

THE FOURTH FACTOR

Managing non-agricultural production in the Roman world

Jean-Jacques Aubert

Introduction

Modern scholars of the primitivistic persuasion tend to believe that the conditions of economic production in the ancient world were necessarily and drastically different from those attested in later periods of history. Attitudes and behaviours in the field of economics are admittedly conditioned by the intellectual, technical, material, and social context in which economic actors grow, live, and perform, as well as by their perception of the historical evolution of the material situation in previous times. Thus, the organization of production, agricultural or not, depends at all times on the need and/or the willingness of 'entrepreneurs' to reach a level of productivity that would make their effort worthwhile: only an economic system like those established by some Communist régimes in the twentieth century would be able to subordinate economic rationalism to social priorities, an endeavour that met limited success and saw the development of parallel economies (black market) ruled by profit. As a rule, the production of goods and services implies some degree of organization, which may or may not be affected by the overall structure of the society in which it takes place. Throughout history, the level of sophistication found in such an organizing process may have varied to a great extent, but attempts at theoreticizing that process never went beyond the construction of an empirical science, to the effect that there is no clear divide between an archaic 'timeless, simple managing' and a modern 'positive management'. Sceptics may start with Allen's *Winnie-the-Pooh on Management* (1994), where management is defined as 'the art and science of directing effort and resources so that the established objectives of an enterprise may be attained in accordance with accepted policies', an activity aimed at getting things done the right way through six distinctive functions:

- 1 defining the objective(s);

- 2 organizing the productive process;
- 3 motivating the personnel involved in that process;
- 4 training those people;
- 5 establishing communication between them and with the chain of command;
- 6 measuring and analysing the results of the operation.

As Allen rightly claims, these six functions are universal and applicable to any field of endeavour, be it 'an expedition to the North Pole, business, the public sector, volunteer work, professions, or one's private life'. (Allen 1994, 4 and 160). Like Monsieur Jourdain who spoke in prose without being aware of it (Molière, *Le Bourgeois Gentilhomme*, ii. 4), practically everyone may have been occasionally acting as a manager, more or less consciously, and with various degrees of competence and success. This is certainly true of those economic agents responsible for the material growth and prosperity of the Roman empire over several centuries.

The overall social and economic history of the Roman world is fairly well known, although all accounts of it will necessarily be overschematic and oversimplified,¹ the reality being too complex to be grasped through documentary evidence, no matter how abundant and diverse it may be. Nevertheless, some features are remarkable: let us mention the general stability of long-term conditions, common to many pre-industrial societies, with a never challenged dominance of the agricultural sector and the ever contained development of the manufacturing sector, to be contrasted with some geographical and chronological differences, such as the uneven distribution of slave labour and the gradual globalization of the market economy, with the progressive and ubiquitous distribution of standard goods (pottery) stretching even beyond the political frontiers of the empire, the universal adoption of similar forms of settlement (*villas*, *vici/kômai*, *municipia*/poleis, etc.), the intermingling of private and public sectors, the superficial, though standardized Romanization at the linguistic and legal/institutional levels, etc. This appearance of stability should not blind us to substantial changes in the field of economic production, evidenced by the development of Roman commercial law, thanks to which production and trade were facilitated despite a deep-rooted social prejudice against such activities (Aubert 1994 and 1999a).

The subject of this paper will be the economic aspect of the organization of the production of goods and services. The social profile of the people involved will not be discussed here, in spite of the fact that our evidence is more explicit on that point than on purely economic matters. For that reason, previous studies, mine included, have tended to get side-tracked in dealing with questions of identity, legal relationships, personal status and origin, to the detriment of the economic aspects of ancient management. The focus will be on the specific activities of business managers in the

Roman economy, mostly in non-agricultural contexts. My objective is not limited to describing these activities, but includes an attempt at reconstructing the theoretical reflection derived from, or conditioning, the actual practices reported in our sources. In order to understand how business management was envisaged in the Roman world, it is necessary to provide a working definition of the concept of management, then to correlate that definition with the few ancient writers who discussed the theoretical aspects of management, and finally to determine to what extent business practices in ancient Rome, documented by written, architectural, and artefactual evidence from across the Empire, fitted both the proposed modern definition and the reconstructed ancient theoretical system (Aubert 1993 and 1994, for further clarification and examples).

Definition

At the end of the twentieth century, management is usually understood as the art of organizing and combining several 'factors' of heterogeneous nature to achieve a well-defined goal, economic or otherwise. Consequently, good management is regarded as the key to survival and improvement, at either a personal or institutional level, in all facets of social and economic life. Nowadays, specialists have devised ways to assess the optimal use of available resources, given one's personal inclination and agenda, to achieve timely gratification and/or lasting fulfilment.

Two thousand years ago things may have been somewhat similar, but in the field of economics those involved as agents or observers either did not think it worth their while to report their thoughts about such expectations, or did so in a way that has remained heretofore hidden to posterity. However, since no economic activity can be carried out without some basic form of management, we can safely postulate that management as an empirical science predated its scholarly treatment, and that, to some extent, the logical criteria it followed in any given period and place could be reconstructed on the basis of their application in actual economic practices. In other words, modern scholars must collect as much evidence as possible for whatever activity can be shown to be directed towards achieving some degree of efficiency in acquiring, allocating, and using human endeavour, as well as material resources for a definite purpose. Thus, management must take into consideration:

- the goal to be reached (for instance, maximum profit, self-sufficiency, steadiness of income, ensured logistical supply, etc.);
- the personnel to be involved (in quantitative terms, permanent or temporary, fixed or transient; in qualitative terms, skilled, specialized, versatile, or not);

- the technology to be used (depending on availability and affordability);
- the timing of execution (dictated by the market or by nature);
- above all, the best ways to coordinate all possible factors engaged in the production and distribution of goods and/or in the performance of services.²

Broadly speaking, management involves two types of decisions:

- strategic, i.e. with global and long-term effects;
- tactical, i.e. with narrower and shorter-term effects.

Strategic decisions are generally made by entrepreneurs, and tactical ones by business managers. It is mostly with this latter aspect that this paper is concerned.

In pre-industrial economies, in which capital investment is small in comparison with modern Western economies, the production of non-agricultural goods seems normally to have been organized on a small scale for local and regional markets (even though archaeological reports tend to emphasize the exceptional elements of long-distance trade). The proximity of centres of production to markets ensured that qualitative and quantitative fluctuations in demand were nevertheless perceived, if not anticipated, by the producers. In small enterprises, strategic and tactical decisions were usually made by one and the same person, the independent craftsman, owner or lessee of the premises in which he or she operated, working alone or with a few associates, assistants, or apprentices. These people often belonged to the same household, as dependants or relatives.

For the Roman world, this type of enterprise is well attested in Greek and Latin inscriptions,³ and in iconographic representations preserved as reliefs on funerary altars, urns, cippi, sarcophagi, and stelai, or as painted shop-signs, mostly from Pompeii.⁴ As an entrepreneur, the owner of a workshop (or, for that matter, of any kind of economic unit) would have to decide:

- what to produce and on what scale;
- what general market to target;
- whether to invest in capital (and how much) or whether to contract out those tasks that required more capital than he or she was ready to acquire;
- whether the enterprise should tend toward vertical or horizontal integration (or both);
- how to organize the distribution process, etc.

