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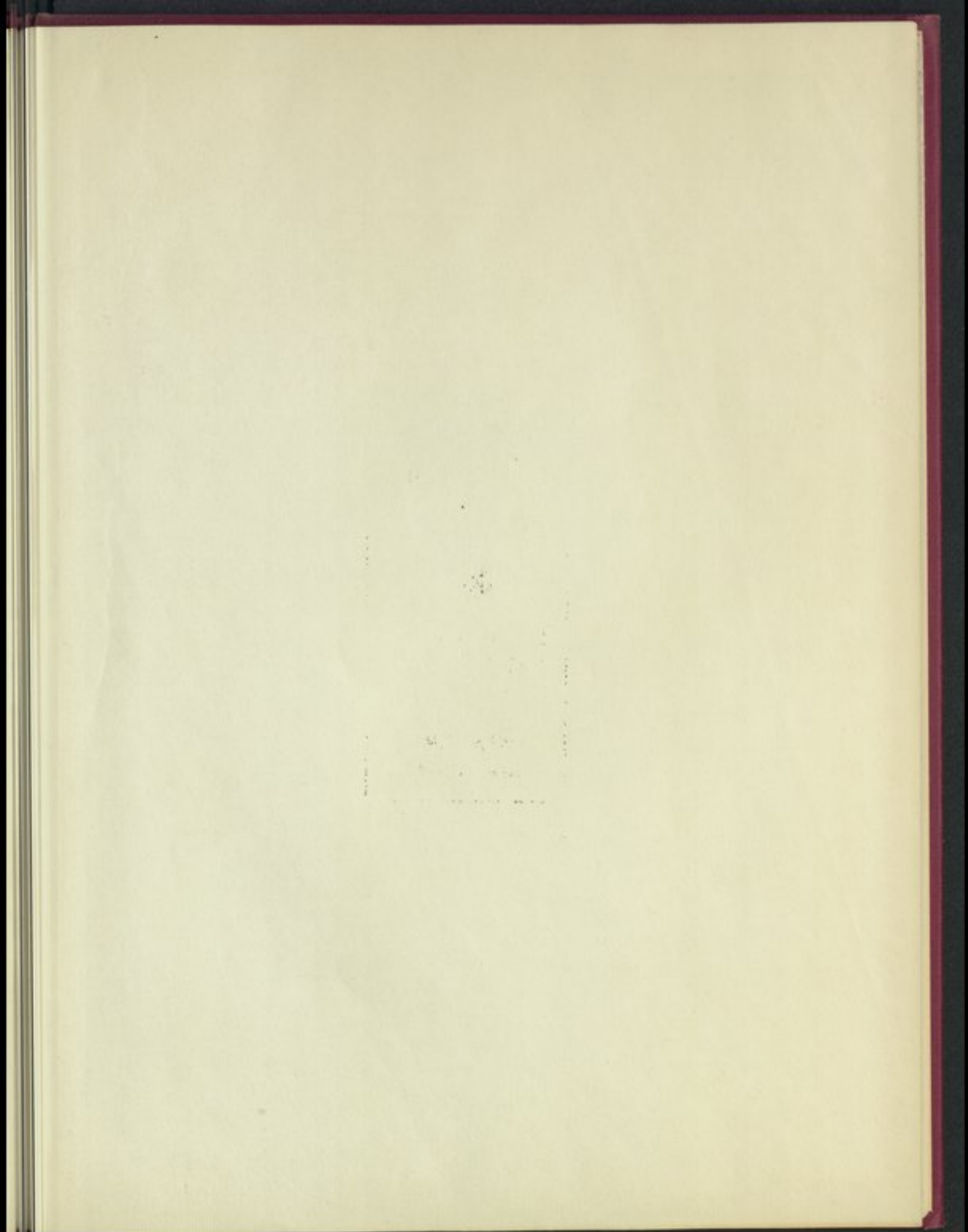
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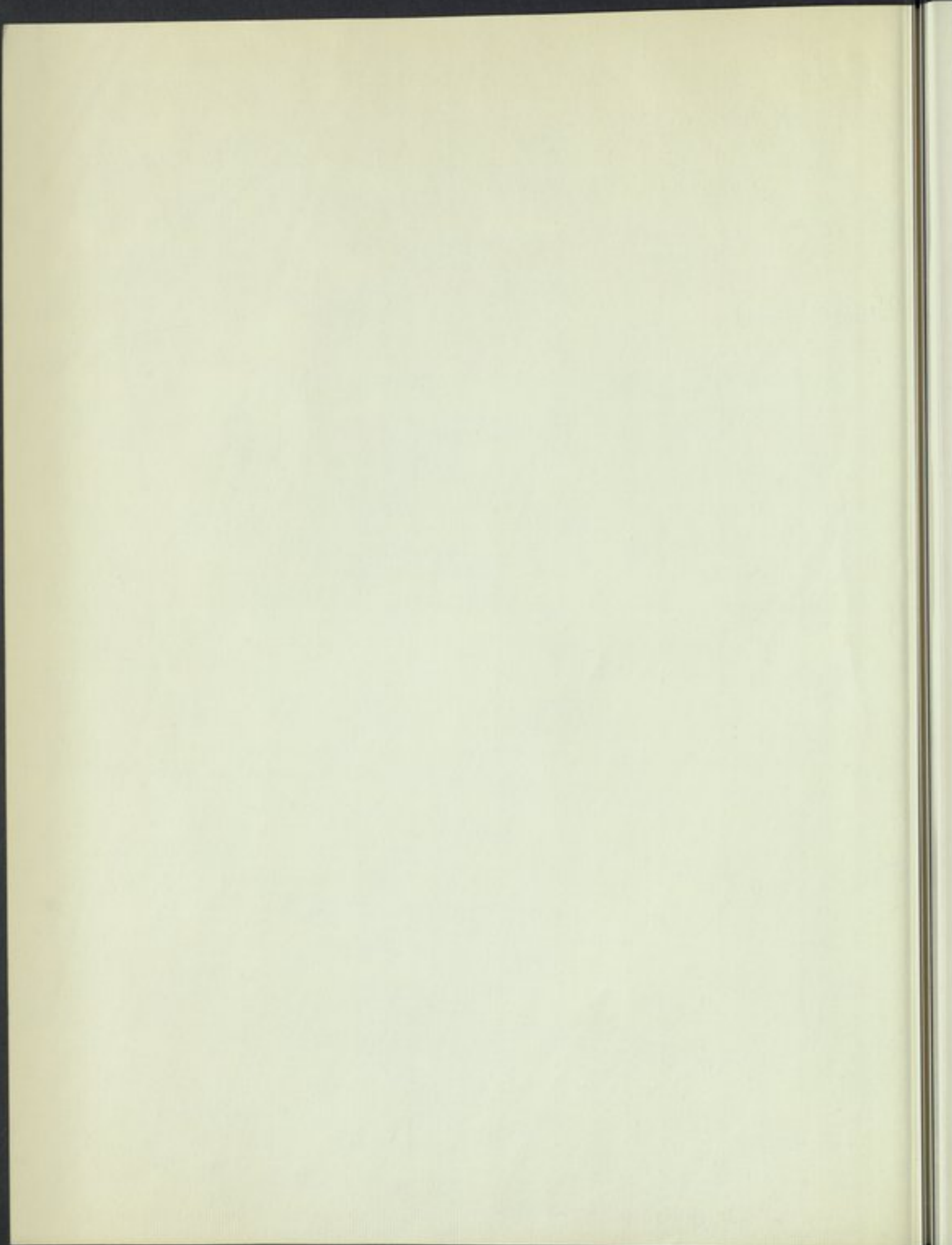
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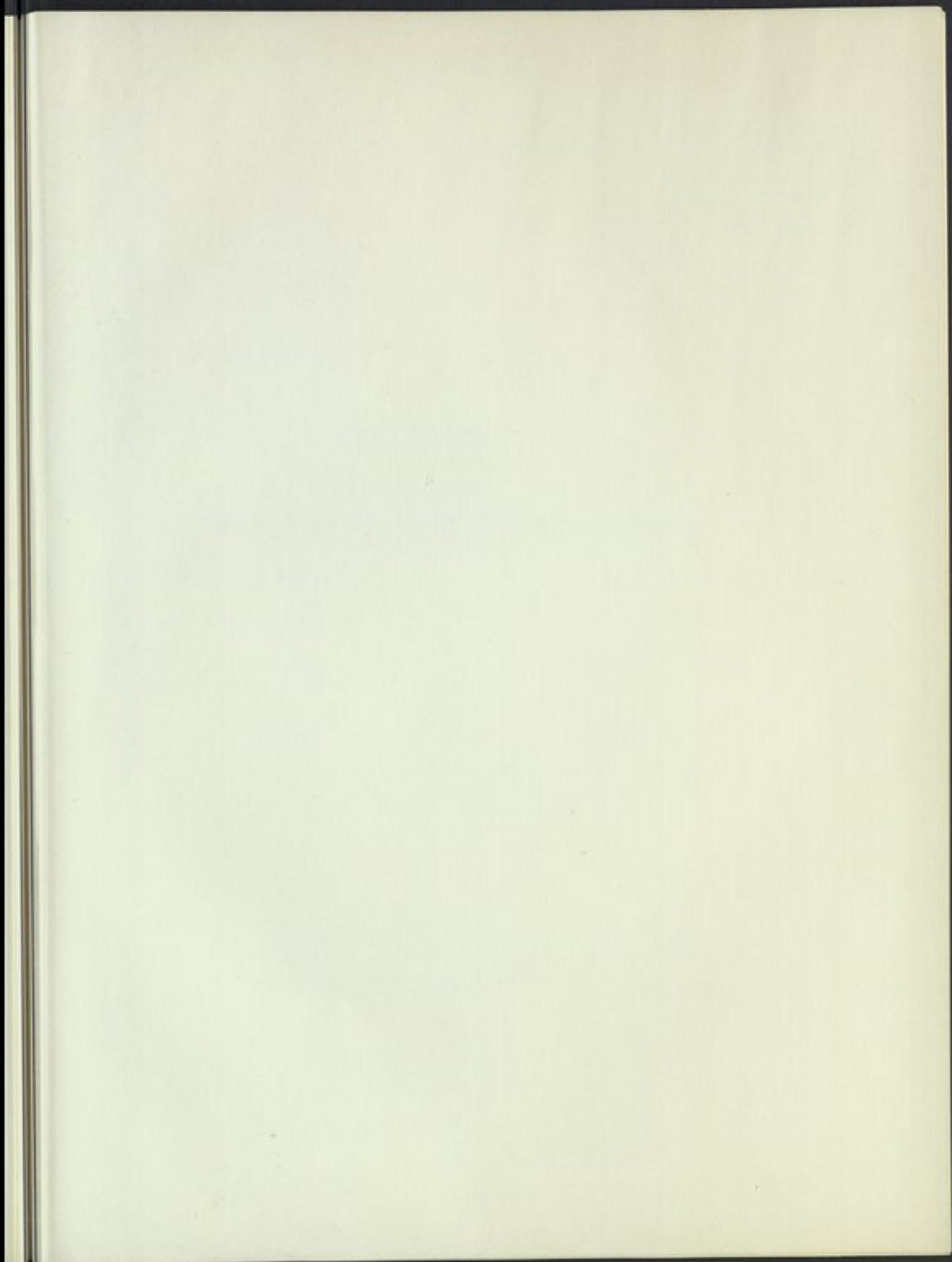


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AMERICAN STUDIES IN PAPYROLOGY

RESEARCH JOURNAL OF PSYCHOLOGY

AMERICAN STUDIES IN PAPYROLOGY
VOLUME FOUR

*THE TAXES IN GRAIN
IN PTOLEMAIC EGYPT*
GRANARY RECEIPTS
FROM DIOSPOLIS MAGNA
164-88 B.C.

ZOLA M. PACKMAN
**

THE AMERICAN SOCIETY OF PAPYROLOGISTS
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Dr. Paul M. Packman, my husband. Without his moral support and material aid, I might never have finished.

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INTRODUCTION

INTRODUCTION

A. SCOPE OF THE STUDY

In this study I propose to present a description and an analysis of a group of Ptolemaic documents. The documents are receipts issued from the granary of Diospolis Magna during the years 164 to 88 BC; the analysis will be concerned with the significance of the phrases employed on those receipts to describe the taxes towards which the payments recorded on them were made; the description will be concerned with information presented by the receipts, not individually, but as a group: Persons and functions of granary personnel, seasons of tax payments, and amounts paid for grain taxes.

All the receipts to be discussed here have been gathered from published collections of ostraka and papyri. Of the many granary receipts that have been published in such collections, a large proportion is considered, with varying degrees of certainty, to have come from the granary of Diospolis Magna; in this study, however, I have included only the receipts that bear the place-of-payment phrase, εἰς τὸν ἐν Διὸς πόλει τῇ μεγάλῃ θησαυρὸν. The provenance of these pieces is certain, and the collection of information about them will provide a securer basis for accepting and rejecting the Theban provenance ascribed to receipts that bear no place name.

On the receipts that bear the place-of-payment phrase εἰς τὸν ἐν Διὸς πόλει τῇ μεγάλῃ θησαυρὸν there are a number of variables that might provide bases for discrete groupings: The name of the signator, or that of the countersignator; the name of the taxpayer; the amount of grain paid; the year, or the month, or the day of payment. But one of the most interesting results of the study of these receipts is a better understanding of the number and nature of the various taxes on grain that were paid into the Ptolemaic granaries. There are a limited number of distinct phrases used on these receipts to describe the taxes towards which payments are recorded on the Diospolis Magna receipts, and I have chosen to make these tax-phrases the primary variable according to which I shall group and study the Diospolis Magna receipts. The names of officials and of taxpayers, the dates and amounts of payment—these variables will be studied in their application to groups of receipts bearing different tax-phrases, and a comparison between their occurrences in the different tax-phrase groups will be used to assess the significance of the difference between the tax-phrases themselves.

This, then will be the form of this study: In Part One, material will be presented in eight Groups—one for each type of expression used on Diospolis Magna

receipts to describe the taxes towards which recorded payments were made. In each Group I shall list the published receipts that bear a single tax-phrase, along with the official signatures appended to those receipts, the formula in which the receipts are written, the amounts of payment recorded on them, the dates of payment recorded on them, and the names of the taxpayers written on them.

In Part Two, the material thus presented will be collated in six Sections. Under "Granary Officials", Section One, I will try to describe the relationship between the two sorts of officials responsible for issuing granary receipts in Diospolis Magna. In Section Two, I will record general trends and individual variations in the formula of the receipts. In Section Three, I will compare the distributions and central tendencies of amounts recorded for payment of taxes on receipts bearing different tax-phrases; in Section Four, the distribution and central tendency of dates recorded for grain-tax payment. The seasonal distribution of payments, and their amounts, will be examined for implications bearing on the question of the Ptolemaic method of grain-tax collection.

The nationality of taxpayers' names will be discussed in Section Five; in Section Six, "Grain Taxes", I will assess the significance of information presented in Sections One through Five for the meanings of the various tax-phrases recorded on Diospolis Magna granary receipts.

The research that led to this study began with questions raised by Professor C. Bradford Welles in connection with his study of *P. Yale 55*,¹ a letter dated August 6, 107 B.C., acknowledging receipt of payment of wheat. The prevailing view of the methods used by the Ptolemaic regime to collect taxes in grain is one proposed by Rostovtzeff as long ago as 1904:² Crown officials on the village threshing floor removed crown taxes from each landholder's crop as it was threshed. As Welles has pointed out, the date of August 6 can hardly apply to a payment extracted on the threshing floor, for August was the season of the Nile flood, when field and threshing floor alike were under water.

Examination of the dates of payment recorded on any large number of granary receipts will reveal that August is no impossible, perhaps no very unusual, month from which to find records of payments of grain for taxes. To what extent, though, must this observation affect our notion of the Ptolemaic method of collecting taxes in grain? Just how unusual is it to find Ptolemaic granary receipts dated in August? Have receipts for such payments any other characteristics that set them apart from those for payments made during the season of harvest and threshing?

These questions and many others require answers that can only be obtained from close studies of groups of documents. Much of the information available in

1. First published in 1964: "On the Collection of Revenues in Grain in Ptolemaic Egypt," *Studien zur Papyrologie und antiken Wirtschaftsgeschichte: Friedrich Oertel zum achtzigsten Geburtstag gewidmet*, pp. 7-16.

