, including accounts. The Greeks and Romans made extensive use of wooden tablets, especially as papyrus was not cheap enough to be used for ephemeral scribblings and could not be re-used indefinitely as tablets could. Waxed tablets, too, owing to the ease with which alterations could be made, were particularly convenient for drafting.[2] And they were used for very diverse purposes: for accounts, memoranda,[3] letters, *billets-doux*,[4] wills,[5] and official documents such as dispatches from the Roman Senate to a foreign king.[6] In Cicero's day (roughly the second quarter of the last century B.C.) it would appear that the great majority of accounts at Rome, public[7] as well as private, were written on waxed tablets; and this was probably true of most of the Graeco-Roman world at that time, apart from Egypt. A fair number of legible wooden tablets have survived from the ancient world,[8] but as I said earlier, I know of only one,[9] from Verespatak in Transylvania, containing actual accounts.

Tablets made of wood, however, were very clumsy: there were physical limitations not only to the number of leaves which could be bound together and used conveniently as one, but also to the size of individual leaves. Tablets of fair dimensions are sometimes pictured in ancient sculpture, reliefs or painting,[10] but all the actual specimens surviving which are known to me are quite small: a tablet 7 inches by 5 or 6

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[1] See Cato, *ap.* Front., *Ep. ad Ant. imp.* 1.2.11 ("jussi caudicem proferri . . . tabulae prolatae." The expression which follows, "usque istuc ad lignum dele," confirms that the *tabulae* were wooden). *Cf.* Sen., *de Brev. Vit.* 13.4. For an explanation of Suet., fr. 104 (Reifferscheid, pp. 133-134), see Roberts, *op. cit.* (in note 12, p. 68 above) 171, note 4.

[2] See Quint., *Inst. Or.* 10.3.31: "scribi optime ceris, in quibus facillime est ratio delendi."

[3] See, *e.g.*, Pliny, *Ep.* 3.5.15: a "notarius cum libro [a papyrus roll, to be read from] et pugillaribus" [tablets for memoranda] always attended the Elder Pliny when he was journeying.

[4] See Mart. 14.8; 14.9; Plut., *Cat. Min.* 24.1-2.

[5] Suet., *Div. Jul.* 83.2; *Nero* 17; Gai. 2.104. Suet., *Div. Aug.* 101, records that Augustus at his death left (a) a will in two *codices* (two sets of tablets) and (b) three *volumina* (papyrus rolls), containing (i) directions for his funeral, (ii) his *res gestae*, and (iii) a *breviarium totius imperii*—which was not an "imperial balance sheet" but rather an inventory of financial assets and military strength.

[6] As in Polyb. 29.27.2 (168 B.C.).

[7] See Cic., *pro Flacc.* 18.43 (*aerarii nostri tabulas*); Ascon., *in Milonian.* 29 (p. 33 Clark: *codices librariorum* were burnt on the improvised funeral pyre of Clodius). The accounts torn up by Scipio Africanus in the Senate in 187 B.C. (Polyb. 23.14.8) were not public accounts but the private accounts of Scipio himself or his brother Lucius: they were apparently written on a papyrus roll (*βυβλίον*).

[8] For the 155 tablets found at Pompeii, mostly in the house of the banker, L. Caecilius Jucundus, see *CIL* IV, Suppl. i, 3340. For the tablets from Verespatak, see *CIL* III ii, pp. 921-960, 1058, 2215. Facsimiles are given in both cases. For the tablets found recently at Herculaneum, see G. Pugliese Carratelli in *La parola del passato*, fasc. 3 (1946) 373-385; 8 (1948) 165-184. *Cf.* Paul, *Sent.* 5.25.6.

[9] See p. 20 above.

[10] In particular the large tablets depicted in the reliefs on one of the balustrades of the Roman Forum—if this scene really does refer, as most people have thought, to the remission of debts owed to the Roman State, by order of Trajan or Hadrian, in which case the objects being piled up (for burning) must be the wooden tablets on which the debts were recorded. (*Cf.* p. 31 above.) For a reproduction and notes, see Rostovtzeff, *op. cit.* in note 20, p. 41 above, pl. 50.2. A tablet composed of several leaves, of more normal size, is represented in a relief from Sens (Agedincum), now in the local museum: see Rostovtzeff, *op. cit.* 206 and

inches would be if anything rather larger than most. In the *Curculio* of Plautus the banker Lyco complains that he filled up four whole pages of his tablets, writing down the absurd name "Therapontigonus Platagidorus"[11]; and although this is of course comic exaggeration, it may serve to remind us that we are dealing with something much nearer the size of the schoolboy's slate than a modern ledger. And it is difficult to write small on wax. A real step forward was made by the Romans, probably in the last century B.C.,[12] when some of them began to employ, to a limited extent, a *codex* made up of leaves of parchment instead of wood,[13] at first for those everyday purposes for which wooden tablets had been used, and then occasionally (by at any rate A.D. 84–85)[14] for works of literature, in place of the papyrus roll. Quintilian,[15] writing in the early nineties of the first century of the Christian era, specially recommends the parchment notebook (*membranae*) for drafting purposes to those having poor sight (who might well find scratchings on wax difficult to read), although at the same time he deplores the necessity—unknown when waxed tablets were being used—for constant dipping of the pen, which tended to shatter the *cogitationis impetum*. Neratius Priscus, an early second-century lawyer, gave the title "Membranae" to one of his