As a manager, the same craftsman was in charge of:

- defining the quality-level of the production (for instance, whether to produce luxury goods for an élite or coarser products for a larger market);
- organizing the actual productive process by using the resources in land, buildings and facilities, tools and other form of capital, labour, and raw material available to him/her in what he/she saw as the most efficient way;
- making arrangements for the distribution of the production, etc.

It should be remembered, however, that the time, energy and creativity of such independent craftsmen may mostly have been engaged in the actual productive work, leaving them with little leisure to think about the overall strategic and tactical aspects of their activity. On the other hand, personal involvement in the productive process ensured that the choice between different forms of management was more pragmatic than dogmatic.

Various economic parameters, such as the weight of taxation, the demand of a growing and more diversified market, the improvement of land and sea transportation, the growing needs of the army and bureaucracy, etc. may have provided an impetus for increasing the production of a whole variety of non-agricultural products. Small entrepreneurs were confronted with the challenge of taking advantage of new economic opportunities without much support or incentive coming from the Roman state, with the remarkable exception of the organization of the food supply for major cities (Sirks 1991). Since potentially large profits were at stake, due to the sheer scale of the operation, some entrepreneurs eventually developed a basic infrastructure and may have pushed for the creation of a legal system that would enable them to increase their productivity, to diversify their production, and to improve channels of distribution. This crucial development can be traced through the study of Roman commercial law, to be reconstructed from the law of contracts, which shows that significant changes were introduced in the field of business management during the late Republican period.⁵ Thus, partnerships (*societates*), joint ventures (*negotiationes exercitatae per servos communes*), and indirect agency (*actiones adiecticiae qualitatis*) were first regulated by Roman praetors during the second century BC and discussed by jurists from the first century BC onward. The connected phenomena of praetorian regulation and juristic interpretation should be regarded as a reflection of the mutations that occurred in the social and economic life of that period.

Insofar as this paper will focus upon the role of business managers as opposed to entrepreneurs, it will focus primarily on the activities of those managers who were acting as agents on behalf of absentee entrepreneurs. Thus, tactical decisions will predominate, in spite of the fact that, first, it is

not always easy to tell strategy and tactics apart, and second, that ancient sources occasionally show business managers as making strategic decisions as well as tactical ones. Moreover, the term 'management' has been used recently to describe either level of decision making, with the effect of somewhat confusing the issue. Thus, the main thesis of Kehoe (1992) is that landowners 'managed' their estates in such a way as to avoid investing too much in capital, resorting instead to tenancy and various kinds of contracts of lease and hire, in order to ensure maximum economic security in relation to their agricultural income. According to the definition proposed above, the landowners studied by Kehoe, from the 'modest' Epimachus of Hermopolis in the first century AD to the 'very powerful' Aurelius Appianus of Alexandria in the third century AD, as well as their counterparts in the West, exemplified by the Younger Pliny, were not managers, since all tactical, and to some extent even strategic, decisions relating to the actual running of individual estates were entrusted as a whole to tenants and sub-tenants, or to appointed managers (*phrontistai, oikonomoi, proestōtes, epitropoi, et al.*). A similar situation is attested in non-agricultural enterprises, such as the brick and tile factories located in the vicinity of clay pits in the outskirts of Rome, owned in the second century AD by the Roman aristocracy and the imperial family, and the lead industry which produced water conduits in Rome and in many towns across the empire, as well as in other sectors of the Roman economy.⁶ In view of the many levels of management attested in agriculture, the distinction between entrepreneurs and managers may be too simplistic. Rathbone's detailed study (1991) of the third century AD Heroninus archive shows that large landowners relied on a sophisticated administrative structure, which could have been adopted in the larger-scale enterprises of the non-agricultural sector (Aubert 1994, Ch. 4).

Management thought in the Greco-Roman world

How did ancient people, economic actors and theoretical writers, think about management? We know far less than we should on that question, considering the ancient writers' interests in technical matters and in the moralistic aspect of leadership. However, a few works of primary importance illustrate the basic principles observed by managers and the attention to details required from them.

In the Greek world, several classical authors had written extensive economic treatises emphasizing the moralistic aspects of good management, based on the enforcement of strict discipline upon the work force and the impractical quest for self-sufficiency. In his *Works and Days*, Hesiod (eighth/seventh century BC) expounds a work ethic in which competition (*eris*) is acknowledged as an important driving force in productivity. Praising hard work, honesty, and good social behaviour as an insurance against misfortune, the poet favours modest growth and self-sufficiency of the

household (*oikos*). For Hesiod, agriculture is a better way to economic prosperity than seaborne commerce, which he considers, however, as an acceptable alternative provided that it is conducted in a proper way.⁷

Hesiod's concept of the *oikos* as the basic economic and managerial unit was taken over by Xenophon in his treatise on domestic economics (early fourth century BC), which starts with praise of agriculture as a higher form of economic activity than crafts. A major proponent of division of labour, Ischomachus, Xenophon's character and spokesman, works in the fields, while his wife stays indoors: both assume responsibilities in organizing the staff and teaching them specific skills. Sound management implies sorting, inventorying, and classifying all human and material resources. The choice of a female administrator (*tamia*) is revealing of the landowner's priorities. Loyalty is secured by her knowledge of the whole *oikos*, complicity at a personal level, good example and a share in the ensuing prosperity of the household. Xenophon focuses on personnel selection, with the conviction that the right manager or foreman (*epitropos*) would instinctively do the right thing. Training, however, remains central, and is the preserve of the omniscient head of the household. It starts with general education aimed at instilling a sense of justice and responsibility (*epimeleia*), underlining the importance of the psychological aspect of managerial tasks. Supervision and retribution are the keys to sound management. Technical knowledge comes second, but is nevertheless essential. The treatise ends with an encomium of leadership, common to politics, (household) economics, agriculture and war. Leaders and foremen (*epitropoi*, *ephestēkotes*, *epistatai*) cannot do more than create positive working conditions, by promoting the workers' willingness to perform as adequately as possible the tasks entrusted to them.⁸

Pseudo-Aristotle's *Economics* partly follows the model of Xenophon in proposing basic definitions and a logical classification. The *oikonomikē tekhnē* is a science dealing with the acquisition (*ktēsis*) and running (*chrēsis*, management) of an *oikos*, and as such has a priority with regard to politics. Revenues from agriculture and other natural resources are held in higher esteem than those from crafts and trade, because they are derived from the generosity of the earth, and not from other people's good will or compulsion. Paradoxically, the first step consists of acquiring agricultural slaves, overseer and workers (*epitropos kai ergatai*), and training them. After a short section on the treatment of slaves comes a survey of the landowner's duties, amounting mostly to supervising foremen and workers. Remarkably, the author refers to an Attic mode of accounting and allows for different practices between small and large estates. The second book starts with a discussion of various types of management according to the scale of the unit (kingdom, province, city, and private enterprises). A basic principle, common to all four levels, is that expenditures and revenues should be balanced. The rest of the work is irrelevant to the subject of ancient management.⁹

Even though Greek classical writers have little to say about business

management, their moralistic concerns had a compelling influence upon Roman and medieval treatises on estate management and husbandry (Oschinsky 1971). In spite of their influence upon the development of management thought and practices, the views expressed in these treatises are not always consistent with what we happen to know otherwise of both agricultural and non-agricultural enterprises. They can be regarded as reductionistic and overschematizing, but should not be dismissed altogether, because they provide us with a rare window on management theory in the ancient world.