2. M.I. Rostovtzeff, "Kornhebung und Korntransport im griechisch-römischen Aegypten," *Archiv* III, p. 204.

the large numbers of published Ptolemaic documents will never be fully available to editors or historians until groups of related documents are available in analytical collections. I chose to begin my researches with a study of granary receipts because these documents, by their brief and formulaic nature, offered limited numbers of variables for relatively simple analysis. Of the granary receipts published from Ptolemaic Egypt, I chose to study those bearing the name of the Diospolis granary because they formed a large group that observed, to a great extent, the unities of time and place.

The chief modern sources of data are, of course, the published collections of Ptolemaic ostraka; those collections are also the only scholarly works known to me that offer, in somewhat the same sense as this work of mine, close studies of the Diospolis Magna receipts. The receipts to be studied here were published in Wilcken's *Griechische Ostraka*, 1899; J.G. Milne's *Theban Ostraca*, 1913; Schubart's *Papyri und Ostraka der Ptolemaerzeit* (BGU Vol. VI), 1922; Viereck's *Griechische Ostraka zu Strassburg*, 1923; and Tait's *Greek Ostraca in the Bodleian Library*, Vol. I, 1930.

Of these works, it is Wilcken's great and pioneering study that makes the greatest effort to correlate, describe, and analyze the information presented by the documents published in it. Subsequent editions of ostraka preserve, in a general way, Wilcken's categories; such commentary as appears in them addresses itself to Wilcken, supplementing, corroborating, or criticizing his remarks.

Thus Milne, editor of the second group of receipts studied here, prefaces his collection of Greek receipts with this remark: "Any large collection of Greek ostraca must now be treated in the main as supplementary to Wilcken's great publication." For Milne, the chief value of his publication of ostraka is to be found "... in the additional light which it may give upon the taxation of Egypt," and he accordingly groups his granary receipts, much as I have done in the first part of this study, according to the tax-phrases they bear. Unlike me, however, he includes within his tax-phrase groups receipts that omit the place-of-payment phrase εἰς τὸν ἐν Διὸς πόλει τῇ μεγάλῃ θησαυρόν. Milne provides at the beginning of each tax-phrase group of granary receipts a discussion of scholarly opinion regarding the meaning of the tax-phrase involved; in these discussions he refers particularly to Wilcken's remarks, and to those of Grenfell and Hunt, in the first volume of *Theban Papyri*, 1902.

As Milne himself indicates (*Theban Ostraca*, p. 70), the receipts presented in his edition are only a selection of those available in his collection. Later, more inclusive publications of ostraka group the documents according to chronological or other principles. In Schubart's *Papyri und Ostraka*, granary receipts bearing the place-of-payment phrase εἰς τὸν ἐν Διὸς πόλει τῇ μεγάλῃ θησαυρόν are printed alongside all the others of Theban provenance without distinction based on tax-phrase. In Viereck's *Griechische Ostraka*, receipts bearing the place-of-payment phrase εἰς τὸν ἐν Διὸς πόλει τῇ μεγάλῃ θησαυρόν appear as a separate group including receipts without distinction based on tax-phrase. In Tait's *Greek Ostraca*, receipts from the Diospolis granary are published in chronological order, without distinctions based on place-of-payment or tax-phrase.

Tait seems to have had a remarkable grasp of the sense and significance of earlier-published documents parallel to those of his collection, and remarkable sureness in the establishing of texts. His edition of the Bodleian ostraka is at once the most cogent and the most cryptic of the publications I have used. Tait provides no introductory remarks, neither to his publication as a whole, nor to his separate groups of documents. His notes on individual documents are few, and those few are more likely to describe the condition and appearance of a text than to argue even dates or the identification of individuals mentioned in his texts. Only once – in connection with *O. Bod.* 150, p. 26 – have I found him to remark upon the historical or economic sense of a document, and in that case he does not so much argue the sense of the document as point out its relevance to a historical matter. And yet his very texts and dates often constitute, or imply, argument on textual or historical questions related to the Diospolis Magna receipts.

For instance: It seems to have been Tait who discovered – perhaps I should say 'decided' – that some receipts of the Diospolis Magna formula bear the tax-phrase εἰς τὸ (ἤμισυ ἀρτάβης). His collection is the only one that includes receipts with that tax-phrase (see *O. Bod.* 195 and *O. Asb.* 7); the other, earlier-published receipts that I have regarded as records of payment for the ἤμισυ ἀρτάβης in my Groups Five and Six have been corrected from their original readings either by Tait (see *Berichtigungsliste* II.1 on WO 704) or after his example. Tait provides arguments neither for his readings of *O. Bod.* 195 and *O. Asb.* 7, nor against the readings in earlier-published collections that his interpretations seem to demolish. And yet his opinion seems to be almost universally accepted (see *Berichtigungsliste* II.1 *passim*, and my rather grudging deference below, p. 69).

Tait's method seems closest to that of the *Berichtigungsliste* itself, where corrections of the readings of published papyri and ostraka are printed with the names of their authors (sometimes) and without argument (nearly always). Karl Fr. W. Schmidt's corrections of Tait's readings, printed in *Berichtigungsliste* III, after Schmidt's review in *Philologische Wochenschrift*, 1931, are set forth with as little explanation as were those readings themselves.

B. STATISTICAL METHODS

It may have been obvious from the vocabulary in which I chose to express the purpose of Sections Three to Five in Part Two of this work (above, pp. 4 f.), that I intend to resort to statistical methods in describing and assessing some of the information offered by the Diospolis Magna receipts. It was not my purpose, in approaching the study of these documents, to design and execute exercises in statistics; on the contrary, I was at first unwilling to attempt any such techniques more sophisticated than the calculation of arithmetic means and the construction of frequency charts. In the end, though, I felt compelled to locate and incorporate a few simple statistical tests, and that for these reasons:

In the first place, the receipts in my eight tax-phrase groups present numerical information, particularly in their dates and amounts, and the attempt to avoid statistical terms in describing them proved futile. Great numbers of such sentences

as, "The average size of wheat payments recorded on receipts of Group Four is rather larger than that of those on receipts of Groups One and Two, much larger than that of those on receipts of Groups Five and Seven, and very much smaller than that of those in Groups Three and Five," are intolerable — even in a technical study.

In the second place, information thus presented is impossible to analyze. How great a difference between two groups in respect to their average size of wheat payments must we find before we can say that that difference is significant, and not merely accidental? No amount of non-mathematical reasoning can provide the answer to that question, particularly when the number of receipts from which the two averages have been computed may be quite different.

The statistical terms and procedures I have used in examining this material are described in most elementary statistical textbooks. For my part, I relied mainly on two books: For a straightforward explication of the fundamentals of statistics, McCollough and Van Atta's *Statistical Concepts*, 1963; for application and analysis of specific tests, Sidney Siegel's *Nonparametric Statistics for the Behavioral Sciences*, 1956.

In order to describe a series of numbers succinctly, one ordinarily resorts to some measure of central tendency, the so-to-speak average number that may be taken to represent the series. There are three common ways of describing the central tendency of a series of numbers: Mode, median, and mean. The mode, or modal class, of any set of values, whether numerical or nominal, is simply the class most frequently represented within the set. If I classify the nationality of taxpayers' names as recorded on published Ptolemaic receipts as Greek, Egyptian, Semitic, and Nubian, and determine the frequency with which names of these four nationalities appear, I shall be able to describe as modal the nationality that most often occurs. In the case of the Diospolis Magna granary receipts, the modal class would be Greek.

Numbers, too, can be described by their modal class. For example, suppose that these numbers represent artabs of wheat paid on a set of nine Ptolemaic tax receipts: 1, 2, 2, 3, 4, 6, 12, 17, 23. If one decides to regard each number as a single class, the number 2 will be the mode, for it appears most frequently. Or, if the numbers are grouped in sets of five, the modal class will be that including numbers 1 through 5.

The median of any set of values is the midpoint in the ranked series. Calculation of a midpoint requires, of course, that a set of values be capable of ordinal arrangement. The nationality of taxpayers' names, since no progression is implied from one nationality to another, cannot be described by a median. If, however, I ranked the published Diospolis Magna granary receipts according to their antiquity, the date I would regard as median would be that of the receipt preceded and followed, in point of time, by equal numbers of receipts. The exemplary set of numbers given above can be ranked according to increasing size; the median among them would be 4.

An arithmetic mean can be calculated neither for sets of nominal values (such as nationalities) nor for sets of ordinal values (such as progressive anti-

quity), but only for mathematical values assigned on some objective scale — inches, pounds, miles, or, as in the exemplary set of numbers given above, artabs. The mean is computed by adding the values of a set of measurements, and dividing that sum by the number of measurements in the set. The mean size of payments in our exemplary group is 7.78 artabs.

Obviously, the number that describes the central tendency of a set of values may differ, depending on whether one uses mode, median, or mean — in our exemplary set, the mode is 2 (or 1 through 5), the median 4, the mean 7.78. Differences between mode, median, and mean are due to patterns of distribution within sets of numerical observations. The addition of one large number to a group of ten small ones, for instance, will affect the mean considerably, the median slightly, and the mode not at all. One cannot tell from any single measure of central tendency whether that measurement was obtained from a set of fairly large numbers that included a few much smaller ones; from a set of fairly small numbers that included a few much larger ones; or from equal numbers of larger and smaller numbers.

A comparison of mean and median, though, will give some indication of the distribution of the set. If mean and median are identical, the set includes equal proportions of larger and smaller numbers; if the median is greater than the mean, the set includes more larger than smaller numbers; if the mean is greater than the median, the set includes more smaller than larger numbers. Statisticians use the term 'normal' to describe a distribution in which mean and median are identical; in any other case, the distribution is termed 'skewed'.

Statisticians have precise ways of measuring the distributions of sets of numbers; they do so in terms of the average divergence from the mean. These methods, though, are applicable only to sets of numbers whose distribution is normal, and the distribution of most sets of numbers to be considered in this study is far from normal.

In the first part of this study, where I describe the information presented by groups of Diospolis Magna receipts, I have provided lists of numbers, where numbers occur. In the case of amounts of grain paid for taxes, the information provided by the list of numbers of artabs recorded will be supplemented by a calculated median and calculated mean. In the case of seasons of payment, I have grouped the dates within months of the Julian calendar, and constructed therefrom charts illustrating the frequency of payments within those months. The central tendency for dates of payment is best expressed in terms of the modal month, usually June or July.

In the second part of this study, where I compare and analyze the information presented by groups of Diospolis Magna granary receipts, further statistical procedures become necessary. The development of the probability theory has made it possible for statisticians to devise ways of assessing the significance of variation between the central tendency or distribution in discrete sets of observations. These procedures, or 'tests', determine the probability of obtaining any specific degree of variation by accident from separate samplings of a single population. If the probability determined is, for example, 0.5 — five times in ten, or a

50 percent probability—the difference between the sets of observations is said to be insignificant, and the sets are then supposed to represent a single population. If, on the other hand, the probability obtained is .01, or .05, or even 0.1—the figure is usually chosen arbitrarily by the investigator—the difference between the sets of observations is said to be significant, and the sets are then supposed to represent distinct populations.

Because the significance of variation in central tendencies between discrete sets of observations depends not only on the degree of variation, but also on the number of sets, and on the number of observations within each set, the calculation of statistical tests is often a lengthy business.

A very common statistical test for the significance of variation in central tendency is the chi-square. The chi-square test evaluates the differences in modal classes between two or more sets of observations; it can be used for sets of nominal, as well as for sets of arithmetic, observations.

Suppose that in two groups of Diospolis Magna granary receipts the proportions of Greek to Egyptian names among the taxpayers vary. In Group A, let us say, there are seven taxpayers whose names are Greek, and three whose names are Egyptian; in Group B there are three whose names are Greek and seven whose names are Egyptian. Am I to suppose from this that persons whose names were Greek were more often required to make payments of the sort recorded in Group A, Egyptians to make payments of the sort recorded in Group B? Or does the reversal of proportions merely represent an accident of sampling? Here is the procedure of the chi-square tests:

	A	B	TOTALS (Y)	ADDENDS OF χ^2	
GREEK NAMES	7 5	3 5	10	.8	.8
EGYPTIAN NAMES	3 5	7 5	10	.8	.8
TOTALS (X)	10	10	20 (Z)		

Recorded observations are placed in the upper left corner of each cell; in the lower, righthand corner, here number 5, are the frequencies expected by chance—in each cell, the number representing a proportion to the column total (X) that equals the proportion of the row total (Y) to the final total (Z). The difference between observed frequency and expected frequency in each cell is squared; the square is divided by the expected frequency in that cell; the numbers thus obtained for each cell are added; the sum is called chi-square. The sum chi-square may be located in a table of the values of chi-square³ under the degrees of freedom allowed by the table from which it was computed. Degrees of freedom are equal to the number of rows less one, times the number of columns less one; in our example, the degrees of freedom are only one, and the probability of obtaining

3. Such a table will be found in almost any statistical textbook, or in a handbook of mathematical tables.

at one degree of freedom the chi-square value 3.2 by chance is greater than .05, but less than .1. There is thus less than one chance in ten that the difference between the proportions of Greek and Egyptian names in our hypothetical groups is accidental.

The chi-square test can be used to test the difference between the medians of sets of ordinal or numerical observations; in this case it may be called simply 'the medians test'. Suppose that we wish to test the significance of the difference in medians of sizes of payment in wheat recorded on two groups of Diospolis Magna granary receipts. First, combining the amounts paid in both sets, we will determine their common median; then we will construct the following chi-square table:

	OVER MEDIAN	UNDER MEDIAN	TOTALS
GROUP A			
GROUP B			
TOTALS			

ADDENDS OF χ^2	

In each cell we will record, at the upper left, the number of observations that applies; we will then proceed as with the chi-square test.

Another test for the significance in variation between medians of sets of observations is called the Kruskal-Wallis test. It is more sensitive than the chi-square medians test, because it takes into account more information—not only how many observations in each group fall above and below the common median, but also how far, relatively speaking, each observation is distant from that median. To compute the Kruskal-Wallis test, one ranks all observations from all sets one wants to compare. One adds the ranks assigned to each set, and tests the significance of the difference between the resulting sums by the following formula, where N is the total number of observations in all sets, n the number of observations in a single set, r the sum of the ranks in a single set:

$$\frac{12}{N(N+1)} \left(\frac{r_1^2}{n_1} + \frac{r_2^2}{n_2} \text{ (and similar fractions for each of)} \right) - 3(N+1)$$

(where n_i and r_i are the number of observations and the sum of ranks, respectively, for set i)

The result obtained by the application of this formula can be evaluated by consulting a table of the values of chi-square, using for degrees of freedom the number of sets tested less one.

One ordinarily uses the Kruskal-Wallis test only for analysis of three or more sets of observations, and those three must normally contain more than five observations each. For a relatively simple example see Table 14.

The statistical tests designed to assess the significance of the difference between arithmetic means in sets of observations commonly require normal distributions of observations within those sets. As I have said already, the numerical information presented by the Diospolis Magna receipts fails to meet this assump-

tion, and so I have avoided tests of the significance of variation between means.

Application of the descriptive and inferential methods I have outlined here must be preceded by a word of caution. The terms and charts I have used in the first part to describe numerical information presented by published Diospolis Magna granary receipts involve no assumptions about the populations from which those receipts were drawn. That is not the case with the tests used in the second part to assess the significance of differences among sets of observations drawn from different groups of those receipts; these tests are valid only on the assumption that the published receipts of my various groups are fair samplings of the larger population of ancient receipts that they represent.

In the physical and behavioral sciences for which the science of statistics has chiefly been developed, the sets of observations used in statistical tests are usually drawn from large and available populations. In that case, the selection of sample observations can be made in such ways as to ensure randomness and independence in those samples; in case of doubt, further samplings can be taken and added to or compared with the earlier observations. In the case of the Diospolis Magna granary receipts, obviously, the situation is quite different. I have no way of knowing whether the historical accidents that have preserved and brought to light the receipts that remain to us were of a nature to ensure randomness; I have no way of knowing even whether the published receipts of this kind are a fair representation of all those preserved in modern collections. And I am not able to gather another sampling of the ancient receipts in order to check the randomness of the ones available to us.

In order to avoid presenting lengthy and repetitive qualifications throughout the second part, let me say here, once and for all, that the results obtained in all the tests used to compare and analyze information presented in two or more tax-phrase receipt groups are valid only if those receipts are in fact fair samplings of the vast numbers of their like issued in Ptolemaic Thebes. I do not mean these remarks to disqualify my own methods. If numerical information presented on ancient documents is to be analyzed at all, it must be analyzed statistically, or else impressionistically — and the latter is hardly a more satisfactory method.