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pl. XXIX 2. A tablet of typical dimensions (to judge by those which have survived) is shown in Plate I in this book. A charming ancient picture of "a poetess with tablets and stylus" is reproduced in Kenyon, *BRAGR*[2] (note 12, p. 68 above), opp. p. 16.

[11] Plaut., *Curc.* III 39-40: "nam mihi istoc nomine, dum scribo, explevi totas ceras quattuor."

[12] The evidence is scanty but just sufficient. I cannot agree with Roberts, *op. cit.* in note 12, p. 68 above) 173 and note 3, that "in palimpsestos" in Catull. 22.5 (not 12.5) probably refers to parchment, since (a) the only other time this word appears in Latin in the last cent. B.C. (Cic., *ad Fam.* 7.18.2) it clearly means papyrus (*cf.* "in illa chartula" in the next sentence), as Roberts himself says; and (b) Catullus is speaking here of a great quantity of verses, 10,000 lines or more, evidently a finished product, and the contrast he draws is not between the completed roll and "the poet's jottings" (which might reasonably have been written on poor material) but between the splendid papyri (*chartae*, line 6) on which Suffenus's verses were actually written and the twice-used papyrus to which other people so often ("ut fit," line 5) committed their poetry. However, Hor., *Sat.* 2.3.2 and *Ars Poet.* 389 can only refer to a parchment notebook used for drafting poems. These two passages are sufficient to establish the familiar use of the parchment codex at Rome before the end of the last cent. B.C. See also Pers. 3.10 (*c.* A.D. 55-60); the jurist C. Cassius Longinus (cos. A.D. 30, died *c.* 70) *ap.* Ulp. in *Dig.* 32.52.pr., 3 ("membranae" are included in a bequest of "libri"); *Epist. II ad Tim.* 4.13 there, as Roberts, *op. cit.* 174, 190-191, acutely points out, the writer "uses the Latin word μεμβράνας because he is referring to a Latin object for which there was no simple equivalent in Greek"). It is quite possible that the parchment notebook (*membranae*, in the plural) was already widely used in Cicero's day: see Roberts, *op. cit.* 174, citing Cic., *ad Att.* 13.24.2. However, I cannot find any suggestion in the sources that the parchment codex was yet employed for accounts—it may have been, but the language of the sources rather suggests the contrary.

[13] We seem to have no definite evidence for the use of the word "codex" for anything except wooden tablets before Gaius (A.D. 160's 170's—see *Dig.* 2.13.10.2: "totum . . . codicem rationum totasque membranas," of the *argentarius*), his contemporary Q. Cervidius Scaevola (*Dig.* 32.102.pr.: "membranulis . . . membranis"), and Ulpian (*c.* A.D. 211 217—see *Dig.* 32.52.pr.: "in codicibus . . . membraneis vel chartaceis . . . vel in ceratis codicillis"; also 2.13.6.7). And see Paul. *Sent.* 3.6.87. "Tabulae," so far as I know, was never used except of wooden tablets.

[14] Mart. XIV 7; 184; 186; 188; 190; 192.

[15] *Inst. Or.* 10.3.31-32.

works,[16] as today he might have called it "Jottings from a Lawyer's Notebook."[17]

Nor was it only in Italy that parchment was used in codex form: an isolated parchment diptych fastened with a leather thong, containing a document believed to date from the last century B.C. or the first of the Christian era, has been found at Dura-Europus on the Middle Euphrates[18]; and one of the comparatively few early Latin literary documents from Egypt,[19] dating apparently from about A.D. 100, once formed part of a parchment codex. During the first two centuries of our era the use of the parchment codex by the Romans seems not to have developed very greatly: at any rate, there appears to be no obvious allusion to it in the works of such writers as Pliny the Elder, Pliny the Younger, or Lucian, and only one in Galen[20]; and I do not myself know of any specific surviving reference during those two centuries to the keeping of accounts on parchment codices instead of wooden tablets, except in the lawyers of the mid-second century, Gaius and Scaevola,[1] from whose language, however, it is clear that accounts kept on parchment were by no means exceptional, even if the use of wooden tablets was still much more common.[2] In Egypt the papyrus codex[3] must have appeared soon after the parchment codex arrived—from the West, if we may accept Roberts's plausible reconstruction of the sequence of events, and hardly later than the end of the first century.[4] The codex form, applied to papyrus, was much favoured by the Christian communities in Egypt. A high proportion of the Biblical papyri from about the first four centuries of the Christian era are codices or fragments of codices, whereas for pagan literature the roll was almost invariable until well into the third century.[5]