From the Roman period two categories of writings are concerned with the theoretical aspect of business management. First, we have the works of the Roman agricultural writers, from Cato the Elder, in the second century BC to Varro in the first century BC, Columella in the first century AD, and finally Palladius at the turn of the fifth century AD. All of them were concerned with the management of agricultural estates owned by absentee landowners and managed by farm managers, usually called *vilici*. The agronomists devoted several sections of their respective treatises to the role of these managers, the scope of their activities, and the organization of the staff (*familia*) attached to single managerial units (*fundi* or *praedia*). The most striking features of their descriptions are the stress they put on division of labour, and the existence of a rather sophisticated chain of command, from individual workers, skilled or not, to foremen (*praefecti, monitores*), overseers (*vilici*), supervisors (*actores*), administrators (*procuratores*), and landowners (*domini*). The type of organization discussed by the agronomists clearly recalls that of military units. Since agricultural work is seasonal by nature, it was acknowledged that the regular staff attached to a managerial unit were either supplemented by outsiders, for instance hired hands (*mercenarii*) or liturgists (in a later period), or occupied in other productive activities taking place on the estate or outside, even at some distance from it. The options available to entrepreneurs and their managers were division of labour, hierarchical organization of the staff, diversification of the production within the unit or in connection with other economic or managerial units, horizontal and vertical integration of economic units, sharing of labour resources and other means of production with other units (Aubert 1994, Ch. 3).

Second, we have the juristic writings preserved in Justinian's *Corpus Iuris Civilis*, consisting mostly of the classical jurisprudence relative to some praetorian remedies created in the late second or early first century BC and called *actiones adiecticiae qualitatis* in modern literature (Dig. 14 and 15). These remedies were originally given to people who had made a contract with an authorized business manager, so that they could sue, on that contract, the principal on whose behalf such managers were acting. The system implied the principal's request (*iussum*) or authorization (*permissio*) for the agent to do business on a specific or general basis, or rested upon the appointment (*praepositio*) of the business manager by his principal as the head of the managerial unit. The *praepositio* amounted to an agreement between the principal

and third contracting parties concerning the scope of the manager's activity. This agreement could be tacit or explicit, then given orally or in writing, before or even after the contract was made. Restricted at first to cases involving legally dependent managers – the principal's slave or son-in-power – the grant of these remedies was eventually extended to cases involving all kinds of authorized agents.

The Roman jurists were mostly interested in the extent of the liability of the principal on account of his agent's contracts and in the nature of the legal relationship between principal and agent. Modern scholars would like to hear more about the economic aspect of the so-called institorian arrangement, but the legal sources are mute on this topic. They acknowledge, however, the existence of various levels of economic control on the part of the principal, who could decide to retain the right to endorse or veto every single transaction made by his manager, or to issue a general authorization to negotiate any contract related to the management of a well-defined economic unit, or even to give complete freedom to his dependant to engage in whatever economic activity he might choose. The extent of the principal's liability would of course vary accordingly.

Another interesting contribution of the juristic sources concerns the definition of the enterprise as an economic and managerial unit. This is to be found in the discussion of a specific aspect of the law of succession, namely the technicalities surrounding the legacy of an estate fully equipped with a view to undisturbed operation (*Dig.* 33.7). There we learn that staff and managers, as well as the basic tools necessary for the production, were considered an integrated part of the unit, and would go with it in the event of a succession, and, I surmise, of a sale or lease.

In the legal sources, business managers are called *institores*, obviously a generic term used to describe a legal position rather than a specific function. An *institor* was basically a manager who had been appointed (*praepositus*) to the head of an economic unit, and who, in that capacity, was likely to negotiate various contracts with suppliers of material, labour, and services, as well as with customers. Principals had unrestricted power of control over their managers' activities, and could interfere at any moment and in any way they chose. Whether a principal could also suspend the appointment, temporarily or permanently, depended upon the nature of the legal relationship established between them.

The personal profile of the manager, in terms of freedom (and, of course, citizenship), gender and age, was less relevant in economic terms.¹⁰ What should be investigated at this point is the functional aspect of the institorian arrangement.

Business managers in ancient Rome: evidence and approaches

Legal, literary, and epigraphical sources

If management is to be understood in a narrow sense as the sum of all tactical decisions made by people appointed as the head of an economic unit in connection with the operation of that unit, the best way to reconstruct Roman management would be to investigate how actual units were run. Of course, the legal sources have little to say about that. But the casuistic approach of classical jurisprudence discloses in which sectors *institores* were known to be active in Roman society. Whereas most excerpts refer to *institores* as being in charge of a *taberna*, a non-specific term used to designate any kind of shop, some texts mention *institores* employed, for instance, in the garment industry, retail trade, banking,¹¹ real estate, undertaking and, rather ambiguously, agriculture.

This functional approach could be extended to non-legal sources, that is literary texts and Latin inscriptions. The former category is not helpful, because the word *institor* is used there in a non-specific, often derogatory meaning, to designate a lower class profiteer whose existence and activity provided no benefit to Roman society. No wonder then that *institores* as such almost never appear in Latin inscriptions: out of six known cases of probably imperial date (three from Italy, one from Noricum, one from Macedonia, one from Spain), two *institores* were involved in the perfume industry or trade, respectively as *unguentarius* and *seplasiarius*, one was a shoemaker (*sutor caligarius*), one possibly a bathkeeper, and one possibly the manager of a relay station.¹² The recent discovery of the epitaph of Aulus Etrilius¹³ adds a possible arms dealer, of libertine status and perhaps Italian origin, buried near Cordoba in the province of Baetica. From this scant evidence, we are forced to admit either that the Roman jurists created a fiction in their lengthy discussion of the *actio institoria* (Dig. 14.3) or that *institores* went by a variety of different names in real life. This second hypothesis is confirmed by the fact that managers of agricultural estates, explicitly discussed by the jurists Labeo/Ulpian and Paul¹⁴ in connection with the *actio institoria*, were known as *vilici*, a term also commonly used in connection with non-agricultural activities in both epigraphic and literary sources (as well as in the Theodosian Code).¹⁵