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PART I
THE EVIDENCE

THE HISTORY
OF THE

Group One: Receipts with No Tax Phrase

<i>O. Bod.</i> 162	<i>BGU</i> 1426	<i>O. Theb.</i> 22
<i>O. Bod.</i> 163		
<i>O. Bod.</i> 164	<i>O. Petr.</i> 43	WO 718
<i>O. Bod.</i> 165	<i>O. Petr.</i> 50	WO 726
<i>O. Bod.</i> 188		WO 728
<i>O. Bod.</i> 189	<i>O. Queens</i> 2	WO 1255
<i>O. Bod.</i> 194		WO 1353
<i>O. Bod.</i> 199	<i>O. Strassb.</i> 316	WO 1511

Formula

Ἔτους xx Month xx. Με(μέτρηκεν) εἰς τὸν ἐν Διὸς πό(λι) τῆ με(γάλη) θη(σαυρόν)
 xx (ἔτους) Name of Taxpayer Kind and Amount of Payment in Words/in Figures.
 Signature. Countersignature με(μέτρημα) Kind and Amount of Payment in Words/
 in Figures.

Signature Groups

- I. Signature Ἀμβρόων.
 - a. Countersignatures Πτολεμαῖος, Ἀπολλώνιος, Μενεύς.
O. Queens 2
 - b. No Countersignature.
O. Bod. 162
O. Bod. 163
 WO 726¹
 - c. Countersignature Ἀπολλώνιος.
 WO 1353²
O. Petr. 43

1. Taxpayer's name read by Wilcken: Ἀβῶτος, Λυσιμάχου; by Bilabel (*BL* 2.1) Ἀβῶτος
 διὰ Λυσιμάχου. The formula suggests that the missing signature was Ambryon's.

2. Assigned by Wilcken to Euergetes' reign. After the example of Tait, I have assigned
 all receipts signed by Ambryon to the reign of Philometor.

- d. Countersignatures Ἀπολλώνιος and Ἐρμοκράτης.
 WO 728³
 WO 1255⁴
 WO 1511⁵
- II. Signature Omitted; Demotic Subscript and Countersignature Ἐρμοκράτης.
O. Bod. 164
- III. Signature in Countersignature Form: Ἀσκληπιάδης.
O. Bod. 165⁶
- IV. Signature Ἀμεινώ(θης); No Countersignature.
O. Strassb. 316
- V. Signature Omitted; No Countersignature.
O. Bod. 188⁷
O. Bod. 189
O. Bod. 194
O. Bod. 199
- VI. Signature Ἀντίοχος; Countersignatures Demotic.
O. Theb. 22⁸
 WO 718⁹
O. Petr. 50¹⁰
 BGU 1426¹¹

Amount of Payment

Artabs of Wheat: Current Tax.

2 1/2 - WO 718	12 1/12 - BGU 1426
3 5/6 - WO 728	16 2/3 - <i>O. Bod.</i> 165
4 - <i>O. Bod.</i> 189	21 - <i>O. Strassb.</i> 316
5 1/2 - <i>O. Petr.</i> 43	90 - WO 1255
8 7/12 - WO 726	90 - WO 1511
10 - <i>O. Bod.</i> 188	

Artabs of Wheat: Late Tax.

3 - <i>O. Bod.</i> 162	6 1/2 - <i>O. Bod.</i> 163
3 - <i>O. Bod.</i> 162	8 - <i>O. Bod.</i> 194
5 1/2 - <i>O. Bod.</i> 162	15 1/6 - <i>O. Queens</i> 2

3, 4, 5. For the date see Note 2 above.

6. Tait suggests either 154 or 143 as year-date. As Ambryon signed receipts from 153, I prefer the date 143.

7. Taxpayer's patronym read by Tait: Καρουίτωνος; by Schmidt (*BL* 3) Καρουρίωνος.

8. After the example of Tait, I have assigned all receipts signed by Antiochus to the reign of Ptolemy Alexander.

9. For the date see Note 8 above.

10. The formula suggests that the missing signature was Antiochus'.

11. For the date see Note 8 above.

Artabs of Barley:

4 1/4 - *O. Bod.* 1645 1/12 - *O. Bod.* 19966 11/12 - *O. Theb.* 22

Artabs of Croton:

1/4 - *WO* 1353

Amount of Payment Lost:

O. Petr. 50*WO* 726

Central Tendencies

Wheat for Current Taxes: Mean size of payment 24.02 artabs; median size of payment 10 artabs.

Wheat for Late Taxes: Mean size of payment 6.86 artabs; median size of payment 6 artabs.

Barley: Mean size of payment 25.42 artabs; median size of payment 5 1/12 artabs.

Season of Payment

Wheat for the tax of the current year:

8 February 153; *WO* 125512 April 154; *WO* 72619 April 154; *WO* 72620 April 129; *O. Strassb.* 31613 April - 29 May 92; *O. Petr.* 5012 May 89; *BGU* 142613 May 120; *O. Bod.* 18816 June 154; *WO* 728c. 7 July 153; *O. Petr.* 4322 July 118; *O. Bod.* 18927 July - 25 August 153; *WO* 151131 August 97; *WO* 718

Wheat for the tax of a previous year:

30 March 155; *O. Bod.* 16330 March 155; *O. Bod.* 162¹²10 June 156; *O. Queens* 227 November 156; *O. Bod.* 162¹²29 November 156; *O. Bod.* 162¹²30 December 114; *O. Bod.* 194

12. The regnal year is lost in the date of receipt on *O. Bod.* 162. To judge from the months and days recorded on it, though, it is far more likely to have been a payment for late than for current taxes (see below, p. 61).

Barley for the tax of the current year:
 14 April 97; *O. Theb.* 22
 5 June 88; *O. Bod.* 199
 19 June 151; *O. Bod.* 164

Date of payment lost:
 WO 1353
O. Bod. 165

Taxpayers

Greek Names:

Διοσκουρίδης Καρουρίωνος - *O. Bod.* 188
 Δωσίθεος Ψα..... - *O. Petr.* 50
 Ἰσάκις Στράτωνος - *O. Bod.* 164
 Καλλίας Μενήτος - *O. Bod.* 194
 Κεφαλ..... - *O. Bod.* 165
 Σίμων Ἐρμίου - WO 728
 Σίμων Ὀραίου - *O. Petr.* 43
 Σίμων Ὀραίου - WO 1511
 Στράτων Μηνοδώρου - *O. Strassb.* 316
 Στράτων Στράτωνος - *O. Bod.* 163

Egyptian Names:

Ἄρποή(ριος) καὶ Λυσσαμοῦν Πατύμεως - *BGU* 1426
 Π.....ος Ἡραξ () Φοτνού(φιος) - *O. Bod.* 189
 Τα.ησ... .. - *O. Bod.* 199

Semitic Names:

Σίμων Ἰσάρου - WO 1255
 Σόλοκτος Σίμωνος καὶ οἱ μέτοχοι - WO 718

Nubian Names:

Νουβίων Ὀνίου - *O. Bod.* 162

Mixed Names:

Ἐρμίας Πτολεμαίου καὶ ...αυσις Ψεναμούνιος - *O. Theb.* 22
 Πικόλαος Πεύτου Π.....ου Κεφάλωνος - WO 1353
 Ἀβῆτος διὰ Λυσιμάχου - WO 726

Names Lost:

O. Queens 2

Group Two: Receipts for Payments Ὑπὲρ τοῦ τόπου

BGU 1428	<i>O. Bod.</i> 181	<i>O. Strassb.</i> 320
BGU 1430	<i>O. Bod.</i> 183	
BGU 1431	<i>O. Bod.</i> 184	WO 724
BGU 1432	<i>O. Bod.</i> 185	WO 725
BGU 1433	<i>O. Bod.</i> 186	WO 734
	<i>O. Bod.</i> 187	WO 740
<i>O. Bod.</i> 152	<i>O. Bod.</i> 190	WO 745
<i>O. Bod.</i> 154	<i>O. Bod.</i> 200	WO 746
<i>O. Bod.</i> 155		WO 747
<i>O. Bod.</i> 156	<i>O. Asb.</i> 6	WO 748
<i>O. Bod.</i> 157		WO 750
<i>O. Bod.</i> 158	<i>O. Petr.</i> 46	WO 754
<i>O. Bod.</i> 159		WO 1350
<i>O. Bod.</i> 160	<i>O. Cam.</i> 10	WO 1521
<i>O. Bod.</i> 166		WO 1524
<i>O. Bod.</i> 168	<i>O. Strassb.</i> 317	
<i>O. Bod.</i> 173	<i>O. Strassb.</i> 318	<i>O. Theb.</i> 27
<i>O. Bod.</i> 180	<i>O. Strassb.</i> 319	SB 8039

Formula

Ἔτους xx Month xx. με(μέτρηκαν) εἰς τὸν ἐν Διὸς πό(λι) τῆ με(γάλη) θη(σαυρόν)
 ὑπὲρ τοῦ τόπου xx (ἔτους) Name of Taxpayer Kind and Amount of Payment in
 Words / in Figures. Signature. Countersignature με(μέτρημαι) Kind and Amount of
 Payment in Words / in Figures.

Signature Groups

I. Signature Ἀσκληπιόδης; Countersignature Πετιέσις.

O. Bod. 152

II. Signature Πανᾶς.

a. No Countersignature.

O. Bod. 154

b. Countersignature Πανίσκος.

O. Bod. 155

O. Bod. 156

O. Petr. 46¹³

SB 8039¹⁴

13. The date and formula suggest that the lost signature was Panas'.

14. SB readings to be corrected from ὑπὲρ τοῦ αὐτοῦ τοῦ ὑπὲρ τοῦ τόπου; from {Πανίς} to the signature Πανᾶς.

- c. Countersignature Ἀπολλώνιος.
 - O. Bod.* 157
 - O. Bod.* 158
 - O. Bod.* 159
 - O. Bod.* 160
- d. Countersignatures Ἀπολλώνιος and Πτολεμαῖος.
 - O. Cam.* 10
- III. Signature Ἀμβρύων.
 - a. Countersignatures Πτολεμαῖος and Ἀπολλώνιος.
 - WO 725¹⁵
 - WO 1350¹⁶
 - b. Countersignature Πτολεμαῖος.
 - BGU 1430¹⁷
 - WO 724¹⁸
- IV. Signature Omitted; Countersignature Διοκλῆς.
 - O. Bod.* 166
- V. Signature Ἡρακλείδης.
 - a. Countersignatures Ἡρακλείδης and Ἀπολλώνιος.
 - O. Bod.* 168
 - O. Bod.* 173¹⁹
 - WO 747
 - b. No Countersignature.
 - O. Bod.* 200²⁰
 - WO 740²¹
 - c. Countersignature Ἀπολλώνιος.
 - O. Asb.* 6
 - d. Countersignature Πτολεμαῖος.
 - WO 745
 - e. Countersignature Ἡρακλείδης.
 - O. Bod.* 180
 - WO 746
 - WO 748
 - BGU 1432
 - BGU 1433

15. Assigned by Wilcken to the reign of Euergetes; after the example of Tait, I have assigned all receipts signed by Ambryon to the reign of Philometor.

16. For the date, see above, Note 3.

17. Countersignature Πτολεμαῖος suggested by Viereck (*BL* 2.1) for editors' Τ.....ος. For date, see above, Note 3.

18. For the date, see above, Note 3.

19. The presence of two countersignatures on the receipt suggests that they were those of Heraclides and Apollonius.

20. The formula suggests placement in this group; the tax-year should perhaps read εἰς τὸ λα (ἔτος).

21. Readings by Wilcken corrected and expanded throughout by Bilabel and Grenfell, *BL* 2.1.

- VI. Signature Πτολεμαῖος σιτολόγος.
 a. No Countersignature.
 WO 734
 b. Countersignature Ἡρακλείδης.
 O. Bod. 181
- VII. Signature Ἀμενώ(θης); No Countersignature.
 O. Strassb. 317
 O. Strassb. 318
 O. Strassb. 319
- VIII. Signature Ἀμμώ(νιος); No Countersignature.
 BGU 1431
 WO 1524²²
- IX. Signature Ἀπολλώνιος.
 a. No Countersignature.
 WO 1521²³
 O. Bod. 183²⁴
 O. Bod. 184
 WO 750²⁵
 O. Bod. 186
 O. Bod. 187
 b. Countersignature Ἀντιγένης.
 O. Bod. 185
- X. Signature Ἐρυ() Ἀρ(); No Countersignature.
 WO 754
- XI. Signature Omitted; No Countersignature.
 O. Theb. 27
 BGU 1428
 O. Bod. 190
 O. Strassb. 320

Amount of Payment

Artabs of Wheat: Current Tax.

5/12 - O. Bod. 200	3 - SB 8039
3/4 - O. Strassb. 319	4 1/6 - O. Bod. 183
5/6 - BGU 1431	4 1/6 - WO 750
1 - O. Bod. 187	4 5/6 - O. Strassb. 317
2 - WO 725	6 1/6 - O. Bod. 184
3 - WO 748	7 2/3 - WO 734

22. Bilabel (BL 2.1) finds the signature Ἀπολλώ(νιος) possible – but notes that Tait inclines towards Ἀμμώ(νιος).

23. Signature supplied by Bilabel (BL 2.1), who corrects the readings throughout.

24. The date and formula suggests that the signature lost was that of Apollonius.

25. Signature supplied by Bilabel (BL 2.1).

7 5/6 - WO 1524	22 - WO 1521
8 - O. Strassb. 318	22 1/3 - O. Bod. 155
8 - O. Bod. 166	25 - O. Bod. 186
9 - O. Asb. 6	26 - O. Bod. 185
9 1/4 - BGU 1433	28 1/6 - BGU 1430
11 1/4 - BGU 1428	31 3/4 - O. Bod. 168
11 2/3 - O. Bod. 173	33 5/6 - O. Bod. 152
15 - WO 750	40 - O. Bod. 190
15 1/2 - WO 746	40 - WO 754
17 - O. Strassb. 320	45 - O. Bod. 181
18 - O. Theb. 27	50 3/4 - WO 724
19 1/3 - BGU 1432	64 1/2 - O. Theb. 27
19 1/3 - O. Bod. 154	72 1/4 - O. Bod. 180
Artabs of Wheat: Late Tax.	
1 3/4 - O. Bod. 156	7 2/3 - O. Bod. 160
2 1/4 - O. Bod. 157	30 - WO 1350
3 2/3 - O. Cam. 10	67 5/6 - O. Bod. 159
6 5/6 - O. Bod. 158	
Artabs of Barley:	
5 - WO 740	12 1/2 - WO 740
5 1/3 - WO 745	14 7/12 - WO 724
10 5/6 - WO 740	20 5/6 - WO 747
10 11/12 - O. Bod. 200	
Amount of Payment Lost:	
O. Petr. 46	

Central Tendencies

Wheat for Current Taxes: Mean size of payment 18.70 artabs; median size of payment 13 1/3 artabs.

Wheat for Late Taxes: Mean size of payment 17.14 artabs; median size of payment 10 11/12 artabs.

Barley: Mean size of payment 11.37 artabs; median size of payment 5 1/12 artabs.