Appendix C. The Roman "Literal Contract"

The Roman literal contract[6] (*obligatio litteris* or *litterarum*) certainly existed in late Republican times.[7] It was probably obsolescent, however, even in the mid-second century of our era, from which period there survives the only reliable description of it we have, in the *Institutes* of Gaius,[8] and it had entirely fallen out of use before Justinian codified

[16] *Dig.* 1.3.21.
[17] So Roberts, *op. cit.* (in note 12, p. 68 above) 196.
[18] F. Cumont, *Fouilles de Doura-Europos* (1926) 296-304; and see Roberts, *op. cit.* 173, note 1.
[19] *P. Oxy.* I 30: see Roberts, *op. cit.* 180.
[20] See Roberts, *op. cit.* 170-171, 180.
[1] As cited in note 13, p. 71 above.
[2] It would be interesting to know what Juvenal (*Sat.* 7.110) had in mind when he wrote of a creditor coming to collect a debt "grandi cum codice."
[3] Note Roberts, *op. cit.* 182-183: "There is no essential connection between format and material." Papyrus could be made up in codex form and parchment in roll form (see *Dig.* 32.52.pr.), although the reverse was of course much more common.
[4] See above and note 19.
[5] See Roberts, *op. cit.* 183-191.
[6] On the literal contract, see the brief and clear commentary of F. de Zulueta, *The Institutes of Gaius* II (1953) 163-166; also H. F. Jolowicz, *Historical Introd. to the Study of Roman Law*[2] 295-297, 564 565; W. W. Buckland, *Textbook of Rn. Law*[2] 459-461; P. F. Girard, *Manuel élém. de droit rom.*[6] 527 532.
[7] I do not regard Livy 35.7 as conclusive evidence of the existence of the literal contract in the early 2nd cent. B.C.; but Cic., *de Offic.* 3.14.58 60 shows that it was well established by the later years of that cent. (I assume that the C. Canius, *eques Romanus*, in this passage and *de Orat.* 2.69.280 are identical.)
[8] 3.128-134, 137-138. Theoph., *Paraphr. Inst.* 3.21 can be ignored.

Roman law in the sixth century.[9] The literal contract was the only "formal" or "abstract"[10] written contract known to Roman law: that is to say, it was the only type of contract recognised by Roman law in which the writing actually *was* the contract, as distinct from merely providing *evidence* of the contract. It was a highly technical affair, and nothing could be more mistaken than to infer from the name, as the layman might, that any written contract could create an *obligatio litteris*. On the contrary, the only two forms which we can be sure the literal contract could take are as follows[11]:—

(a) *Transcriptio a persona in personam*.[12] If a debt was owing from B to A, C might by agreement be substituted as A's debtor *litteris* in place of B, who then dropped out entirely. The essential writing was an entry by A of a fictitious loan to C, equivalent to the amount of the existing debt.

(b) *Transcriptio a re in personam*. If a debt was owing from B to A, the debt could with the agreement of the parties be converted into an *obligatio litteris* by an entry in writing by A of a fictitious loan to B. This was, of course, a plain form of novation of an existing debt.

From the creditor's point of view the superiority of a contract *litteris* to an ordinary contract (of sale, for example) was that it might greatly improve his own legal position by providing him with a more effective form of action *stricti juris*, by *condictio*,[13] free from the counterclaims and other features of an action *bonae fidei* which, but for the literal contract, might have been his only remedy at law.

That is virtually all we know about the Roman literal contract.[14]

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[9] See *Inst. J.* 3.21. It has been very plausibly suggested that creditors came to prefer the *constitutum* (on which see Buckland, *op. cit.* 529-531), since on this could be based the *actio de pecunia constituta*, with its higher penal *sponsio pecuniae partis dimidiae* (Gai. 4.171; *Inst. J.* 4.6.8,9).

[10] It may be that in strictness these terms are inapplicable to the literal contract: see de Zulueta, *op. cit.* (in note 6 above) II 165.

[11] From these two forms of *nomina transcripticia* Gaius (3.131-132) distinguishes real entries recording the payment of money (*nomina arcaria*), where the contract is brought into existence by the actual payment (*numeratio pecuniae*) and not by the making of the entry, which can do no more than supply evidence of the payment.