This equation/identification (*vilicus = institor*) is of fundamental importance for several reasons. First, it means that the list of economic sectors in which *institores* were reportedly active is much longer than that provided by the legal sources. However, such a list will never be comprehensive, the evidence being selective by nature. Second, it is possible to build a large, ever growing data-bank of Latin inscriptions featuring *vilici*, which provides the necessary basis for a prosopographical study revealing possible geographical variations and functional diversity (tax collection, water supply, lead

workshops, etc.). Third, there are good reasons to think that *vilicus* was not the only label used by ancient business managers to refer to their occupational position, and that other Latin or Greek words designating professionals could have been used in the same way (cf. *actor*, *magister pecoris*, *insularius*, *offinator*, etc.), allowing additional prosopographical lists to be built up. Fourth, the Roman agricultural treatises underline a few concepts relative to the management of agricultural estates, from which it may be possible to extrapolate the methods of management used in other types of economic units. However, the Roman agronomists belong to the most conservative layer of Roman society, namely the landed aristocracy, and their works are more normative than descriptive (they say what *vilici* should do, not what they were actually doing, and the difference *is* significant). To what extent these treatises can be used to illustrate the management of, say, a workshop producing terracotta lamps, an inn, or a commercial ship is hard to establish. Fifth, the terminology sometimes reveals controversial technicalities. For instance, the legal sources mention that shipmasters appointed by shippers could occasionally appoint a substitute as sub-agent.¹⁶ The passage by Ulpian, quoting Iulianus, has been rejected as interpolated by some scholars, but is vindicated by the manifold occurrences of *subvilici* and *subactores* in Italian inscriptions.¹⁷

Archaeological material

Based on legal, epigraphical, and literary material, the functional and prosopographical approaches remain problematic, because they provide little diachronic perspective on the phenomenon of business management. How long did a particular workshop keep producing the same items? How far away were these distributed? Duration of activity and spatial range of distribution can be seen as the result of managerial decisions if marketing was not carried out by an independent trader. A study of the archaeological material helps to overcome the limitation of written evidence. The remains of various types of clay artefacts, signed by the producer(s), have been found in significant quantities in areas sometimes wide apart, so that the question of a possible distribution or relocation of centres of production and of differentiated marketing practices has arisen.¹⁸ In this respect, petrological analysis of artefacts, their dating on the basis of typology or archaeological context, and the making of distribution maps can reveal specific details about the production and distribution policy chosen by individual enterprises. Admittedly, this sounds more like a matter of strategy than tactics.

Artefacts made in several parts or stages, such as moulded or decorated pottery with stands and handles, or lamps with tanks and lids, occasionally display more than one signature. When any of these signatures is not visible without dismantling the finished object, the addressee is not the customer, but someone involved in the manufacturing process. Thus, it could be

suggested that the manufacturing of some parts was contracted out, or carried out in separate sections of a workshop. The signing of individual parts allowed a central authority (the manager?) to apportion blame or praise for the quality of work at a lower level.

Workshops can also be identified through excavated waste dumps, and their output estimated, for example on the basis of the size of kilns, drying sheds, or levigation tanks. In urban workshops located in the front of aristocratic houses, for instance at Pompeii, the relationship between the owner of the house and the manager of the shop has been analysed on the basis of the existence of direct access from shop to dwelling quarters. Though this reveals the involvement of the local élite in retail trade or craft production, it says little about managerial practices other than that supervision by the principal was facilitated by easy access and proximity (Parkins 1995, Chapter 1). However, the evidence suggests that despite certain similarities, the practical application of management in a wide range of different productive activities showed great diversity.¹⁹

What is needed is more detailed study of the interaction between management and workers within a managerial unit, and the intricacies of the organizational activity of business managers in a given sector of the Roman economy. These are best illustrated by the study of coinage, which suggests the presence of competing workshops within the mint, possibly as a way to foster internal competition and thus increase productivity.²⁰ But again, we are dealing here with a very specific activity, namely a state monopoly, hardly comparable with more competitive sectors, such as the food, garment, or ceramic industries. Fortunately, we are left with another type of evidence which has not been used so far for this purpose, namely the papyri from Roman Egypt. Because of their particular nature, especially the provincial origin of almost any such document, any extrapolation of the conclusion reached on this basis will have to be critically reviewed.

Papyrological sources from Roman Egypt

While Egypt may have resembled the rest of the empire to a higher degree than was once thought, some striking differences had a bearing on the nature and organization of the economy. First, rural slaves are almost non-existent in our sources, and urban slaves not very numerous, whereas the sources indicate a different picture for Italy and some other Western provinces, where those who can be identified as business managers were overwhelmingly of servile status or origin.²¹ Slaves provided labour, but were regarded as a form of capital investment, whose idleness, like that of draft animals, was costly and therefore to be avoided in any possible way. Italian managers found a solution to this problem in the development of other types of economic activities, some of them agriculture related (such as foresting or quarrying), others of non-agricultural nature, like producing

building material or providing overnight hospitality for travellers. In Egypt, the absence of rural slavery and the exceptional fertility of the soil, as a result of the yearly flooding of the Nile, were favourable to a small peasantry engaged in nothing but agriculture-related activities.

Second, our evidence comes mostly from the *chōra*, so that urban activities are not so precisely documented as could be expected from the number of extant and published papyri.²² In fact, a survey of all documentary papyri published over sixty-three volumes of the Oxyrhynchus papyri proved rather disappointing from the viewpoint of the history of ancient management. The size of the town (perhaps 15,000–30,000 inhabitants), the sheer number of documents found there (4,400 published to date, with many more awaiting publication), make Oxyrhynchus a litmus test for the importance of non-agricultural economic activities in the written evidence.²³ To what extent the result of such a test reflects the reality of urban economic life is hard to ascertain. The least that can be said is that if urban workshops were numerically or economically important, they simply did not generate the same paperwork as agricultural activities, either qualitatively or quantitatively speaking. Moreover, what has come down to us rarely illustrates the kind of enterprises that our archaeological, legal, and epigraphical sources from Italy and the Western provinces record.

The complexity of the available papyrological evidence for management of agricultural estates is well illustrated by the so-called archive of the descendants of Laches, made of some eighty papyri of the second century AD discovered in the Fayum village of Tebtynis. The estate was composed of scattered plots producing grains, fodder, reeds, wine, and fruits. Since the owners seem to have had little interest in agriculture, the management of the land was entrusted to *phrontistai* supervising a mixed labour force, composed of workers permanently attached to the estate and of day labourers. The account books of these *phrontistai* record the volume of daily transactions, the number of hired hands for each day and the rate of remuneration for various tasks. The *phrontistai* were in charge of organizing the maintenance work of the irrigation system, and the distribution and use of fertilizers (dung); they also contracted out various types of agricultural work, hired regular shepherds and goatherds, rented out draft animals such as oxen, donkeys, mules and horses, drew and copied contracts of leases, and paid out salaries in money and in kind. They were working themselves on a contractual basis, for an unknown period of time, and could be promoted to other positions within the administrative staff of the estate. Because of the general lack of involvement on the part of the landowners, it is reasonable to suggest that one of the *phrontistai* may have been the designer of the revolutionary and highly successful system of crop rotation used all over the estate (Bagnall 1974).