Season of Payment

Wheat for the tax of the current year:

- 28 March 123; O. Strassb. 317
- 6 April 128; O. Theb. 27
- 7 April 123; O. Bod. 185
- 7 April 122; WO 750
- 8 April 108; O. Strassb. 320
- 9 April 128; O. Theb. 27
- 11 April 122; WO 750

13 May 131; WO 748
 17 May 130; WO 1521
 18 May 121; *O. Bod.* 187
 20 May 128; *O. Strassb.* 318
 26 May 122; *O. Bod.* 186
 20 May - 18 June 120; *BGU* 1428
 3 June 131; *O. Bod.* 181
 5 June 115; *O. Bod.* 190
 17 June 119; WO 754
 17 June 161; *O. Bod.* 154
 18 June 140; *O. Bod.* 168
 18 June 136; *O. Bod.* 173
 c. 19 June 135; *O. Bod.* 200
 21 June 126; *BGU* 1431
 22 June 125; WO 1524
 26 June 132; *O. Bod.* 180
 28 June 160; *O. Bod.* 155
 12 July 157; *BGU* 1430
 14 July 157; WO 724
 18 July 139; WO 734
 27 July 163; *O. Bod.* 152
 1 - 10 August 135; *O. Ash.* 6
 2 August 157; WO 725
 7 August 126; *O. Strassb.* 319
 8 August 126; *O. Bod.* 184
 11 August 132; WO 746
 16 August 142; *O. Bod.* 166
 28 August - 26 September 160; *O. Petr.* 46
 17 September 128; *O. Bod.* 183
 26 September 160; *SB* 8039

Wheat for the tax of a previous year:

11 January 157; *O. Cam.* 10
 29 January 157; *O. Bod.* 160
 30 March 158; *O. Bod.* 158
 17 May 159; *O. Bod.* 157
 7 July 156; WO 1350
 22 September 160; *O. Bod.* 156
 23 November 158; *O. Bod.* 159

Barley for the tax of the current year:

1 April 135; WO 740
 8 May 135; WO 740
 13 May 131; WO 747
 11 June 135; WO 740
 c. 19 June 135; *O. Bod.* 200
 20 June 132; WO 745
 14 July 157; WO 724

Date of receipt lost:

BGU 1432

BGU 1433

Taxpayers

Greek Names:

- Ἀγαθοκλῆς Διονυσίου - *O. Bod.* 190
 Ἀμμώνιος Ἐρμίου - *O. Bod.* 168
 Ἀμμώνιος Ἐρμοφίλου - *WO* 1521
 Ἀμμώνιος Παύρωνος - *SB* 8039
 Ἀπολλώνιος Πραξίου - *O. Bod.* 184
 Ἀσκληπιάδης - *BGU* 1428
 Δίφιλος Ἀλεξάνδρου - *O. Bod.* 180
 Δίφιλος Ἀλεξάνδρου - *O. Bod.* 181
 Δῶρος Δώρου καὶ οἱ μέτοχοι - *O. Bod.* 154
 Δωσίθεος Πύρρου - *WO* 724
 Ἐλλην Δωσίθεου - *O. Bod.* 160
 Ἐυτυχίδης Λυσιμάχου - *O. Bod.* 155
 Ἡρακλείδης Ἐρμοκλέους - *BGU* 1433
 Ἡρακλείδης Ἐρμοκλέους - *WO* 734
 Ἡρακλείδης Ἐρμοκλέους - *WO* 740
 Ἡρακλείδης Ἐρμοκλέους - *WO* 745
 Ἡρακλείδης Ἐρμοκλέους - *WO* 746
 Ἡρακλείδης Ἐρμοκλέους - *WO* 747
 Ἡρακλείδης Ἐρμοκλέους - *WO* 748
 Θεόδοτος - *O. Bod.* 157
 Θεόδοτος Θαρασητοῦ - *O. Bod.* 159
 Θεόχρηστος Σαλαμίνιος - *WO* 1350
 Ἰάσων Ἰάσωνος - *WO* 725
 Λυσανίου - *BGU* 1432
 Πανκρῆς Χεσιῶ - *WO* 754
 Πέταλος - *O. Strassb.* 317
 Πλάτων Σαμ.... - *O. Petr.* 46
 Στράτων Μηνοδώρου - *O. Theb.* 27
 Στράτων Μηνοδώρου - *O. Strassb.* 320
 Στράτων Στράτωνος - *O. Bod.* 158
 Σωκράτης Ἰσιδώρου - *O. Bod.* 186
 Τρύφωνος - *WO* 750
 Χαριθῆμος Ἀλεξάνδρου - *O. Bod.* 200

Egyptian Names:

- θησαῖς Σισοίτου - *BGU* 1431
 Νεχθμώνθης Ψενθώτου - *O. Asb.* 6
 Ψενθώτου - *O. Bod.* 166
 Ψενθώτου - *O. Bod.* 183
 Παουσίρις Πανεχάτου - *WO* 1524

Περμῆμις Ψευχώνσιος - *O. Strassb.* 318

Πετενεφώθης Ἐριέως - *O. Bod.* 187

Πμεννιδ... .. - *O. Bod.* 185

..... Ψευθέως - *O. Strassb.* 319

Ψεγγώνσις Παβύτος - *BGU* 1430

Semitic Names:

Ἰνδῶς Ἀβιήστου - *O. Bod.* 156

Πολλοῦς Ἀβδαίου - *O. Cam.* 10

Mixed Names:

Πατσοῦς καὶ Ἐπαίνης - *O. Bod.* 152

Πεταροῦ(ρις) καὶ Ἡρακλῆς - *O. Bod.* 173

Group Three: Receipts for Payments

Εἰς τὴν ἐπιγραφὴν ὑπὲρ τοῦ τόπου.

O. Bod. 149

O. Bod. 171

O. Cam. 11

O. Bod. 150

O. Bod. 172

O. Bod. 151

O. Bod. 174

O. Bod. 153

O. Bod. 175

WO 709

O. Bod. 169

O. Bod. 176

WO 735

O. Bod. 170

O. Bod. 178

WO 736

Formula

Ἔτους xx Month xx. Με(μέτρηκεν) εἰς τὸν ἐν Διὸς πό(λι) τῆ με(γάλη) θη(σαυρόν)
εἰς τὴν ἐπιγρ(αφήν) τοῦ xx (ἔτους) ὑπὲρ τοῦ τόπ(ου) Name of Taxpayer Kind
and Amount of Payment in Words / in Figures. Signature. Countersignature
με(μέτρημα) Kind and Amount of Payment in Words / in Figures.

Signature Groups

I. Signature Φιλώτος.

a. Countersignatures Petiesis and Ἀμμώνιος.

O. Bod. 149

O. Bod. 150

WO 709

b. Countersignatures Petiesis, Patous, and Ἀμμώνιος.

O. Bod. 151

II. Signature Πανῆς; Countersignature Ἀπολλώνιος.

O. Bod. 153

- III. Signature Ποῶρις; No Countersignature.²⁶
O. Bod. 170
O. Bod. 171
- IV. Signature in Form of Countersignature: Ἐρμων.²⁷
O. Bod. 175
O. Cam. 11
O. Bod. 176
- V. Signature Πτολεμαῖος σιτολόγος; Countersignature Ἡρακλείδης.
O. Bod. 169
 WO 735
 WO 736
- VI. Signature Ἡρακλείδης; No Countersignature.
O. Bod. 172
- VII. Signature Omitted; No Countersignature?²⁸
O. Bod. 174
O. Bod. 178

Amount of Payment

Artabs of Wheat: Current Tax.

1 1/2 - <i>O. Bod.</i> 149	16 1/6 - <i>O. Cam.</i> 11
1 3/4 - <i>O. Bod.</i> 153	20 1/3 - <i>O. Bod.</i> 151
3 1/2 - <i>O. Bod.</i> 178	25 - <i>O. Bod.</i> 169
4 1/2 - <i>O. Bod.</i> 149	26 19/24 - <i>O. Bod.</i> 175
5 2/3 - <i>O. Bod.</i> 150	41 - WO 735
7 2/3 - WO 709	45 - <i>O. Bod.</i> 169
12 2/3 - <i>O. Bod.</i> 176	228 1/2 - <i>O. Bod.</i> 150
14 5/12 - WO 736	

Artabs of Wheat: Late Tax.

20 2/3 - *O. Bod.* 172

26. The signature Ποῶρις) was suggested by Karl Fr. W. Schmidt, *BL* 3; Tait read Ἰτωα() in the signatures of *O. Bod.* 170 and 171. Tait assigned these receipts to the reign of Euergetes because the taxpayers named on them are also named on receipts issued in the reign of Euergetes by the receipt writers Heraclides and Ptolemy the sitologus (see *O. Bod.* 169, 172, 180, 181). I have reassigned the receipts *O. Bod.* 170 and *O. Bod.* 171 to the reign of Philometor because that dating allows a more plausible description of the succession of receipt writers at the Diospolis granary (see below, pp. 47-49).

27. Tait assigned Hermon's receipts, for the same reasons as Pooris' (see note 26 above), to the reign of Euergetes. I have reassigned them, for much the same reasons as Pooris', to the reign of Philometor. Signatures in the form of countersignatures seem to be typical of receipts issued in the forties of the second century (see below, pp. 47-48).

28. Tait assigns these receipts to the reign of Euergetes. There seems to be no compelling reason to believe that they couldn't have been issued in the reign of Philometor; unsigned receipts, though, are more common in the later part of the second century, and I prefer the later date.

Artabs of Barley:

5 11/12 - *O. Bod.* 170

Artabs of Croton:

23 - *O. Bod.* 171

Amount Lost:

O. Bod. 174

Central Tendencies

Wheat for Current Taxes: Mean size of payment 30.30 artabs; median size of payment 14 5/12 artabs.

Season of Payment

Wheat for the tax of the current year:

4 June 134; *O. Bod.* 174

8 June 145; *O. Bod.* 175

15 June 145; *O. Cam.* 11

18 June 164; *O. Bod.* 149

21 June 139; *O. Bod.* 169

21 June 164; *O. Bod.* 150

23 June 164; *O. Bod.* 150

23 June 164; *O. Bod.* 149

26 June 162; *O. Bod.* 153

16 July 145; *O. Bod.* 176

12 August 139; *O. Bod.* 169

20 August 164; *O. Bod.* 151

24 August 139; *WO* 735

20 September 139; *WO* 736

25 September 134; *O. Bod.* 178

Wheat for the tax of a previous year:

22 January 136; *O. Bod.* 172

Barley for the tax of the current year:

13 July 137; *O. Bod.* 170

Croton for the tax of a previous year:

26 November 147; *O. Bod.* 171

Date of payment lost:

WO 709

Taxpayers

Greek Names:

Δίφιλος Ἀλεξάνδρου - *O. Bod.* 169

Δίφιλος Ἀλεξάνδρου - *O. Bod.* 171

Δίφιλος Ἀλεξάνδρου - *O. Bod.* 172

Δίφιλος Ἀλεξάνδρου - *O. Bod.* 174

Δίφιλος Ἀλεξάνδρου - *O. Bod.* 176
 Δῶρος Δώρου - *WO* 709
 Ἡρακλείδης Ἐρμοκλέους - *WO* 735
 Πατσιοῦς Ἀρτεμιδώρου - *O. Bod.* 150
 Πατσιοῦς Ἀρτεμιδώρου - *O. Bod.* 151
 Σῶσος Ἀλεξάνδρου - *O. Bod.* 175
 Σῶσος Ἀλεξάνδρου - *O. Bod.* 170
 Σῶστρατος Ξένωνος - *O. Bod.* 178

Egyptian Names:

Παθούτης Παχνούβιος - *O. Bod.* 149
 Πελαίος Κεμαίους - *WO* 736
 Ψενα..... - *O. Cam.* 11

Semitic Names:

Σίμων Ἀβδιοῦτος - *O. Bod.* 153

Group Four: Receipts for Taxes for Specified Places

<i>O. Bod.</i> 161	<i>WO</i> 721
	<i>WO</i> 723
<i>O. Cam.</i> 137	<i>WO</i> 727
	<i>WO</i> 731
<i>O. Strassb.</i> 314	<i>WO</i> 1505

Formula

Ἔτους xx Month xx. Με(μέτρηκον) εἰς τὸν ἐν Διὸς πό(λι) τῆ μεγ(άλῃ) θη(σαυρόν)
 xx (ἔτους) Name of Taxpayer ὑπὲρ Name of Place Kind and Amount of Payment
 in Words / in Figures. Signature. Countersignature με(μέτρημοι) Kind and Amount
 of Payment in Words / in Figures.

Signature Groups

- I. Signature Πανδῆς; Countersignatures Ἀπολλώνιος and Πτολεμαῖος.
O. Bod. 161. Tax-phrase before taxpayer's name: ὑπὲρ τοῦ Παθυρίτου Νήσου
 Τμωνπαρώ.
- II. Signature Ἀμβρύων.
 - a. No Countersignature -
WO 721:²⁹ ὑπὲρ ἱερῶς νήσου.
WO 723:³⁰ Tax-phrase before tax-year: ὑπὲρ τοῦ Κοπιτίου.

29. ἱερῶς Νήσου suggested by Grenfell, *BL* 2.1, for Wilcken's ἱερ///. Wilcken assigned this receipt to the reign of Euergetes; after the example of Tait, I have dated all receipts signed by Ambryon to the reign of Philometor.

30. The date and formula suggest that the missing signature was Ambryon's. Ὑπὲρ τοῦ Κοπ(τίου) κγ (ἔτους) suggested by Viereck, *BL* 2.1, for Wilcken's ὑπὲρ τόπου Κ... For date, see note 29 above.

- b. Countersignature Πτολεμαῖος.
O. Cam. 137. Tax-phrase before tax-year: ὑπὲρ τοῦ Κοπτίτου.
- c. Countersignature Ἀπολλώνιος.
 WO 1505³¹ Ποσειδεῖον.
- d. Countersignatures Πτολεμαῖος and Ἐρμοκράτης.
 WO 727³² Νήσου Τμοήρεως.
- e. Countersignature Ἐρμοκράτης.
 WO 731³³ Νήσου Πτο(λεμαίου).
- III. Signature Omitted; Countersignatures Ἀσκληπιάδης and Ἀντίπατρος.
O. Strassb. 314³⁴ ὑπὲρ τοῦ Παθυρίτου.

Amount of Payment

Artabs of Wheat: Current Tax.

- 4 1/3 - WO 721
 16 1/4 - *O. Bod.* 161
 29 2/3 - WO 731

Artabs of Wheat: Late Tax.

- 1 11/12 - *O. Strassb.* 314
 46 1/3 - *O. Cam.* 137

Artabs of Barley:

- 15 5/12 - WO 1505

Artabs of Croton:

- 4 21/24 - WO 727

Amount Lost:

- WO 723

Central Tendencies

Wheat for Current Taxes: Mean size of payment 16.75 artabs; median size payment 16 1/4 artabs.

Season of Payment

Wheat for the tax of the current year:

- 30 March - 28 May 157; WO 721
 10 July 153; WO 731

Wheat for the tax of a previous year:

- 25 January 143; *O. Strassb.* 314
 6 March 157; WO 723
 25 November 157; *O. Cam.* 137

31. For the date, see note 29 above.

32. Compare Τμωνπαρώ read in *O. Bod.* 161 above. For the date, see note 29 above.

33. Ἰσάκις suggested in *BL* 2.1 for the taxpayer's name read by Wilcken: Κάκις. For the date, see note 29 above.

34. Ὑπὲρ τοῦ Παθυρ(ίτου) reported by Tait and Viereck, *BL* 2.1, for Viereck's original reading ὑπ(ίρ) τοῦ πατρ. . .

Barley for the tax of the current year:
 9 April 154; WO 1505
 Croton for the tax of the current year:
 5 May 154; WO 727
 Date of payment lost:
 O. Bod. 161

Taxpayers

Greek Names:

Δωσίθειος Παχράτου - WO 723
 Ἑλλην Δωσιθείου - O. Cam. 137
 Ἰσάκις Στράτωνος - WO 731
 Νουμήνιος Πακελλούτος - WO 727
 Ὀρθέας Ορθέου - O. Bod. 161

Egyptian Names:

Περκᾶς Ψενθώτου - O. Strassb. 314

Semitic Names:

Ἰωσήπος Ἀβδίου - WO 721
 Σαμβαταῖος Ἀβιήλου - WO 1505

Group Five: Receipts for Payments

Εἰς τὸ (fraction) ἀρτάβης

O. Bod. 195

O. Asb. 7

O. Theb. 16

WO 704

WO 752

WO 1527

WO 1529

Formula

Ἔτους xx Month xx. Με(μέτρηκεν) εἰς τὸν ἐν Διὸς πό(λει) τῆ με(γάλη)θη(σαυρὸν)
 εἰς τὸ fraction (ἀρτάβης) xx (ἔτους) Name of Taxpayer Kind and Amount of Pay-
 ment. Signature.

Signature Groups

I. Signature Ἀντιγένης; No Countersignature.

O. Asb. 7 εἰς τὸ <ϣ.

WO 752³⁵ Tax-phrase after tax-year: εἰς τὸ <γ.

35. The date and formula suggest that the illegible signature was Antigenes'. BL 2.1 suggests εἰς τὸ <γ for Wilcken's reading, εἰς τὸ δ.

WO 1527³⁶ Tax-phrase after tax-year: εἰς τὸ ἥ(μισυ) ἀ(ρτάβης).

O. *Theb.* 16³⁷ εἰς τὸ <τ.

II. Signature Που(); No Countersignature.

WO 1529³⁸ εἰς τὸ <δ.

III. Signature Omitted; No Countersignature.

O. *Bod.* 195. εἰς τὸ <γ.

WO 704³⁹ εἰς τὸ <τ.

Amount of Payment

Artabs of Wheat: Current Tax.