[12] An inscription apparently illustrating this is *FIRA* III[2] no. 124=Bruns, *Fontes*[7] no. 156. See also P. F. Girard, *Textes de droit rom.*[4] 846-847.

[13] See de Zulueta, *op. cit.* (in note 6 above) II 164-165; and, for the *condictio*, Jolowicz, *op. cit.* (in note 6 above) 221-223, with 197-200 (see esp. 198-199 on the *sponsio et restipulatio tertiae partis*). The literal contract was inferior in some respects to *stipulatio*, but unlike *stipulatio* it could be concluded *cum absentis* (Gai. 3.138; and note the words "apsente [de]bitore" in the inscription mentioned in the preceding note).

[14] Our three main pieces of literary evidence for the literal contract do not take us much further:—(a) Val. Max. 8.2.2 does not make clear the grounds on which the *judex* gave judgment against Otacilia: he may simply have refused to enforce a contract which could well be regarded as contrary to morality. (b) Cic., *de Off.* 3.14.58 60 is evidently describing a literal contract: Pythius had swindled Canius, but Canius had become his debtor by novation under a literal contract, and it appears that at that time the Roman courts would not go behind a literal contract, even to investigate a case of alleged fraud. This, however, took place (see note 7 above) at a time before C. Aquilius Gallus had devised the *exceptio doli*, c. 66 B.C. (see Jolowicz, *op. cit.* 292 and note 6). Presumably Canius was shown to have consented, by words or actions if not by writing, to the making of the all-important *nomina* by Pythius, and this was sufficient to bind him. (c) Cic., *pro Q. Rosc. com.* (see pp. 41-43 above) is a real puzzle, mainly perhaps because Cic. may have had a bad case and may have

There is no reason to suppose that any writing on the debtor's part was necessary,[15] although of course there would be no *obligatio* unless the debtor had consented to the making by the creditor of the *nomen* which created the literal contract.[16] Nor is there the slightest evidence that it was necessary, or even customary, for the creditor to make a "counter-entry" recording the discharge of the debt which was being replaced by the literal contract. In my opinion it is not even quite certain, whatever Cicero may say in his speech for Q. Roscius, that the *nomen* had to appear *in the account-books* of the creditor. Fannius, the plaintiff against Roscius, evidently believed the entry in his *adversaria* to be sufficient; and I think that possibly the *nomen* might appear in any document, although an entry in the formal account-book may in practice have been almost invariable.[17]

It is usual to speak of the entry creating the literal contract as *expensilatio*, but this expression never occurs in Classical Latin except once in Aulus Gellius,[18] where it may not be a technical term and indeed is probably two words, *expensi latio*. Certainly the word one might have expected to provide its antithesis, *acceptilatio*,[19] is a technical term belonging to an entirely different legal context: it denotes only the verbal release of a verbal contract (*verbis obligatio*, including *stipulatio*). Any obligation created otherwise than verbally might, with the agreement of the parties, be transformed by a novating *stipulatio* into an *obligatio verbis*, and then released by *acceptilatio*[20]; but the *acceptilatio* itself was purely verbal and required no book-keeping entries or other writing.

When we remember that Roman accounts were kept in narrative rather than tabular form, and above all that separate debit and credit columns were unknown, we shall not be tempted to try to find in the *nomina transcripticia* of the literal contract any anticipation of double-entry book-keeping.

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confused the issue deliberately. Fannius Chaerea, the plaintiff, was surely claiming under a literal contract (see esp. 4.13; 5.14), the evidence for which was in his *adversaria* (1.2 to 3.9). Cic. ridicules this evidence, but we do not know whether he was justified. Evidently Fannius believed he had a good case. Cic. claims that Roscius had made no corresponding entry in his own accounts; but Roscius, of course, might have made the entries originally and afterwards destroyed the accounts. Cic. invites the court (1.2) to treat the absence of entries in Roscius's books as evidence at least equal in force to the entries made by Fannius: evidently the absence of writing on the part of Roscius was not at all a serious legal flaw in Fannius's case, or Cic. would have made very much more of the point.

15 See the last part of the preceding note.

16 "Nuda ratio non facit aliquem debitorem": *Dig.* 39.5.26; 15.1.49.2. And see Cic., *pro Q. Rosc. com.* 1.2 ("jussu hujus").

17 I have not been able to read the article by V. Arangio-Ruiz in *Studi Enrico Redenti* I (1950) 115-123, which is not available to me. I know of it only through Jolowicz, *op. cit.* (in note 6 above) 564-565.

18 14.2.7.

19 Gai. 3.169-172; *Dig.* 46.4.

20 Gai. 3.170; *Dig.* 46.4.19.pr.