The archive of Heroninusai reveals the level of complexity required by the management of large estates (Rathbone 1991). Some 450 published

documents, perhaps only half of what has been preserved, provide detailed evidence for the activity of a *phrontistēs* based in the Fayum village of Theadelphia between AD 249 and 268 and his relationship with the managers and staff of other similar units, in particular with the central administration of the estate owned by one Aurelius Appianus, a citizen from Alexandria and a member of the provincial élite. Rathbone convincingly showed that Heroninus' management was geared toward the production of a marketable surplus of agricultural products, mostly wine, while retaining some degree of self-sufficiency, if not at the level of his unit (*phrontis*), at least within a group of similar units. What is remarkable is that, in contrast to what has just been said in connection with the management of the estate of the Laches family, a *phrontistēs* like Heroninus was more involved in accounting than in making contracts, this aspect of management being handled by the central administration located in nearby Arsinoe and represented by the local gentry. Also, all non-agricultural tasks, as well as those requiring intensive supervision or implying a financial risk, were contracted out to villagers, i.e. independent craftsmen who were not attached to Appianus' estate. Thus, wine containers were produced outside, and the management of facilities such as weaving workshops, mills, olive and wine presses, baths, etc. was systematically contracted out. We are admittedly far from the Italian model of the villa economy, but nothing indicates that the management of Appianus' estate should be considered as the norm in Roman Egypt.

Turning to urban activities, we can only deplore the lack of such integrated collections of documents. Evidence for workshop management has come down to us in the form of isolated contracts or business letters, the context of which is not to be reconstructed as in any way approaching the detailed richness of archives pertaining to agricultural estates. Exceptionally, some clusters appear, such as three famous papyri from Oxyrhynchus preserving mid-third century leases of a potter's workshop.²⁴ In the earliest and fullest document (3595, AD 243), the lessee, a potter specializing in the manufacture of wine jars, rented the facilities attached to a large farmstead, fully equipped with store rooms, kiln, potter's wheel, and all the necessary tools, for a period of two years, on the condition that he would make and deliver on a fixed date to the lessors 15,000 four-*chous* jars of a specific kind known as Oxyrhynchite, 150 double *keramia*, 150 two-*chous* jars, all fully coated with pitch, leak-free, flawless, and brand new, for the price of 4,800 drachmas and a certain quantity of wine and vinegar. All the production exceeding the above quota could be bought by the lessors, if they had a need of it. Clay, firing material, water, and pitch were provided by the lessors, while the necessary labour (potters, assistants, and stokers) was left to the responsibility of the lessee, who promised to return the workshop free of ash and sherds when the lease was up. For all the details of its fifty-three lines (the contract is fully preserved) and the interest that lies in the nature of the legal transaction, this document tells us

virtually nothing about the actual management of the workshop except for the fact that the lease precisely defines the productivity of the workshop in quantitative and qualitative terms. The two related documents²⁵ present some minor variants (different potter, workshop, and lessors), but are basically so similar in form and content that nothing can be gained from the clustering of these papyri.²⁶

This is not to say that the papyri shed no light to our topic. Some sectors of the economy, for example, the garment industry, are actually well known, and have been the subject of book-length monographs (for instance, Wipszycka 1965), and new documents keep cropping up. They occasionally illustrate the nature of the relationship between employer and employees. Thus, in a recently published receipt from Oxyrhynchus dated to 304 (*P. Oxy.* lxiii, 4353), a tapestry weaver (*tapetouphos*) acknowledges the advance payment of two talents from the master of the workshop (*epistatēs ergastēriou*), binding himself to work in the workshop for a fixed salary, and to return the full amount paid in advance in case he ever leaves the workshop (no term is stipulated for the end of the contract). Here again, not much information pertains to the actual management of the workshop, except for the fact that some workers were obviously hired and paid in advance to ensure their co-operation on a long-term basis. The terminology designating the employer and the provision relative to the employee's possible absence are reminiscent of apprenticeship contracts. Another document from Panopolis, dated to 3 September 355, records the lease of part of a linen-weaving workshop (*ergastērion linouphikon*) equipped with two loom-frames (*pugmata = pēgmata*) and their appliances, for an unlimited period of time (as long as the owner, also a weaver, wants to rent it) for the modest sum of 200 silver talents for the premises in addition to ten woven linen items for the loom-frames, the material being provided by the owner.²⁷

The papyri are not even very explicit about the application of the institorian arrangement in Roman Egypt. It is true that the law in use in that province could be very different from what we know through the *Corpus Iuris Civilis*. A few papyri, however, can be interpreted as referring to *institores*. Thus, the estate of Tiberius Iulius Theon, a well-to-do Alexandrian who died by 111 (*P. Oxy.* xliv, 3197), included, before its division among his descendants, between fifty-nine and 100 slaves, an exceptionally high number for Roman Egypt. Some of them were skilled workers, and most of them were living away, scattered through the Oxyrhynchite, Hermopolite, and Arsinoite nomes. It is possible that they had an economic activity more or less independent from their master, to whom they must have paid the *apophora*, a percentage of their profits (Biezunska-Malowist 1965). This is a mere conjecture and tells us nothing about the slaves' activities. Their dispersal and the distance between their master's residence and the seat of their activities are consistent with what we know of the institorian arrangement, but do not demonstrate it.

Such slaves may have been so successful as to raise suspicion concerning their honesty. We have a letter in Latin, dated to the Augustan period, addressed to a member of the *familia Caesaris*, and reporting the speculative activities of a slave who had made such an unusual profit that his owner had been dutifully warned by a banker from Oxyrhynchus: 'whoever makes such a big profit out of such a small investment is bent on killing his master.'²⁸ This case is not necessarily representative of the ancient attitude toward profit making.

Elsewhere, we read about the 'foreman' of a weaving workshop (*ergastēr-iarchēs linouphon*) employing 'scores' of workers and supplying the government: for that reason he claims for himself exemption from liturgical services, while his opponent counters that he is nothing but a well-to-do perfume dealer, therefore not entitled to any advantage.²⁹ And what about that runaway slave, weaver by trade, aged thirty-two, who spoke loud and walked as if he were important? The responsibilities he was entrusted with, and the privileges probably attached to his position, did not prevent him from abandoning it (*P. Oxy.* li, 3617, third century).

There are also those contracts of apprenticeship, so standard that they tell us virtually nothing about the specifics of workshop management.³⁰ Training, however, is an important aspect of business management. The duration of such contracts, and the conditions contained in them imply serious concern for the transmission of professional skills. How common and widespread those arrangements were, however, is hard to ascertain.