2/3 - WO 704

7 1/2 - WO 1527

3 1/2 - WO 752

9 - O. *Asb.* 7

7 1/2 - O. *Bod.* 195

13 3/4 - O. *Theb.* 16

Artabs of Barley:

17 2/3 - WO 1529

Central Tendencies

Wheat for Current Taxes: Mean size of payment 6.99 artabs; median size of payment 7 1/2 artabs,

Season of Payment

Wheat for the tax of the current year:

20 June 113; O. *Bod.* 195

11 July 119; O. *Theb.* 16

14 July 122; WO 752

16 July 123; O. *Asb.* 7

12 August 122; WO 1527

17 August 113; WO 704

Barley for the tax of the current year:

18 March 121; WO 1529

Taxpayers

Greek Names:

Ἀμμόνιος Ἐρμοφίλου - WO 1529

Ἀμμόνιος Ἐρμοφίλου - WO 1527

36. Reading of signature provided by BL 2.1, which also suggests ἥ(μισυ) ἀ(ρτάβης) for Wilcken's reading, Ἀμμόνιον.

37. BL 3 suggests κδ for Milne's κθ in the date of receipt. In date of payment, Grenfell suggests (BL 2.1) γα for Milne's λ. Tax-phrase and signature supplied in BL 2.1.

38. Εἰς τὸ <δ suggested in BL 2.1 for Wilcken's reading, εἰς τὸ α. . .

39. Εἰς τὸ <τ suggested by Tait, BL 2.1, for Wilcken's reading, ἔνικ/. Πετρήσιος suggested as taxpayer's name by Grenfell, BL 2.1, for Wilcken's reading, Πετρεφίος.

Δημήτριος Ένισίου - *O. Asb.* 7
 Ἡρακλείδης Ἡρακλείδου - *WO* 752
 Φίλιππος Φιλίππου - *O. Bod.* 195

Egyptian Names:

Πετεήσιος Ψενοσίριος - *WO* 704
 Σελοῦλις Λολήνιος - *O. Theb.* 16

Group Six: Receipts for Payments

Εἰς τὸ (fraction) ἀρτάβης for Specified Places

WO 702

WO 1341

Formula

Ἔτους xx Month xx. Με(μέτρηκεν) εἰς τὸν ἐν Διὸς πό(λει) τῆ μεγάλης θη(σαυρὸν)
 Name of Taxpayer εἰς τὸ fraction Name of Place Kind and Amount of Payment
 in Words / in Figures.

Signature Groups

I. Signature Omitted; No Countersignature⁴⁰

WO 1341. εἰς τὸ Ἀμ(ώνιον) ἱερᾶς νήσου Ποανεμού(νεως), Wilcken. εἰς τὸ <-
 ἱερᾶς νήσου Ποανεμούνεως, Tait.

WO 702 εἰς τ... ἱερᾶς νή(σου) ..ανελαιμεύς, Wilcken. εἰς τὸ Ἀμ(ώνιον) ἱερᾶς
 νή(σου) Ποανεμούνεως, Grenfell.

Amount of Payment

Artabs of Wheat: Current tax.

50 - WO 1341

121 5/6 - WO 702

Central Tendencies

Wheat for Current Taxes: Mean and median size of payment 85.92 artabs.

40. Wilcken and Tait, if not Grenfell, seem to be of two minds about whether these receipts' tax-phrases should read 'εἰς τὸ Ἀμ(ώνιον)' or 'εἰς τὸ ἡ(μισυ) ἀ(ρτάβη)' The place-name is, at least, fairly certain, and I have extended Tait's opinion about the tax-phrase of WO 1341 to cover that of WO 702 as well, making these two receipts a special class. I have assigned both receipts to the reign of Soter II because of their resemblance to *O. Bod.* 195, assigned by Tait to that reign.

Season of Payment

Wheat for the tax of the current year:

23 April 113; WO 1341

14 June 113; WO 702

Taxpayers

Greek Names:

Προῖτος Πανίσκου καὶ Κόνων Δώρου καὶ οἱ μέτοχοι - WO 702

Προῖτος Πανίσκου καὶ Κόνων Δώρου καὶ οἱ μέτοχοι - WO 1341

Group Seven: Receipts for Payments ἐξ Ἀντιδιαγραφῆς

BGU 1446

O. Bod. 179

BGU 1447

WO 742

O. Bod. 167

WO 1509

O. Bod. 177

WO 1533

Formula

Ἔτους xx Month xx. Με(μέτρηκεν) εἰς τὸν ἐν Διὸς πό(λι) τῆ με(γάλη) θη(σαυρόν)
 xx (ἔτους) ἐξ ἀντιδιαγραφ(αφῆς) Name of Taxpayer Kind and Amount of Payment
 in Words / in Figures. Signature. Countersignature με(μέτρημα) Kind and Amount
 of Payment in Words / in Figures.

Signature Groups

I. Signature Ἀμβρόων; No Countersignature.

WO 1509⁴¹

II. Signature Πτολεμαῖος σιτολόγος; No Countersignature.

BGU 1447⁴²O. Bod. 167⁴³

O. Bod. 177

III. Signature Ἡρακλείδης; Countersignatures Ἡρακλείδης and Πτολεμαῖος.

BGU 1446

O. Bod. 179

41. Assigned by Wilcken to the reign of Euergetes. After the example of Tait, I have assigned all receipts signed by Ambryon to the reign of Philometor.

42. BGU reading of taxpayer's name to be corrected from Ἡράκλει(τοῦ) to Ἡρακλεί(δης).

43. The date and formula suggest that the lost signature was Ptolemy's.

IV. Signature Omitted; No Countersignature.

WO 742

WO 1533

Amount of Payment

Artabs of Wheat: Current Tax.

5/6 - WO 742

2 1/2 - BGU 1447

4 1/6 - WO 742

5 - BGU 1447

6 7/12 - BGU 1446

15 - O. Bod. 177

15 1/12 - O. Bod. 179

34 1/6 - WO 1509

Artabs of Wheat: Late Tax.

2 - WO 1533

Amount of Payment Lost:

O. Bod. 167

Central Tendencies

Wheat for Current Taxes: Mean size of payment 10.42 artabs; median size of payment 5 19/24 artabs.

Season of Payment

Wheat for the tax of the current year:

c. 8 June 139; BGU 1447

21 June 136; BGU 1446

26 June 132; O. Bod. 179

21 July 135; WO 742

20 August 135; WO 742

20 August 134; O. Bod. 177

31 August 154; WO 1509

Wheat for the tax of a previous year:

13 August 117; WO 1533

24 November 139; O. Bod. 167

Date of payment lost:

BGU 1447 (first payment)

Taxpayers

Greek Names:

Διονύσιος Χαϊρήμονος - WO 1533

Ἐρμόφιλος Πτολεμαίου - WO 1509

Ἐρμόφιλος Ἡρακλείδου δεσ καὶ Θοτιμη()

καὶ Ἡράκλειος - O. Bod. 179

Ἡρακλεί(δης) Ἐρμοκλ(έους) - BGU 1447

Ἡρακλειδης Ἐρμοκλέους - WO 742

Θέων Δωρίωνος - O. Bod. 177

Names Lost:

BGU 1446
O. Bod. 167

Group Eight: Payments of ἱερὸς πυρὸς and ἱερὰ κριθή

O. Bod. 166	O. Bod. 176	O. Strassb. 316
O. Bod. 167	O. Bod. 180	O. Strassb. 318
O. Bod. 168	O. Bod. 190	O. Strassb. 320
O. Bod. 170		WO 740
O. Bod. 171	O. Cam. 11	WO 746
O. Bod. 173		WO 747
O. Bod. 174	BGU 1428	WO 1341
O. Bod. 175		WO 1521

Formula

(in superscript to receipt
recording another payment)

ἱεροῦ (πυροῦ) xx (ἀρτάβης)

or

ἱερᾶς (κριθῆς) xx (ἀρτάβης)

Signature Groups

I. Signature Ποῶρις; No Countersignature.

O. Bod. 170
O. Bod. 171

II. Signature in Form of Countersignature: Ἐρμων.

O. Bod. 175
O. Cam. 11
O. Bod. 176

III. Signature Omitted; Countersignature Διοκλῆς.

O. Bod. 166

IV. Signature Πτολεμαῖος σιτολόγος; No Countersignature.

O. Bod. 167

V. Signature Ἡρακλείδης.

a. Countersignatures Ἡρακλείδης and Ἀπολλώνιος.

O. Bod. 168
O. Bod. 173
WO 747

- b. No Countersignature.
WO 740
- c. Countersignature Ἡρακλείδης.
O. Bod. 180
WO 746
- VI. Signature Ἀπολλώνιος; No Countersignature.
WO 1521
- VII. Signature Ἀμενῶ(θης).
O. Strassb. 316
O. Strassb. 318
- VIII. Signature Omitted; No Countersignature.
O. Bod. 174
O. Bod. 190
O. Strassb. 320
BGU 1428
WO 1341

Amount of Payment

Artabs of Wheat: In Receipt		In Superscript
Lost	O. Bod. 167	1/12
8	O. Bod. 166	1/12
8	O. Strassb. 318	Lost
11 1/4	BGU 1428	Lost
Lost	O. Bod. 174	1/6
11 2/3	O. Bod. 173	1/6
12 2/3	O. Bod. 176	1/6
15 1/2	WO 746	1/6
16 1/6	O. Cam. 11	1/6
17	O. Strassb. 320	Lost
21	O. Strassb. 316	1/6
22	WO 1521	1/4
26 19/24	O. Bod. 175	(η'κδ')
31 3/4	O. Bod. 168	1/3
40	O. Bod. 190	1/2
50	WO 1341	1/2
72 1/4	O. Bod. 180	(εγ'ιβ')
Artabs of Barley:		
5 11/12	O. Bod. 170	1/12
20 5/6	WO 747	2/3
28 1/6	WO 740	(δβ')
Artabs of Croton:		
23	O. Bod. 171	1/4

Central Tendencies

Payments of Wheat: Mean size .23 artab; median size 1/6 artab.

Season of Payment

Wheat for the tax of the current year:

- 8 April 108; *O. Strassb.* 320
- 20 April 129; *O. Strassb.* 316
- 23 April 113; *WO* 1341
- 17 May 130; *WO* 1521
- 20 May 128; *O. Strassb.* 318
- 20 May - 18 June 120; *BGU* 1428
- 4 June 134; *O. Bod.* 174
- 5 June 115; *O. Bod.* 190
- 8 June 145; *O. Bod.* 175
- 15 June 145; *O. Cam.* 11
- 18 June 140; *O. Bod.* 168
- 18 June 136; *O. Bod.* 173
- 26 June 132; *O. Bod.* 180
- 16 July 145; *O. Bod.* 176
- 11 August 132; *WO* 746
- 16 August 142; *O. Bod.* 166

Wheat for the tax of a previous year:

- 24 November 139; *O. Bod.* 167

Barley for the tax of the current year:

- 1 April 135; *WO* 740
- 8 May 135; *WO* 740
- 13 May 131; *WO* 747
- 11 June 135; *WO* 740
- 16 July 148; *O. Bod.* 170

Croton for the tax of a previous year:

- 26 November 147; *O. Bod.* 171

Taxpayers

Greek Names:

- Ἀγαθοκλῆς Διονυσίου - *O. Bod.* 190
- Ἀμμώνιος Ἑρμίου - *O. Bod.* 168
- Ἀμμώνιος Ἑρμοφίλου - *WO* 1521
- Ἀσκληπιάδης - *BGU* 1428
- Δίφιλος Ἀλεξάνδρου - *O. Bod.* 180
- Δίφιλος Ἀλεξάνδρου - *O. Bod.* 171
- Δίφιλος Ἀλεξάνδρου - *O. Bod.* 174
- Δίφιλος Ἀλεξάνδρου - *O. Bod.* 176

- Ἡρακλείδης Ἐρμοκλέους - *WO* 740
 Ἡρακλείδης Ἐρμοκλέους - *WO* 746
 Ἡρακλείδης Ἐρμοκλέους - *WO* 747
 Προῖτος Πανίσκου καὶ Κόνων καὶ οἱ μέτοχοι - *WO* 1341
 Στράτων Μηνοδώρου - *O. Strassb.* 316
 Στράτων Μηνοδώρου - *O. Strassb.* 320
 Σῶσος Ἀλεξάνδρου - *O. Bod.* 175
 Σῶσος Ἀλεξάνδρου - *O. Bod.* 170

Egyptian Names:

- Ψενθώτου - *O. Bod.* 166
 Περμῆμις Ψεγγώνσιος - *O. Strassb.* 318
 Ψενα... - *O. Cam.* 11

Mixed Names:

- Πεταροῆ(ρις) καὶ Ἡρακλῆς - *O. Bod.* 173

Names Lost:

- O. Bod.* 167

Payments of *ἱερός πυρός* and *ἱερά κριθή* do not form an independent group in the same sense as payments described by other tax phrases. These payments are not recorded on separate and independent receipts as are those in other groups; rather, they are recorded in superscripts to receipts in which the main body records payments of some other sort. In a sense, then, my listing documents and signature groups under this Group Eight is redundant – all the documents here recorded have been recorded already under the group to which their tax-phrases, as written in the lower text, suit them.

All the same, the occurrence of the *ἱερός* superscript makes it necessary to study these documents together; convenience suggested their inclusion in this section as an eighth main receipt-group. Their nonindependence, on the other hand, and the fact that the amounts recorded in the superscripts are so strikingly different from those recorded in the receipts of the other groups make it necessary to discuss these payments of *ἱερός πυρός* and *ἱερά κριθή* separately, rather than discussing them, along with the documents recording payments of other kinds, in the next part of this study.

The superscript *ἱεροῦ* (or *ἱερός*) does not appear on any Diospolis Magna receipt dated earlier than 148 B.C. Considering the large number of published receipts that are dated to the sixties and fifties of the second century, it seems certain that the failure of the superscript to appear at an earlier date is significant. Either the superscript represents an impost that was never paid before the forties, or, if it was paid earlier, it was not paid to the royal granary (if the word *ἱερός* indicates, for instance, that the grain was to be assigned to the temples, it may originally have been taken to those temples directly by the taxpayer), or, if it was paid at the granary, it was not recorded by receipt.

The *ἱερός* superscript appears on about 20 per cent (21 out of 108) of the Diospolis Magna receipts here studied. All the tax-groups but Four, Five, and Seven include receipts on which the superscript appears; as the total numbers of receipts assigned to those three groups are eight, seven, and eight, respective-

ly, the absence of the ἰσὸς superscript among them may well be due to chance.

The size of the payment recorded in a ἰσὸς superscript is very much smaller than that of the payment recorded in the main text of receipts of all other groups. ἰσὸς payments are always expressed in terms of fractions; these fractions range from $1/12$ to $1/2$; the mean amount recorded in these fractions is $1/6$; that is also the median, and the fraction most often recorded.

There is a clear correlation between the amount of payment recorded in the lower text of any receipt and the size of the fraction written in the ἰσὸς superscript. Wilcken was the first to assess this relationship; as he expressed it (*WO* I, p. 223), the superscript payment represents, "im Durchschnitt, nach oben oder unten abgerundet," one percent of the amount recorded in the lower text. Wilcken's was a fair assessment; with the help of more recently-published receipts, we can see from the figures the outlines of a proportional scale that must have been used at the Diospolis Magna granary in assessing the ἰσὸς payments. Thus, when the size of the lower-text payment is eight artabs, the superscript reads $1/12$. When the size of the lower-text payment is $11 \frac{2}{3}$ to 21 artabs, the superscript reads $1/6$. The fraction $1/4$ is attached to a lower-text payment of 22 artabs; $1/3$ to a lower-text payment of $31 \frac{3}{4}$ artabs; $1/2$ to 40 or 50 artabs.

Among payments in wheat, published texts only twice seem to break this continuum of relative amounts of lower-text and superscript payments: Once in the case of *O. Bod.* 175, whose main text records a payment of $26 \frac{19}{24}$ artabs, while the superscript fraction is read as $\eta' \kappa' \delta'$; once in the case of *O. Bod.* 180, where the main text records a payment of $72 \frac{1}{4}$ artabs, while the superscript is read as $\epsilon \gamma' \iota \beta'$.

In other cases where Tait's readings seem to challenge some notions of Wilcken, it seems to be because Tait has some other notion in mind — some revision of accepted opinions supported by earlier editors. In this case I, at least, am unable to discern the sense of Tait's out-of-the-way readings of the superscript fractions in *O. Bod.* 175 and *O. Bod.* 180. I cannot accept, in the first place, the fraction $\eta' \kappa' \delta'$ as read in *O. Bod.* 175; $1/8$ and $1/24$ add up, after all, to $1/6$, and the Ptolemaic scribes write the fraction $1/6$ as ζ' . I would prefer that the reading of this superscript be altered to $\delta' \kappa' \delta'$ — $1/4$ and $1/24$, or $7/24$. In that case, the superscript fraction would fit nicely into the series formed by amounts read on other receipts, between $1/4$, as recorded over the next smaller lower-text payment, and $1/3$, recorded over the next-larger.