The mid-fourth century accounts of the relay stations at Tacona and Oxyrhynchus provide some useful insights into non-agricultural management. They list guests staying overnight, with the number of animals they travelled with, and the rations issued on any given day in the months of October to December, and June. Each entry includes the number of travellers in each party, the direction (north or south) in which they travel, the duration of their stay (one day at Tacona, two in Oxyrhynchus, three altogether), the quantity of food and fodder issued to them daily (one sixth of a *modius* of wheat, one *sextarius* of wine, half a *litra* of meat; half a *modius* of barley and twenty *litrai* of chaff). Since each party was different in size, some being quite large (up to fifty-two persons in one group), and since two groups travelling in opposite directions could stop the same night at the same relay (up to ninety people with their animals stopped on one night), the amount of food and fodder to be provided clearly varied from one day to the next and was somewhat unpredictable. One can imagine how much planning skill the managers of those relay stations were required to display to satisfy their customers' expectations while cutting the costs of wasting perishable resources (such as meat).³¹

From the survey of several thousand papyri found in Oxyrhynchus, it appears that non-agricultural activities are scarcely documented. One category of business agents, however, is often mentioned in the papyri and

would repay a special study: the *pragmateutai*.³² Like their probable Latin equivalent (*actores*), they were tied to a person rather than to a business or managerial unit. Finally, let us say that later documents tend to be longer, more detailed, and more pertinent to the kind of business transactions discussed in this paper. In that regard, a study of the fifth to seventh century Flavius Apion archive would throw lights on interesting aspects of work relationship in both the agricultural and non-agricultural sectors.³³

Conclusion: new approaches to palliate the deficiencies of the evidence

The ancient evidence, for all its diversity, chronological and geographical range, and sheer abundance, still fails to provide an adequate basis for the study of economic aspects of business management. This negative conclusion finds its explanation in the fact that ancient management was mostly approached empirically, and was not deemed worth the trouble of a theoretical discussion on the part of ancient writers, except in the field of agriculture.

Few modern scholars have studied ancient management, and the few exceptions have mostly been content with formulating a list of questions likely to find an obvious answer in the available ancient evidence. This methodological approach has reached its limits. Progress could be made by borrowing from modern theoreticians, such as Frederic Taylor, Henri Fayol, or Max Weber, the basic conceptual framework upon which the study of the evolution of ancient management thought and practice has to be built.³⁴ Such an approach should take into account the size of enterprises, their geographical location and distribution, the diversification of the production and the task specialization (division of labour) within each economic unit, the level of globalization of the economy in relation to imports and exports, and their respective economic rationality, as well as the available technical means, including accounting practices, literacy and numeracy levels, and communications. It is necessary to measure the economic and organizational impact of institutional developments, such as that of the imperial, provincial, municipal, and local administrations, the professional and other voluntary associations (Aubert 1999b), the Christian Church, the Roman army, and the *cursus publicus*. By way of comparison, it has been shown that the modern science of management changed drastically with the development of the railroad in nineteenth century America which entailed an unusually large and complex type of enterprise involving an enormous financial capital investment across a huge geographical space (Wren 1994, 75-82).

Ancient historians have given less attention to labour than to the use of land, natural resources, and technology, even though labour in non-agricultural sectors was probably more important than any other factor of

production. For instance, we know little about ancient unemployment, permanent or seasonal, and about its impact upon social and economic life in antiquity (Pleket 1988), even though Artemidorus of Daldis, in his book on the interpretation of dreams, reveals that ancient people may have been deeply concerned about it, as he lists no less than twenty-one cases of impending *scholē*, *apraxia*, or *apragia*: 'if someone dreams that he has been borne by a woman of no particular standing, it means the following: for a poor man, it is positive, because someone will feed him, like a newborn, unless he is a craftsman. In that case, the dream warns of forthcoming unemployment, because newborns are idle and have their hands swaddled.'³⁵

Likewise, strikes would repay a new study, to which the papyri have much to contribute. A papyrus from Hermopolis, dated to 16 July, 116, preserves a letter from one Eudaemonis to her daughter Aline, whose husband owned several weaving workshops in Hermopolis. The mother reports experiencing significant difficulties with the workforce employed in one of the workshops. Some workers seem to have been on strike, blocking the whole productive process, in spite of her hiring substitute female workers. The writer also alludes to the fact that some or all of the workers went demonstrating in town in order to get a raise. It sounds as if the mother was acting in the capacity of her daughter's agent or manager while the latter was on maternity leave!³⁶

Other demonstrations for the defence of professional interests are known to have occurred, as in the famous case of the silversmith, Demetrius of Ephesus (*Acts* 19: 23–40), who spoke in anger against the threat mounted by early Christianity against the prosperity of the local temple of Artemis, and the trade in silver statues connected with it. The ensuing disorder was put down by Roman forces, after negotiations introduced by the local authorities between the craftsmen on the one hand and Paul and his group of Jews and Christians on the other failed to yield satisfactory results (van Minnen 1987, 57 with bibliography).

Modern studies on labour in the Roman world have traditionally focused on slavery (de Robertis 1963 is an exception), a social phenomenon that precludes any comparison with the modern concept of labour in the capitalist age. Yet some comparisons with modern conditions are sensible, if they are introduced with due caution, because any economic activity that relied on a skilled and sometimes highly specialized workforce necessarily implied good-will and co-operation on the part of all those involved in the productive process. Thus, entrepreneurs and managers had to concentrate on the real, perennial problems of organization, and to provide for the recruitment, training, selection, specialization, promotion, and motivation of workers with regard to short- and long-term objectives. That is where the approach devised by the pioneers of the so-called scientific management era can usefully be tried as a magnifying glass, in spite of the manifold risks of distortion. It is only with such a change in perspective that modern scholars can expect to be able to reconstruct the history of ancient business management.

Historical discourse should not be reluctant to use modern concepts and criteria to formulate the theoretical basis for the study of a range of activities that clearly fall outside the sphere of interest of ancient writers.

Notes

- 1 Pace Gargola 1996, 1527. Periodization, for instance, is imposed by the appearance and disappearance of the evidence (legal, epigraphic), but does not imply that economic conditions changed drastically at either end of the chronological spectrum (second century BC–mid-third century AD): the papyri sometimes show that continuity is warranted.
- 2 Wren 1994, 3–33, esp. 17–19 on Greece and Rome.
- 3 Joshel 1992; cf. Petrikovits 1981; Loane 1938; Maxey 1938.
- 4 Zimmer 1982: nos. 18 (tombstone of M. Vergileus Eurysaces, *pistor redemptor*, Rome); 38 and 39 (funeral reliefs, woollen artefacts, Florence); 42 and 45 (shop-sign, *fullonica* of M. Vecilius Verecundus, Pompeii); and 121 (relief, metal workshop, Naples).
- 5 Huvelin 1929, 176–83; Behrends 1981; Serrao 1989; Aubert 1994 and 1999a. Time is ripe for a new synthesis on Roman commercial law.
- 6 Helen 1975; Bruun 1991; Petrucci 1996; Aubert 1993 and 1994.
- 7 Hesiod, *Opera et Dies*, 11–26 (productivity); 286–319, and *passim* (hard work); 320–41 (honesty); 342–60 (good social behaviour); 341, 361–2 (modest growth); 364–5 (self-sufficiency); 370 (contracts); 470, 502, 573, 597–608 (slave labour); and 618–94 (seaborne commerce).
- 8 Xenophon, *Oeconomicus*, 6. 6–8 (agriculture vs. crafts); 7 and 9 (staff organization and training); 9. 11–13 (deterrent and incentive); 12–14 (psychological aspects of management); 15–20 (technical knowledge); 21. 2, 9, and 11 (leadership), with Pomeroy's excellent commentary (1994).
- 9 Pseudo-Aristotle, *Oeconomica* 1344 a 26 (acquisition and training of staff); 1344 b 31 and 1345 a 18 (accounting); 1346 a 15 (expenditure vs. income).
- 10 Evidence, discussion and bibliography in Aubert 1994, chapters 1 and 2.
- 11 Andreau 1987; Petrucci 1991.
- 12 *CIL* vi. 10007 (Rome, *unguentarius*); *CIL* ix. 3027 (Teate Marrucinorum, *Regio* iv, *sutor caligarius*); *CIL* xi. 1621 (Florentia, *Regio* vii, *seplasiarius*); *CIL* iii. 13523, Tüffer/Noricum, *balneator*?); *CIL* iii. 14206.21, Karrakavak/Macedonia, *tabernarius*). Aubert 1994, 444 = Appendix, A1–5.
- 13 *CIL* ii 2. 7. 337: *Institor arm[...]* can be read 'arm[orum]' (arms maker or dealer), 'arm[amentorum]' (maker or trader in nautical equipment), 'arm[entorum]' (involved in cattle breeding), 'arm[illorum]' (supplier of wine containers) or 'arm[illarum]' (jeweller).
- 14 Ulpian (28 *ad ed.*), citing Labeo, *Dig.* 14. 3. 5. 2: *Labeo quoque scripsit, si quis pecuniis faenerandis, agris colendis, mercaturis redempturis faciendis praeposuerit, in solidum eum teneri.* (Labeo also wrote that if someone appointed a business manager to lend money, to run an agricultural estate, to trade or to carry out public contracts, he would be liable in full ...). Paul (29 *ad ed.*) *Dig.* 14. 3. 16: *Si cum vilico alicuius contractum sit, non datur in dominum actio, quia vilicus propter fructus percipiendos, non propter quaestum praepositur. Si tamen vilicum distrahendis quoque mercibus praepositum habuero, non erit iniquum exemplo institoriae actionem in me competere.* (If someone has entered into a contract with another's farm manager, no legal remedy would be given against the latter's master/principal, because the farm manager is (supposed to be) appointed in order to farm the land, not to trade. However, if I appointed a farm manager in order to sell goods, it would not be unfair to hold me liable to an action on the analogy with the institorian remedy). Cf. Pseudo-Pauli *Sententiae* 8.2 and Aubert 1994, 8–9 for an explanation of the apparent contradiction between Labeo/Ulpian and Paul.

- 15 Aubert 1994, chapters 1, 3, and 5, with case studies; Carlsen 1995.
- 16 Ulpien (28 *ad ed.*) *Dig.* 14. 1. 1. 5: *Magistratum autem accipimus non solum, quem exercitor praeposuit, sed et eum, quem magister ...* (We recognize as shipmaster not only the person appointed by the shipper, but also whomever the shipmaster appointed himself ...).
- 17 For *subvilici*, Aubert 1994, 461-2; for *subactores*, cf. *AE* 1993, nos. 740-2, on tiles from Augusta Bagiennorum, Italy, *Regio* ix = S. Albano Stura, Piemont, AD 451 and 453/454.
- 18 Harris 1980; Aubert 1993 and 1994, chapter 4.
- 19 Pace Fülle 1997, who seems to think that the verification of his model in a specific case (pottery industry at Arezzo) is enough to void all others in any context.
- 20 Aubert 1994, 386-409. I wish that H. Kloft had presented the possibly valid arguments that made him doubt my conclusions; cf. *Klio* 79 (1997) 259-60.
- 21 Aubert 1994, chapters 3-5; and di Porto 1992.
- 22 Van Minnen 1987, with a good selection of the material and a rich bibliography; and Reil 1913/1979.
- 23 It used to be fashionable to discard the evidence from Roman Egypt on the ground of an alleged particularism - more often the reflection of a lack of familiarity with the material. Rathbone's recent work has gone a long way to reversing that trend. Ideally, one would wish to compare evidence of the same nature originating from, say, Eburodunum or Lousonna, but it simply does not exist. Even Pompeii or Herculaneum do not provide adequate evidence to estimate the ratio of various economic activities.
- 24 *P. Oxy.* I, 3595-7; Cockle 1981; and Aubert 1994, 253-5, with bibliography.
- 25 *P. Oxy.* I, 3596 (219-55) and 3597 (260).
- 26 For pottery in the papyri, cf. Reil 1913/1979, 37-46.
- 27 *P. Dublin* 31. Cf. also *ZPE* 82 (1990) 115-21.
- 28 *P. Oxy.* xlv, 3208: . . . *qui de tam pusilla summa tam magnum lucrum facit dominum occidere volt.*
- 29 *P. Oxy.* xxii, 2340 (AD 192). Van Minnen 1987, 47.
- 30 For instance, *P. Oxy.* ii, 275 (AD 66, weaver); *P. Oxy.* iv, 724 (AD 155, shorthand writer) and 725 (AD 183, weaver); *P. Oxy.* xiv, 1647 (late second century: a slave belonging to a woman is apprenticed to a weaver); *P. Oxy.* xxxviii, 2875 (early third century, builder: the contract is made between the apprentice and the overseer), cf. R. Bagnall in *BASP* 5, 1968, 135-9; *P. Oxy.* xli, 2977 (AD 239, wool-carder: the apprentice is a slave, the overseer a freedman); *P. Oxy.* xxxi, 2586 (15 September, 253, weaver); *BGU* iv, 1124. Van Minnen 1987, 33; Hengstl 1972; and Bradley 1985, 107-12 and Table 5.1.
- 31 *P. Oxy.* lx, 4087 (AD 310, 327, 331 or 344) and 4088 (c. AD 347-50). Tacona was an important relay station in the northern part of the nome, cf. *P. Oxy.* xvi, 1906, 2021, 2028, and 2040 (all sixth and seventh century). For the management of relay stations, cf. Kolb forthcoming; Aubert 1994, 368-85.
- 32 Aubert 1994, 186-96. *P. Oxy.* iv, 825 (second century); vi, 899 (AD 200); xii, 1514 (AD 274 or 280); 1544 (AD 284-304); 1569 (third century); xiv, 1646 (AD 268/9); 1753 (ad 390); xvi, 1830 (sixth century); 1880 (AD 427); xvii, 2130 (AD 267); xx, 2271 (mid-third century); 2285 (AD 285); 2286 (AD 274 or 280); xxiv, 2421 (early fourth century); xxxiii, 2668 (22 August AD 311); xxxvi, 2775 (late third century); 2793 (second/third century); xl, 2938 (?) (AD 259-61); xlii, 3048 (AD 246); lxiii, 4394 (AD 494-500); *PSI* iii, 249; *P. Cair. Masp.* ii, 67158. 17; *P. Lips.* 64. 30; *P. Grenf.* ii, 58. 1; cf. Westermann 1932, 16-17 for additional evidence.
- 33 Roger Bagnall informs me that two Oxford dissertations currently being compiled by Todd Hickey and Peter Sarris deal with this body of evidence.
- 34 Wren 1994, 105-31 (Taylor); 179-94 (Fayol); 194-8 (Weber).
- 35 Artemidorus Daldianus, *Oneirocritica*, 1. 13; cf. also 1. 21; 31; 32; 42; 50; 54; 64; 2. 1; 3; 14; 22; 23; 28; 55; 68; 3. 22; 24; 34; 62; and 65.
- 36 *P. Bremen* 63, with Berichtigungsliste; cf. also *P. Giss.* 12, 20, and 78. Buckler 1923; McMullen 1963; Baldwin 1964; van Minnen 1987, 62-3, with additional bibliography.