And while $72 \frac{1}{4}$ artabs is a large main-text payment, it is not sufficiently larger than 50 artabs to justify an increase in the amount recorded in the superscript from $1/2$ artab to $5 \frac{5}{12}$ artabs. Perhaps the superscript in *O. Bod.* 180 should read $\epsilon \iota \beta'$, or $7/12$ — or, less likely, $\epsilon \gamma' \iota \beta'$, $11/12$.

The number of ἰσὸς payments recorded in grains other than wheat is too small to give any sure indication of how the series of fractions corresponded to that of lower-text payments. If the correlation is the same as in the case of wheat, as I suspect, we should read, on *WO* 747, ζ' ($1/6$) in place of B' ($2/3$); on *WO* 740, $\delta' \kappa' \delta'$ ($7/24$) in place of $\delta B'$ ($4 \frac{2}{3}$). Whether Wilcken was aware that these readings were not in agreement with his own belief that superscript payments amount to some one percent of lower-text payments I do not know; he nowhere states that the proportions he suggests hold true for payments of no other grain than wheat.

Within the various tax-phrase groups, the superscript payment is recorded only on receipts whose lower texts record comparatively large payments for other taxes. The least amount recorded in the lower text of a receipt that bears the *ἰσρός* superscript is eight artabs, and the majority of payments in most of the tax-phrase groups is below eight artabs. A medians test shows a high degree of difference between the number of superscripted receipts recording below-the-median lower-text payments and those recording above-the-median lower-text payments (see Table 9).

Still, while it is true that the *ἰσρός* superscript appears above no payment that is less than eight artabs in size, it is equally true that not all receipts for payments of more than eight artabs bear the superscript. As one can see from the chi-square test referred to above, the number of above-the-median payments bearing no such superscript is nearly equal that of those that do.

Thus, while we may say that the *ἰσρός* superscript appears only in conjunction with relatively large payments for other taxes, we are still left with the problem of why the superscript appears on some receipts for large tax payments, while it is omitted on others.

Wilcken remarks (WO I, p. 223) that the receipts bearing the *ἰσρός* superscript ". . . sind durchaus den anderen Grundsteuerquittungen conform, sodass sich gar kein Grund finden liesse, weshalb gerade hier und nicht auch in den anderen Fällen das Procent berechnet worden sei." With the additional evidence of receipts published during the course of this century, the situation remains unchanged. Receipts that bear the *ἰσρός* superscript are not distinguished by their season of payment, for they occur during the months normal for payments of other sorts (see below, pp. 59-60). The nationality of the taxpayers' names is not a distinguishing factor, for the different nationalities are represented among receipts bearing the *ἰσρός* superscript in proportions comparable to those in which they occur in other tax-phrase groups (see below, pp. 64-65). Nor is the status or personality of the taxpayer at issue, for published collections of receipts include, in several cases, different receipts — some with, some without the superscript — issued to the same taxpayer.⁴⁴

It is no wonder that Wilcken, after the remark quoted above, felt compelled to conclude that the *ἰσρός* payment must have been exacted in connection with every payment of grain for taxes, and that it was only sometimes recorded on receipts. I cannot accept a theory that attributes such caprice, in the point of one detail, to men who wrote, in other respects, such rigidly formulaic receipts. I cannot, on the other hand, offer any better theory to replace Wilcken's. I can only suggest that the *ἰσρός* superscript records a payment assessed on grounds that cannot be determined from the evidence of the receipts themselves.

44. Group Six, for example, consists of two receipts both issued to the company that went by the name of Προϊτος Πανίσκου; of the two, WO 1341 (lower text payment 50 artabs) includes the *ἰσρός*-superscript payment; WO 702 (lower text payment 121 5/6 artabs) has none. Στράτων Μηνοδώρου, Δίφιλος Ἀλεξάνδρου, Ἀμμώνιος Ἐρμοφίλου, and Ἡρακλείδης Ἐρμοκλέους are four other taxpayers whose names appear on Diospolis receipts both with and without the superscript.

PART II
DISCUSSION

THE
UNION

SECTION ONE: GRANARY OFFICIALS

The Ptolemaic granary, as it is commonly described,¹ acted as a sort of state bank in grain. Its officials were, first and foremost, agents of the state treasury, responsible for receiving grain paid to the state for taxes, and for issuing payments of grain at the direction of the government. They were also able to act as bankers in grain for private citizens.

The Diospolis Magna granary receipts furnish a detailed record of one of the primary functions of the Ptolemaic granary—that of receiving payments for taxes in grain. They furnish, too, the names of granary officials who were responsible for writing and for countersigning receipts for such payments. Tables of signatures and countersignatures from Diospolis Magna granary receipts will be found at the end of this Section, pp. 47-51.

A cursory glance at the lists of names in both tables will reveal that most writers and countersigners of Diospolis Magna granary receipts used Greek names. Some few names, though, in both categories are Egyptian—and, of course, a Greek name, in second-century Egypt, was no assurance as to the national origin of the man who used it (see my remarks on taxpayers' names below, p. 64). The names of the granary officials who wrote and countersigned Diospolis Magna receipts seem to support the accepted opinion that granary officials in Ptolemaic Egypt might be either of Egyptian or of foreign extraction.²

To judge from the evidence of the receipts themselves, the relationship between writers and countersigners of receipts in the Diospolis Magna granary changed, to some extent, during the course of the second century. The situation between these two sorts of officials is quite clearly indicated in the earlier receipts—those issued between 164 and 153 B.C. In those years, there was at all times just one person whose duty it was to write and sign receipts for payments of grain to the state; Philotas in 164; Asclepiades in 163; Panas from 162 to January 29, 157; Ambryon from March 6, 157 to 153. No receipt from this period omits the signature of the receipt-writer, and it seems that in the absence

1. As, for example, in Rostovtzeff's *Social and Economic History of the Hellenistic World*, pp. 1286-7; see also Bouché-Leclercq, *Histoire des Lagides*, Vol. 3, p. 373; A. Calderini, 'Θήσαυροι', *Studi della Scuola Papirologica di Milano*, Vol. IV, part 3; Preisigke, *Girwesen in griechischen Aegypten*.

2. See W. Petemans, *Vreemdelingen en Egyptenaren in vroeg-ptolemaisch Egypte*, p. 370.

of the one man entitled to write them, receipts could not, at that period, be issued.

There were also, at all times, one or more persons whose duty it was to countersign receipts for payments of this sort. We have receipts countersigned by Ammonius in 164, Petiesis in 164 and 163, Paniscus in 160, Apollonius between 159 and 153, Ptolemy in 157 and 156, Meneus in 156, and Hermocrates from 156 to 151. Whether there was a constant number of persons entitled to countersign receipts at any one time cannot be determined, but the discrepancy in the span of time they seem to have held office suggests that countersignators were appointed singly rather than as a group, and that one might continue in office after his fellows had resigned.

When two or more officials possessed the right to countersign receipts, countersignature might be made by one or by several. So in the years 157 and 156 we have receipts countersigned by Apollonius only, by Ptolemy only, by Apollonius and Ptolemy, and by Apollonius, Ptolemy, and Meneus. Countersignature is sometimes omitted during this early period, indicating that, in the absence of officials who ordinarily countersigned receipts, valid receipts might be issued on the sole authority of the receipt-writer.

It is clear that in the years 164 to 153 the separate offices of receipt-writer and countersigner were by no means coterminal. Thus Panas continued to write receipts after the countersigner Paniscus had yielded place to Apollonius and Ptolemy; Apollonius and Ptolemy continued to countersign receipts after Panas had been replaced by Ambryon.

Receipts from the forties of the second century are rather few and insecurely dated (see above, p. 26). Signatures which I have assigned to this period are Pooris (148 and 147), Hermon (145), and Asclepiades (143). Countersignators include Asclepiades and Antipater (144), and Diocles (142). This period offers the curious phenomenon of countersignature appended to unsigned receipts: *O. Strassb.* 314, *O. Bod.* 166, and *O. Bod.* 164 are receipts from the forties of the second century on which editors read, in a hand distinct from that of the body of the receipt, a countersignature similar in form to those of the earlier period. Even more curious, perhaps, are *O. Bod.* 165, 175, and 176, and *O. Cam.* 11, where a subscript similar in form to countersignatures of the earlier period seems to have been written in the same hand as the body of the receipt.

The texts of these receipts are brief, of course, and often damaged as well. The editor of the four last-mentioned receipts may have been unable to distinguish between two separate but similar hands used in the body and in the countersignature of the same receipt. If that is the case, then in the forties of the second century it became common practice for the writer of receipts to omit his name and for countersigners to append theirs directly to the body of the receipt. If, on the other hand, Tait is correct in indicating that receipt and countersignature were made in the same hand on four of his receipts, there seems in this period to have been a certain breakdown in the distinction between writer and countersigner of receipts. In either case, the Asclepiades listed below as Signature 7 is probably the same person as the Asclepiades listed as Countersignature 11 in the preceding year—a further indication that the distinction between writer and countersigner was breaking down.

Documents from the thirties of the second century are commoner again, and the information they supply correspondingly clearer. Only two signatures appear on receipts dated between 140 and 131: Those of Ptolemy the sitologus (in 139, 134, and 131) and Heraclides (in 140, 136, 135, 132, 131). As the two persons seem to have held office during the same years, and as Heraclides' signature appears so much oftener than that of Ptolemy the sitologus, it may be reasonable to assume that Heraclides was the person ordinarily responsible for issuing receipts in the thirties, and that Ptolemy the sitologus did so only in Heraclides' absence, or in other extraordinary situations.

Several persons countersigned receipts in the thirties: Heraclides (who is surely not the same Heraclides who signed receipts during the same period, since he countersigns the writer Heraclides' receipts) between 140 and 131; Apollonius between 150 and 131; Ptolemy between 136 and 132. An Apollonius and a Ptolemy countersigning receipts in the thirties, might seem to be the same Apollonius and Ptolemy who did so in the fifties, but the countersignatures of the earlier set occur in regnal years 22 and 23, too early to be assigned to Euergetes' reign, while receipts countersigned by the second set are dated in regnal years 37, 38, and 39, too late to be assigned to Philometor's reign. Furthermore, the countersignatures of the later set exhibit peculiarities unknown at the earlier period—abbreviation of names, and other characteristics noted below, p. 53. It is not, of course, impossible that the selfsame men may have been at the granary for a period of thirty years—but the absence of the countersignatures Apollonius and Ptolemy in the forties makes it unlikely.

Receipts from the period 130-119 exhibit a variety of signatures overlapping in date and suspiciously similar in appearance. Accepting the present readings of documents, it appears that Amenotnes and Ammonius signed receipts between 129 and 125; Antigenes between 123 and 119; Pau() in 121; Herm() Ar() in 119; and Apollonius from 130 to 121. Only one countersignature appears after the year 130, and that is Antigenes'. Antigenes of Signature 13 is probably the same man as Antigenes of Countersignature 18 in the same year, and it appears that granary officialdom in the twenties made no distinction at all between the offices of writer and countersigner of receipts, but consisted rather of a body of officials all empowered to issue receipts without countersignature. Apollonius of Signature 12, who signed receipts between 130 and 121, may be the same man as Apollonius of Countersignatures 14 and 15, who countersigned receipts between 140 and 131, if we understand that a man earlier accustomed to countersigning receipts was required, under the later organization, to write them himself.

After 119, omission of signature, which had been increasingly common in the preceding periods, became regular, indicating a further step in the breakdown of earlier granary observances. In the years 97 to 89, receipts appear with the signature of Antiochus, but if these represent an attempt to revive earlier granary practices, that attempt was only temporarily successful. After 89, we have almost no receipts at all, and unless we assume that historical events (a new location for the city dump, perhaps) have removed later receipts from our reach, it appears that the traditional formula of the Diospolis Magna granary

receipt was altogether abandoned, the distinctive words of the place-of-payment phrase discarded, and remaining receipts doomed to the "provenance-unknown" sections of modern collections.

Modern scholars' descriptions of the functions of the various granary officials generally indicate a supposition that it was the σιτολόγος of the Ptolemaic granary who was responsible for writing receipts for payments of grain for taxes, and the ἀντιγραφεύς who was responsible for countersigning them.³ Any such supposition assumes a kind of bureaucratic stability that did not, so far as the Diospolis Magna granary receipts indicate, in fact exist. The receipts give us no reason to suppose that there was any great change, during the second century, in the numbers or titles of Diospolis Magna granary officials. But they give us no reason to suppose, either, that the title of the official who wrote and signed receipts, for example, in the sixties of the second century was necessarily the same as that of the official who wrote and signed them in the twenties.

The notion that the σιτολόγος issued, and the ἀντιγραφεύς countersigned, receipts is, on *a priori* grounds, convincing. What better official, after all, to whom to attribute countersignatures than an ἀντιγραφεύς? And the addition of the receipt-writer Ptolemy's title, σιτολόγος, to his signature adds some weight to the notion that the σιτολόγος was commonly responsible for writing and signing granary receipts.

I have sometimes thought, though, that if the σιτολόγος was ordinarily the man to sign receipts, Ptolemy's habit of writing his title into his signature was indicative of an extraordinarily time-consuming form of self-importance. Perhaps he used his title in order to distinguish himself from the Ptolemy (Countersignatures 15 and 17) who countersigned receipts during the same period. But the countersignature Ptolemy never appears below the signature Ptolemy the sitologus, even though both officials were at the granary during the same period. What if Ptolemy the sitologus is in fact the Ptolemy who commonly countersigns receipts? In that case, he might be expected to add his title when he was performing a task—in this case the writing of receipts—not ordinarily assigned to a man of his position. Such an interpretation would make it appear that the σιτολόγος was responsible, not for writing, but rather for countersigning receipts.

The best way of establishing the titles of the writers and countersigners of granary receipts would be to find them referred to by name and by title in some other of the second-century Theban documents. The only possible identifications of this sort that I have been able to locate offer contradictory indications.

If the Apollonius who wrote Diospolis Magna granary receipts in the years from 130 to 121 (Signature 12) can be identified with Apollonius the ἀντιγραφεύς (Number 1760 in the *Prosopographia Ptolemaica*), who held office in 121 (see *UPZ* 168.2; 169.2), then we may suppose that the ἀντιγραφεύς was commonly responsible for issuing and signing receipts. If, on the other hand, the Ptolemy

3. So Bouché-Leclercq, *op. cit.*, p. 374; see also Calderini, *op. cit.*, pp. 53-54; Wilcken, *Grundzüge*, p. 181.

who commonly countersigns receipts in 157 and 156 (Countersignature 8) can be identified with Peremans and Van 't Dack's ἀντιγραφεύς (*Prosopographia Ptolemaica* number 1807) who held office in the year 155 (see *UPZ* 164.3), then we must suppose that the ἀντιγραφεύς commonly countersigned receipts. Without patronymics, which are of course omitted in both signatures and countersignatures of receipts, we cannot tell whether either, both, or neither of these identifications is correct.

Signatures, Dates of Documents, Tax-phrase Groups

	1	2	3	4	5	6	7
1. Φιλώτας			164 164 164 164				
2. Ασκληπιάδης		163					
3. Πανᾶς		161 160 160 160 160 159 158 158 157 157	162				
4. Ἀμβρύων		157 157 157 156 156 155 154 154 153 153 153 ???		157 157 157 154 154 153			154
5. Ποῶρις							
			148 147				
6. (In countersignature form) Ἐρμῶν			145 145 145				

	1	2	3	4	5	6	7
7. (In countersignature form) Ἀσκληπιάδης	143						
8. Πτολεμαῖος Σιτολόγος	139 131 139	139 139 139					139 139 134
9. Ἡρακλείδης	140 136 135 135 135 132 132 132 131 131 ???	136					136 132
10. Ἀμινώ(θης)	129	128 128 126					
11. Ἀμμό(νιος)		126 125					
12. Ἀπολλώνιος		130 128 126 123 122 122 121					
13. Ἀντιγένης						123 122 122 119	
14. Ἐρμὸ ἌρϜ		119					
15. ΠανϜ						121	

	1	2	3	4	5	6	7
16. Αντίοχος	97						
	97						
	92						
	89						
17. No Signature	151	142	134	144	113	113	135
	120	128	134		113	113	117
	118	120					
	114	115					
	88	108					

Countersignatures, Dates, Tax-phrase Groups

1. Petiesis and Αμμώνιος		164	
		164	
		164	
		???	
2. Petiesis, Patous, and Αμμώνιος		164	
3. Petiesis only		163	
4. Πανίσκος only		160	
		160	
		160	
		160	
5. Απολλώνιος, Πτολεμαῖος, and Μενεύς	156		
6. Απολλώνιος and Ἐρμοκράτης	154		154
	153		
	153		
7. Απολλώνιος only	153	159	154
	???	158	
		158	
		157	
8. Πτολεμαῖος only		157	157
		157	

	1	2	3	4	5	6	7
9. Ἀπολλώνιος and Πτολεμαῖος		157 157 156		157			
10. Ἑρμοκράτης only	151			153			
11. Ἀσκληπιάδης and Ἀντίπατρος				144			
12. Διοκλῆς only		142					
13. Ἡρακλείδης and Ἀπολλώνιος		140 136 131					
14. Ἡρακλείδης and Πτολεμαῖος						136 132	
15. Ἀπολλώνιος only		135					
16. Πτολεμαῖος only		132					
17. Ἡρακλείδης only		132 132 131 131 ???	139 139 139				
18. Ἀντιγένης only		123					
19. No Countersignature	156 155 154 143 129 120 118 114 97 97 92	161 139 135 135 130 128 128 128 128 126 126	148 147 145 145 145 136 134 134	157 157 122 121 119 113 113	123 122 122 121 119 113 113	113 113 139 135 134 117	154 139 139 135 134 117

	1	2	3	4	5	6	7
89							126
88							125
							122
							122
							121
							120
							119
							115
							108

SECTION TWO: FORMULA

The text of the receipts discussed in this study may be divided into eight basic formulaic elements: Date of receipt, place-of-payment phrase, tax-phrase, tax-year, kind and amount of payment, signature, countersignature, and miscellaneous additions.⁴ Not every element appears in each receipt. The tax-phrase, for instance, is omitted in a great many receipts that have for that reason been examined together in the first Part of this study as Group One. Signatures are sometimes, countersignatures often omitted; and miscellaneous additions only rarely appear. But the elements enumerated, where they do appear, are subject to only the slightest variation during the century spanned by the Diospolis Magna granary receipts. The following discussion is meant to suggest to what extent these variations may be described as chronological developments, and to what extent they are the result of chance deviation and the idiosyncracies of the various writers.

1. Date of Receipt: Commonly *ἔτους* xx (Month) xx. All the receipts dated earlier than 143 use this form, except for those written by Panas, where the year-sign *λ* is substituted for the word *ἔτους* roughly half the time. Roughly half the receipts written after 143 use the sign *λ*; the various writers, excepting Apollonius and Antiochus, who seem to have used *λ* exclusively, are inconsistent in their usage. Only one writer, Ptolemy the sitologus, is found to have written the date of receipt—including the numbers of regnal years and month-days—entirely in words, and that he does in roughly half his receipts.

2. Place-of-Payment Phrase: Commonly *με(μέτρηκεν) εἰς τὸν ἐν Διὸς πό(λι) τῆ με(γάλη) θη(σαυρόν)*. *Εἰς με(μέτρηκεν)* is used twice at an early date (by Panas and Asclepiades), and once at a rather late date (by Antiochus). *Τ(ὸν)* (written by Amenothes), *Δ(ιὸς)* (by Heraclides), *Δ(ιὸς)* (by Apollonius), and

4. I have omitted from this catalogue of formulaic elements the superscript that records payment of *ἑρόσ πυρός* and *ἑρό κριθή*; that superscript has been discussed above, pp. 38-40.

Δι(ὸς πόλις) (by Antiochus) are abbreviations that occur only once. πόλις is occasionally written out by Philotas, Panas, Ambryon, Ptolemy the sitologus, and Antiochus; πόλις appears sometimes in Ptolemy the sitologus', Heraclides', Apollonius'; regularly in Pooris', Antigene's, Herm() Ar()'s, and Pau()'s receipts.

Τῆ μεγάλη is once omitted by Philotas; appears as τ(ῆ) μ(ε)γ(άλ)η once over Ambryon's signature. μεγάλη is sometimes written out by Philotas, Panas, Ambryon, and Ptolemy the sitologus; sometimes appears as μεγ(άλ)η on Ambryon's, Asclepiades' (Signature 7), Ptolemy the sitologus', and Heraclides' receipts. μ(εγ)άλ)η appears occasionally on receipts from 121 to 110. θησαυρόν is sometimes written out by Antiochus and Ambryon; appears as θησ(αυρόν) on all Philotas' receipts.

The place-of-payment phrase is the element by which Diospolis Magna granary receipts of the second century are identified; it is perhaps the element least subject to change in the texts of these receipts. There are indications of a trend towards increasing abbreviation—πόλις and μεγάλη are seldom written out after 139, and μ(εγ)άλ)η is common after 120. Other variations are few and infrequent.

3. Tax-phrase: Omitted on receipts of Group One. In Groups Two and Three ὑπέρ τοῦ τό(που) is commonly thus written. Philotas once omits ὑπέρ, once (on a Group Three receipt) omits ὑπέρ τοῦ τόπου. τόπου is written out sometimes by Ambryon, Panas, and Hermon; sometimes appears as τόπ(ου) on Hermon's, Ptolemy the sitologus', Heraclides', Amenothes', Ammonius', Apollonius', and Herm() Ar()'s receipts. ὑπέρ τ(οῦ) τό(που) appears once over Ptolemy the sitologus', ὑπέρ τ(οῦ) τόπ(ου) once over Apollonius' signature.

On receipts of Group Three, εἰς τὴν ἐπιγρ(αφήν) is commonly thus written. ὑπέρ τοῦ τόπου is omitted in one Group Three receipt signed by Philotas. On most Group Three receipts, εἰς τὴν ἐπιγρ(αφήν) precedes ὑπέρ τοῦ τό(που); only Panas writes ὑπέρ τοῦ τό(που) first. The abbreviation ἐπιγρ(αφήν) is used by Pooris, Ptolemy the sitologus, and—only once—by Heraclides.

Ἐξ ἀντιδιαγρ(αφῆς) is commonly thus written; Ptolemy the sitologus sometimes uses ἀντιδιαγρα(φῆς).

The designation of geographical sites for which payment is made in Group Four receipts varies, and the reading of the fraction-of-an-artab tax-phrase in Group Five is very much in doubt (see above, pp. 30-32; below, p. 69).

4. Tax-year: Often written τοῦ xx λ. The tax-year follows the tax-phrase except in receipts of Group Three, where it is written between the two elements of the tax-phrase: εἰς τὴν ἐπιγρ(αφήν) τοῦ xx λ ὑπέρ τοῦ τό(που). εἰς τὸ xx λ is used occasionally by Asclepiades (Signature 2), Panas, Ptolemy the sitologus, Heraclides, and Antiochus; xx λ is used often by Heraclides, always by Panas, Ambryon, Asclepiades (Signature 7), Amenothes, Ammonius, Apollonius, Antigene's, and Herm() Ar().

5. Kind and Amount: Commonly written once in words and once in figures. However, abbreviation of kind (by the mark $\frac{1}{2}$ to indicate artabs of wheat, by $\kappa\rho$ to indicate artabs of barley) even in the first writing is common on receipts of all signatures; sometimes the amount is simply written twice in figures.

6. Signature: Commonly the name(s) only. Hermon and Asclepiades (Signature 7) use a countersignature form: Name followed by a repetition of the amount of payment. Writers of receipts dated between 140 and 120 are inclined to abbreviate their names: Ptolemy the sitologus' name appears Πτο σιτο, Πτο σιτολ, and Πτο σιτολογ with comparable frequency; Heraclides appears as Ἡρακ or Ἡρα; Ἀμενώ(θης) and Ἀμμώ(νιος) abbreviate their names as indicated; Apollonius writes either Ἀπολ or Ἀπολλω; Ἀντι(γένης) and Παυ() abbreviate their names as indicated. Ἐρυ Ἀρ must be some sort of abbreviation.

Omission of signature occurs with increasing frequency in the course of the century spanned by the dates of the Diospolis Magna granary receipts: Never before 151, rarely between 151 and 120; then regularly until the brief appearance of Antiochus, 97 B.C.

Signature would appear to be one element particularly subject to the phenomenon of increasing abbreviation, which is only barely noticeable in most other formulaic elements. In general we observe that from 164 to 143 signatures are neither abbreviated nor omitted; from 143 to 120 they are often abbreviated, occasionally omitted; from after 120, they are regularly omitted.

7. Countersignature: Commonly written (Name) με(μέτρησαι) (Kind and Amount in Words / in Figures). As with signatures, the abbreviation of name occurs particularly between 140 and 120: Ἐρμοκρά(της) (Countersignature 13) as indicated; Heraclides either Ἡρακ or Ἡρακλ; Πτο(λεμαῖος) signs once as indicated; Ἀντι(γένης) always as indicated.

με(μέτρησαι) is sometimes omitted in the later countersignatures. Abbreviation of kind in the first writing of amount is common in all periods. Kind in the first writing of amount is sometimes altogether omitted. Sometimes kind and amount are written twice in figures, or even once, particularly on receipts dated 140 to 120.

Omission of countersignature occurs even in the earlier receipts; it becomes common in receipts of the forties, and regular after 130.

Although countersignature, like signature, is an element subject to increasing abbreviation in all its parts, countersigners occasionally add uncommon elements to their texts: The tax-year is sometimes included in the countersignatures of Asclepiades, Heraclides, Apollonius (Countersignature 15), and Ptolemy (Countersignature 16). The date of receipt is recorded once by Heraclides, twice each by Ptolemy (Countersignature 16) and Apollonius (Countersignature 15). The tax-phrase is sometimes repeated by Asclepiades, Diocles, Heraclides, and Apollonius (Countersignature 15).

8. Miscellaneous Additions: The cautionary τῷ δὲ πρότερον γραφέντι μὴ χρῆση appears on two receipts: *O. Bod.* 160, where it is inserted immediately preceding Panas' signature, and *O. Theb.* 16, written by Apollonius, where it is inserted before kind and amount of payment. In both cases the phrase τοῦ αὐτοῦ (ἔτους) is included; *O. Theb.* 16 includes also the year of payment.

Dated subscripts recording additional payments are commonly written (Month) xx ὁ αὐτός (Kind and Amount in Words / in Figures). *O. Bod.* 183 records the year, and *WO* 726 and *WO* 750 omit the month (which I then understand to be the

same as that in the date of payment in the body of the receipt), and give only the day of payment. Ordinarily the subscript records a later payment, but *O. Bod.* 150 and *O. Bod.* 183 seem to refer in their dated subscripts to earlier payments than those recorded in the main text of the receipts. *O. Bod.* 162 and *WO* 740 contain two dated subscripts apiece. It is not difficult to perceive that having several, or even all, payments for the tax of a single year recorded on a single receipt would be convenient to the taxpayer. It seems that he was able either to return an earlier receipt when making subsequent payments, and have the subsequent payments recorded in subscripts to the earlier receipt, or to request that receipt of an earlier payment be transferred to the margin of a receipt for later payment.

The placement of the dated subscript varies. When signature is omitted, the phrase appears after the body of the receipt (so *O. Bod.* 183, *WO* 726, *WO* 742); if signature is included, the subscript commonly appears after the signature (see *WO* 740, *WO* 750), but may be inserted (see *O. Bod.* 162) before the signature. On *O. Bod.* 150, where both signature and countersignature appear, the subscript is written in the signator's hand following the countersignature; the subscript, which is not re-signed, is followed by a second countersignature.

Undated subscripts which appear recording additional payment are usually written ἄλλας (Kind and Amount in Words / in Figures). *WO* 735 and *WO* 736 read ὁ αὐτὸς ἄλλας; *O. Bod.* 180 and 194 write kind and amount twice in figures; *O. Bod.* 163 includes the tax-year, omits ἄλλας; *WO* 735, after kind and amount of the additional payment written once in words, gives in figures the total of both the main-text and the subscript payments. Considering the care with which date of payment is otherwise recorded, I suppose that undated subscripts may very well record additional payments made on the same date as that of the main text to which they are appended.

Where signature is omitted, the undated subscript appears after the body of the receipt (see *O. Bod.* 194); where signature appears, the phrase may be inserted before the signature (see *O. Bod.* 163); where signature and countersignature appear, the undated subscript may be inserted before countersignature (see *WO* 735 and 736), in which case the countersignature acknowledges both the main-text payment and the payment recorded in subscript. On *O. Bod.* 180 and *WO* 724, the undated subscript follows both signature and countersignature.

Dated subscripts recording additional payments occur at random on receipts between 164 and 122; undated subscripts appear between 155 and 114, but particularly during the thirties of the second century.

SECTION THREE: AMOUNT OF PAYMENT

Any discussion of the amounts recorded for payment of taxes in grain on the Diospolis Magna receipts must begin with the remark that these amounts cannot be considered to represent payments in full for the taxes towards which

they are paid. A number of these receipts—seventeen out of a total of 107⁵—record two or more payments towards a single tax for a single year, and of these seventeen, ten⁶ record separate dates for the several payments. The existence of receipts recording multiple payments indicates that the Ptolemaic taxpayer was able to pay his grain taxes in installments.

Nor was it necessary for installments on the tax of a single year to be recorded on a single receipt. In four separate cases⁷ we possess two published receipts issued to a single taxpayer for amounts paid towards the same tax in the same year.

It might be argued that installment paying was exceptional, and that in general a single receipt recorded a single taxpayer's total payment for one tax in one year. In that case, we should expect the separate amounts recorded for an individual's installments to be noticeably lower than the amount usually recorded for single payments towards that tax; one would likewise expect that the sums of such installments would be roughly equivalent to the amounts of single payments on receipts for the same taxes. These expectations are not supported by a comparison of amounts paid for installments with amounts paid on other, single-payment, receipts. On the contrary, a medians test indicates that the sums of installments paid by single persons for the taxes of single years are significantly higher with respect to their median than single payments paid by single persons (see Table 10).

In short, it seems fairly certain that installment paying was the regular, rather than the exceptional, practice for the payers of royal grain taxes, and it is probably safe to assume that single payments, even by taxpayers to whom no other published receipts were issued in the same year, are ordinarily only installments towards the total amount of one year's tax.

I do not believe that the total grain tax can be estimated from the information given us by the Diospolis Magna receipts. The cases in which we have record of more than one payment by a single taxpayer in a single year are few, and even in these cases we cannot be confident that we have record of all such payments made by that taxpayer for that tax in that year.

It is, of course, possible that amounts of installments were affected by the total tax assessment per annum, or by other considerations connected with the nature and with the collection of the tax. The following discussion is based on the amounts of single payments regarded as installments. Where receipts record several payments by single taxpayers within single years, I shall treat those payments as separate amounts, without computing or considering their sum.

5. *O. Bod.* 149, 150, 162, 163, 169, 180, 194, 200; *O. Theb.* 27; *BGU* 1447; *WO* 724, 726, 735, 736, 740, 742, 750.

6. *O. Bod.* 149, 150, 162, 169, 200; *O. Theb.* 27; *WO* 726, 740, 742, 750.

7. Issued to Ἡρακλίδης Ἐρμοκλέους in 132: *WO* 745 and *WO* 746. Issued to Ἡρακλίδης Ἐρμοκλέους in 131: *WO* 747 and *WO* 748. Issued to Πατισσοῦς Ἀρτιμιβόρου in 164: *O. Bod.* 150 and *O. Bod.* 151. Issued to Προΐτος and Κόνων in 113: *WO* 702 and *WO* 1341.

Payments in three crops appear on receipts of the Diospolis Magna formula: wheat, barley, and croton. Of these, the number of payments in wheat is far greater than that of payments in barley and croton—the proportion is greater than six to one⁸—and this circumstance suggests that wheat was by far the most common grain crop in second-century Diospolis.⁹

It has long been known that it was the habit of the Ptolemaic government to assess taxes on cereal crops by specifying the grain, as well as the amount, to be paid. It is known, too, that the per-volume value of different grains was not identical, and when a taxpayer chose to pay in one grain some part of a tax assessed in another, the amounts were adjusted according to a set proration.¹⁰ In one of the Diospolis Magna granary receipts—WO 1529—we have evidence of such prorations. In that receipt, payment is recorded in artabs of barley; a subscript gives the equivalent in terms of wheat: κρηθ(ῆς) ἑξ β'αί (πυροῦ ἀρτάβας) η γ'.