Bibliography

- Allen, R. E. (1994), *Winnie-the-Pooh on Management. In which a Very Important Bear and his Friends are Introduced to a Very Important Subject* (New York).
- Andreau, J. (1987), *La vie financière dans le monde romain: Les métiers de manieurs d'argent (IVe s. av. J-C - IIIe s. ap. J-C.)* (Rome).
- Aubert, J-J. (1993), 'Workshop managers', in Harris (ed. 1993), 171-81.
- (1994), *Business Managers in Ancient Rome: A Social and Economic Study of Institores, 200 BC - AD 250* (CSCT, 21; Leiden).
- (1999a), 'Les institores et le commerce maritime dans le monde romain', in *Topoi* 9, 145-64.
- (1999b), 'La gestion des collegia: aspects juridiques, économiques et sociaux', in *Cahiers du Centre Glotz* 10, 49-69.
- Bagnall, W. S. (1974), *The Archive of Laches: Prosperous Farmers of the Fayum in the Second Century* (Unpublished Ph.D. thesis, Duke University).
- Baldwin, B. (1964), 'Strikes in the Roman empire', *CJ* 59, 75-6.
- Behrens, O. (1981), 'Die Rechtsformen des römischen Handwerks', in Jankuhn (ed. 1981), 141-203.
- Biezunska-Malowist, I. (1965), 'Les esclaves payant l'apophora dans l'Égypte gréco-romaine', *JJP* 15, 65-72.
- Bradley, K. R. (1985), 'Child labor in the Roman world', *Historical Reflections/Réflexions historiques* 12 (1985), 311-30, reprinted in K. R. Bradley, *Discovering the Roman Family: Studies in Roman Social History* (New York, 1991), 103-24.
- Bruun, C. (1991), *The Water Supply of Ancient Rome: A Study of Roman Imperial Administration* (Helsinki).
- Buckler W. H. (1923), 'Labour disputes in the province of Asia', in Buckler and Calder (eds 1923), 27-50.
- and Calder, W. M. (eds 1923), *Anatolian Studies presented to Sir William M. Ramsay* (Manchester).
- Carlsen, J. (1995), *Vilici and Roman Estate Managers until AD 284* (Analecta Romana, Supplement, 24; Rome).
- Cockle, H. (1981), 'Pottery manufacture in Roman Egypt: A new papyrus', *JRS* 71, 87-97.
- Fülle, G. (1997), 'The internal organization of the Arretine terra sigillata industry: Problems of evidence and interpretation', *JRS* 87, 111-55.
- Gargola, D. J. (1996), review of Aubert 1994, *AHR* 101, 1527.
- Harris, W. V. (1980), 'Roman terracotta lamps: the organization of an industry', *JRS* 70, 126-45.
- (ed. 1993), *The Inscribed Economy: Production and Distribution in the Roman Empire in the Light of instrumentum domesticum* (JRA Supplement 6; Ann Arbor).
- Helen, T. (1975), *The Organization of Roman Brick Production in the First and Second Centuries AD* (Helsinki).
- Hengstl, J. (1972), *Private Arbeitsverhältnisse freier Personen in den hellenistischen Papyri bis Diokletian* (Bonn).
- Huvelin, P. (1929), *Études d'histoire du droit commercial romain* (Paris).
- Jankuhn, H. (ed. 1981), *Das Handwerk in vor- und frühgeschichtlicher Zeit, Teil I* (Göttingen).
- Joshel, S. R. (1992), *Work, Identity, and Legal Status at Rome: A Study of the Occupational Inscriptions* (Norman, OK).
- Kehoe, D. (1992), *Management and Investment on Estates During the Early Empire* (Bonn).

- Kolb, A. (2000) *Kommunikation und Transport des Staates im römischen Reich* (Habilitationsschrift, Univ. Zurich).
- Loane, H. J. (1938), *Industry and Commerce of the City of Rome (50 BC - AD 200)* (Baltimore).
- McMullen, R. (1963), 'A note on Roman strikes', *CJ* 58, 269-71.
- Maxey, M. (1938), *Occupations of the Lower Classes in Roman Society* (Chicago).
- Minnen, P. van (1987), 'Urban craftsmen in Roman Egypt', *MBAH* 6.1, 31-88.
- Oschinsky, D. (1971), *Walter of Henley and Other Treatises on Estate Management and Accounting* (Oxford).
- Parkins, H. M. (1995), *Aspects of the Economic Organisation of the Roman Household During the Late Republic and the Early Principate* (Unpublished PhD thesis, University of Leicester).
- Petrikovits, H. v. (1981), 'Die Spezialisierung des römischen Handwerks', in Jankuhn (ed. 1981), 63-132.
- Petrucci, A. (1991), *Mensam exercere: Studi sull'impresa finanziaria romana (II secolo a.C. - metà del III secolo d.C.)* (Naples).
- (1996), 'Fistula aquaria di Roma e dell'ager Viennensis', *Labeo* 42, 169-207.
- Pleket, H-W. (1988), 'Labor and unemployment in the Roman Empire: some preliminary remarks', in Weiler (ed. 1988), 267-76.
- Pomeroy, S. B. (1994), *Xenophon, Oeconomicus: A Social and Historical Commentary* (Oxford).
- Porto, A. di (1992), 'Servus e libertus strumenti dell'imprenditore romano', in *Imprenditorialità e diritto nell'esperienza storica (Erice 22-5 novembre 1988)* (Palermo) (non vidi).
- Rathbone, D. W. (1991), *Economic Rationalism and Rural Society in Third-Century-AD Egypt: The Heroninus Archive and the Appianus Estate* (Cambridge).
- Reil, T. (1913/1979), *Beiträge zur Kenntnis des Gewerbes im hellenistischen Ägypten* (Borna).
- Robertis, F. M. de (1963), *Lavoro e lavoratori nel mondo romano* (Bari).
- Serrao, F. (1989), *Impresa e responsabilità a Roma nell'età commerciale: Forme giuridiche di un'economia-mundo* (Ospedaletto).
- Sirks, A. J. B. (1991), *Food for Rome: The Legal Structure of the Transportation and Processing of Supplies for the Imperial Distribution in Rome and Constantinople* (Amsterdam).
- Weiler, I. (ed. 1988), *Soziale Randgruppen und Aussenseiter im Altertum* (Graz).
- Westermann, W. L. (1932), 'Entertainment in the villages of Graeco-Roman Egypt', *JEJ* 18, 16-27.
- Wipszycka, E. (1965), *L'industrie textile dans l'Égypte romaine* (Wrocław).
- Wren, D. A. (1994), *The Evolution of Management Thought*⁴ (New York).
- Zimmer, G. (1982), *Römische Berufsdarstellungen* (Archäologische Forschungen, 12; Berlin).