Despite their apparent discrepancy in value, the size of payments in barley matches that of payments in wheat very well; a medians test indicates no difference at all between the distributions of payment size in the two grains (see Table 11). This medians test is based, however, on the total number of payments. The number of payments in barley is too small for effective comparison, either of sizes of barley and wheat payments within single tax-phrase groups, or of sizes of barley payments in different groups.

By far the greater number of published Diospolis Magna granary receipts were, as I have said, issued for payments of wheat. Of these, nearly 15 percent¹¹ record late payments—payments of wheat towards the tax of a previous year. And there appears to be a significant difference in the distribution of size between payments of wheat for late and for current taxes. A medians test shows that more than two-thirds of the late payments fall below the median size of payments in wheat (see Table 12). The number of late payments in wheat is too small for effective comparison either with current payments within single tax-phrase groups or with late payments between the various groups. The following discussion will deal only with amounts of payment of wheat for current taxes.

The means and median sizes of payment in wheat for each tax-phrase group appear in Table 13. Even a casual assessment of their relative values draws one's attention to the very large amounts recorded in Group Six, and to the very small amounts recorded in Group Eight. Group Six, however, contains only two receipts—both issued to the same taxpayer in the same year—and I have elsewhere recorded

8. Recorded payments: in wheat = 102, in barley = 13.

9. The prominence of wheat among the cereal crops has been discussed by Schnebel, *Die Landwirtschaft im hellenistischen Ägypten*, pp. 94-100. Hohlwein, in *Le blé d'Égypte*, finds that the Ptolemaic predominance of wheat over the native Egyptian grain, *olyra*, is due to a 'capitalistic evaluation'—the more easily exportable crop was preferred to that which was suitable for domestic consumption.

10. See Wilcken, WO I, p. 667.

11. Payments of wheat for current taxes = 76, for taxes of a previous year = 16.

my doubts as to the actual independence of this group.¹² Group Eight, which consists of no independent payments, but only amounts paid in connection with other taxes, cannot reasonably be compared with the independent amounts paid for other taxes.¹³ Among Groups One through Five, and Group Seven, the mean size of payment for current taxes ranges from seven to thirty artabs, and the median size of payment from six to sixteen artabs. In all groups but Five, the mean is larger than the median.

The statistical tests ordinarily used to test the significance of the differences between means are parametric—they suppose that the samples tested have been drawn from a population with a normal, or symmetrical, distribution. The distributions of amounts paid on Diospolis Magna granary receipts are far from normal; rather, they are heavily skewed, for the average difference between mean and median is approximately seven artabs—the median, in other words, is ordinarily about one-third lower than the mean.

The Kruskal-Wallis test, a nonparametric technique for measuring the significance of the difference between discrete sets of numerical information with respect to their averages, indicates no greater discrepancy between the average size of payment in wheat in Groups One through Seven than can be accounted for by sampling variation (see Table 14). A chi-square medians test also indicates no significant difference between the median size of payment of wheat for current taxes in the several groups (see Table 15). So far, then, as regards their amounts, the payments of current wheat on Diospolis Magna receipts might best be described as a single population, with a mean of 21 artabs, and a median of 12 artabs.

The size of payments made during the course of the century spanned by the dates of Diospolis Magna granary receipts indicates no general tendency with respect to size. The payments seem neither to grow nor to diminish in size during that time. A chi-square test based on the number of payments above and below the general median during successive periods yields an emphatically insignificant result (see Table 16). Either the size of the wheat harvest was fairly stable from one twenty-year period to another—as is quite possible—or the amounts of payment failed to reflect differences in the size of the crop.

We have already seen that the size of payment does not reflect a known difference in the values of different crops, and it is apparent from the foregoing discussions that, unless we suppose that the amount of every tax described by the seven tax-phrases under consideration was identical, we must reject the hypothesis that the size of payment reflected a difference in the total assessment of the grain taxes. Perhaps the only satisfactory explanation of the sizes of payments recorded on Diospolis Magna granary receipts is that they describe the amounts of grain that it was convenient for the taxpayer to transport to the granary at one time.

12. See below, p. 69.

13. For a discussion of amounts paid in the superscripts that mark Group Eight receipts, see above, pp. 38-40.

To judge from the tomb paintings of the pharaonic period,¹⁴ it was customary for Egyptians to transport grain by land on the backs of asses. And we have documents from the hellenistic period in Egypt that describe shipments of grain by donkey-train. In the third volume of the Tebtunis Papyri,¹⁵ for instance, are a number of second-century papyri recording large shipments of grain. The writers seem to have calculated the amounts of grain shipped by counting donkeys, and multiplying by 3, 3 1/2, or 4. It would seem that the average donkey was expected to carry three to four artabs of wheat.

We have already observed that by far the greater number of payments in all groups but Four and Six—and those groups describe payments for taxes raised at specified places that may have been out of the Diospolis topos and might thus present special transportation problems—are between one and ten artabs in size. Perhaps we may assume that payments of this size were made when men drove pairs of donkeys laden with wheat into town.

Payments of between ten and twenty artabs are also fairly common: These, like even larger payments, might represent amounts hauled by several asses (or possibly in carts—though I know of no evidence that carts were commonly used for transporting grain).

Still larger payments might result from the use of packs of asses driven together. Or, more likely, they represent the sums of several payments.

We know that payments for one tax in one year could be recorded on separate receipts. Some taxpayers may have preferred having a fresh receipt for each payment made. But we have a number of receipts that record several separate payments made on different dates; it appears that some taxpayers preferred bringing their earlier receipt to the granary so that new payments might be recorded on the same ostrakon. One can sympathize with this preference—ostraka are bulky things, and a man who expected to pay his taxes in half a dozen or more installments would find himself with a very heavy filing cabinet—particularly if he were required to keep tax records for a minimum of three years.

Of course, ostraka provide only a limited amount of space for recording payments. We have no published receipt that bears record of more than three payments. It may well be that when a taxpayer had filled one ostrakon by having several payments recorded on it, he might take it to the granary with his next payment, and turn it in for a new one that recorded the total of all payments to date. This would account for the very large amounts sometimes recorded for payments; it would explain the subscript τῷ δὲ πρότερον γραφέντι μὴ χρῆσθαι (see *O. Bod.* 160, *O. Teb.* 16)—'let him not use the receipt written earlier'. That phrase would be a necessary precaution in the case of a taxpayer who claimed loss of an earlier receipt, and who visited the granary to obtain a receipt for all payments of grain to date.

14. See Pierre Montet, *Everyday Life in Ancient Egypt*, p. 117; Claire Préaux, *L'économie royale des Lagides*, p. 144.

15. See *P. Teb.* 848, introduction; see also 849, 850, 855, 858.

If the size of payment depends mainly on mode of transportation, of course, there is some difficulty in interpreting the apparently significant difference between the sizes of late and of current payments of wheat (see Table 17). I can only suggest that in the case of late payments, the amount due did in some slight way affect the usual size. If we suppose that amounts in arrears were usually smaller than amounts currently due, we can understand that late payments would seldom require the use of so many donkeys as current ones; their totals would seldom be as high as the totals of current payments.

SECTION FOUR: SEASON OF PAYMENT

The harvest of wheat in Egypt was brought in during the month of April¹⁶ and that month, as is apparent from Tables 1 through 7 and Table 22, is the first in which any appreciable quantity of wheat is recorded as paid for the taxes of the current year. Payments continued to be made for current wheat taxes during the months of May, June, July, and August; some occur during the month of September; none between the months of October and January.

The regnal year, during the portion of the Ptolemaic period to which the Diospolis Magna granary receipts belong, ended in the month Mesore. The regnal year would have ended on the equivalent of our second of October in 164, the year of the earliest Diospolis Magna receipts, and on the equivalent of our thirteenth of September in 88, the year of the latest. Since the dated payments of wheat for current taxes that have been recorded for the month of September all occur before the end of Mesore, we may deduce that the due date for payment of grain taxes was the end of the regnal year.¹⁷ The general limits of the period of payment of grain taxes were, then, on the one hand, the harvest, which gave the farmer the wherewithal to pay them; and, on the other, the end of the regnal year, when they were due in full.

This general description—during the months from April through September—fits the payments of wheat for current taxes in all the tax-phrase groups; the distribution of payments within those months, however, varies between one tax-phrase group and another. A Kruskal-Wallis test, in fact, reveals a high

16. Schnebel, *Landwirtschaft*, gives April as the month of harvest in the south of Egypt; May and June he calls harvest months in the north. Wilcken, *WO I*, p. 213, gives February as the month of harvest in the Thebaid—but notes, p. 224, that payments in grain were ordinarily made in April and June. Preisigke, *Girouesen*, p. 64, gives March and April as the season of harvest.

17. Preisigke, *Girouesen*, p. 64, notes the correspondence between the end of the regnal year and the end of the business of tax-collection.

degree of significance in the variation between the distributions of dates of payments in those groups (see Table 18).

If, as I have suggested, the distribution of dates of payment in wheat for current taxes was controlled by the season of the harvest and by the end of the regnal year, there seems to be no good explanation for a significant difference in the distribution of dates of payment between one group and another. I feel that the significance of the Kruskal-Wallis test is due, in this case, to the failure of the evidence to meet the assumptions which that test makes.

Like other statistical tests, the Kruskal-Wallis can be applied only to samplings that can be regarded as independent and random. The randomness of published receipts in representing the populations of receipts of their kind cannot, as I have said in the introduction to this discussion, be tested. Their independence, however, can be shown to be limited by the fact that some receipts record more than one payment.

The nonindependence of multiple payments recorded on single receipts applies to the problem of size of payment, of course, as well as to that of season. But if, as I suggested above, the size of payment was controlled by the amount that it was convenient for a farmer to transport to the granary at one time, there is no very good reason to suppose that multiple payments recorded on single receipts would vary in size any differently from a random sampling of the same number of payments recorded on separate receipts.

If, on the other hand, multiple receipts were formed in the way I have suggested above (see p. 58) — if, that is, a farmer would have had several payments recorded on a single receipt until it was filled up, then start a new one — then one might expect that the dates of multiple payments recorded on single receipts would vary less than a random selection of the same number of dates from separate receipts.

The average number of days that separates the dates of the several payments recorded on single receipts that bear more than one dated payment is nine — those payments, then, that are recorded on single receipts are quite likely to occur within a week of each other. But in the few cases in which there remain to us separate receipts issued to single taxpayers during single years, their dates are an average of forty-six days apart — suggesting that a random sampling of the dates of separately-recorded payments would be quite likely to bear dates more than a month apart.

I know no simple way to analyze the contributions of single groups to the significance of the Kruskal-Wallis test, and the numbers of payments in Groups Four, Five, Six, and Seven are too few to contribute to a valid chi-square test. One can arrange a chi-square test for the significance of the difference between seasons of payment for Groups One, Two, and Three; the result of that test indicates a probability of less than 0.1, and the group that contributes most to the sum of chi-square is Group Three (see Table 19). Group Three is also the group that, of these three, contains the highest proportion of payments recorded on multiple receipts — forty percent, as compared with eleven percent for Group Two, and seventeen percent for Group One.

Both these considerations, then, support the view that it is the occurrence

of multiple payments on single receipts that creates a significant difference in the distribution of dates of payment between the various tax-phrase groups, which we may therefore regard as identical in respect to their dates. A frequency chart of all payments for current wheat taxes recorded on Diospolis Magna granary receipts describes a season of payment fairly closely confined to the months April through September (see Table 22). The frequency chart is somewhat irregular—but some twenty percent of the payments it describes are on multiple receipts. I expect that a truly random sampling of dates of payments for current wheat taxes in Diospolis Magna in the second century would describe a nearly normal curve, with an apex in the months of June and July, and one tail cut off sharply in September.

A chi-square test shows no significant difference in the sizes of payments made at different parts of the harvest-to-year-end paying season, though there seems, in our present evidence, to be some slight shift from equal numbers of over- and under-the-median payments in April and May to a larger proportion of over-the-median payments in June and July to a larger proportion of under-the-median payments in August and September (see Table 20).

A chi-square test for the significance of the difference in dates of payment of wheat for current taxes during successive chronological periods yields a certain degree of significance—but no clear pattern emerges from the findings, and one cannot say either that payments tended to take place later during the course of the century nor that they began to take place earlier (see Table 21). Here again the problem of the nonindependent payments interferes with an interpretation of the data, and we may suppose either that this consideration has suggested shifts in seasons of payment where none occurred, or that it has obscured what shift there may have been.

Payments of barley for the taxes of the current year occur within approximately the same seasons as those of wheat; if there is any slight difference between the dates of payment in wheat and those of payments in barley, it is that payments in barley come somewhat earlier, for of the thirteen dated payments in barley, none occurs later than July (see Table 23). It seems reasonable to suppose that taxes in barley, like those in wheat, were due by the end of the regnal year. Barley, though, was harvested somewhat earlier than wheat, and a larger and random sampling of payments in barley for current taxes would probably form a curved peaked in the months of May and June.

The dates of payment of wheat for late taxes are, as one might expect, strikingly divergent from those of any grain for current taxes. Of the twenty dated payments of wheat for late taxes recorded on Diospolis Magna granary receipts, only one appears in each of the months from May through September, while five each are dated to the months of November and January, four to the month of March (see Table 24). It appears that payments of wheat for late taxes were more likely to be made between the start of the regnal year and the beginning of harvest than they were to be made between the harvest and the end of the regnal year.

As I noted in the introduction to this study, one of the problems that led me to the study of the granary receipts concerns the seasons and methods of collec-

tion of grain taxes in Ptolemaic Egypt.

Many of the Ptolemaic taxes were leased to contractors, or tax-farmers, and Wilcken¹⁸ in 1899 was of the opinion that the tax-farming system extended to the collection of taxes in grain, and that the persons named as payers on the Ptolemaic granary receipts were, in fact, the tax-farmers responsible for their collection. Wilcken also noted¹⁹ that the span of months covered by the dates of these receipts was rather broad, and he made no attempt to define closely the manner in which the payments were collected.

In 1904, however, Rostovtzeff published a new and rather dogmatic account of the method of collection of grain taxes in Ptolemaic Egypt.²⁰ This new account was based largely on a document published by Grenfell and Hunt in 1902. That document, *P. Teb.* 27, brought to modern attention the existence of officials called γενηματοφύλακες, whose duty it was, apparently, to guard harvested grain on the common threshing-floor until state taxes had been removed. So, according to Rostovtzeff, "Ueber die richtige Zufuhr zu den Tennen wachen die γενηματοφύλακες. Auf der Tennen wird das Korn gedroschen und wohl nur notdürftig gesichtet. Nichts soll von der Tenne vor der Abrechnung mit dem Staate weggenommen werden."²¹

Rostovtzeff's conclusions were accepted by Wilcken (see *Grundzüge*, p. 181), and by almost everyone else. Rostovtzeff has reasserted:²² "The grain on the threshing floor was inspected and divided between the crown and the peasant, and what remained after the claims of the former were satisfied (ἐπιγένημα) was released (ἀφαισις) and carried home by the peasant. The government grain was then transported to royal barns scattered all over the country and handed over to the keepers of the grain (σιτολόγοι)." The same view is asserted by A. Bouché-Leclercq,²³ M. Schnebel,²⁴ F. Heichelheim,²⁵ and Claire Préaux.²⁶

All modern authorities seem to have based their notion of the method of grain-tax collection in Ptolemaic Egypt primarily on the evidence of *P. Teb.* 27. But the evidence of the granary receipts ill accords with that of *P. Teb.* 27. The dates of the receipts fall as often as not in July and August; those are the months of the inundation, and unless we suppose that threshing floors were so far removed from the fields as to be above flood level, and that a man's total crop was sequestered for months after the harvest, the accepted account of the method of grain-tax collection fails to account for the dates of the receipts.

Two scholars in recent years have taken exception to the prevailing opinion about grain-tax collection in Egypt, and both have done so in connection with

18. *WO* I, p. 57.

19. *Ibid.*, pp. 213-14.

20. 'Kornerhebung und Korntransport im griechisch-römischen Aegypten,' *Archiv* III, 1904, pp. 201-224.

21. *Ibid.*, p. 204.

22. *Social and Economic History of the Hellenistic World*, p. 280.

23. *Histoire des Lagides*, vol. 3, p. 374.

24. *Landwirtschaft*, p. 165.

25. *RE* Suppl. VI, s.v. 'sitos,' p. 866.

26. *L'économie royale*, p. 128.

studies of ancient receipts. Verne B. Schuman, in a study of special charges on grain in Roman Egypt,²⁷ has asserted that taxes in kind were not normally paid at the threshing floor, but weeks or even months after harvest. C. Bradford Welles, in his publication of a Ptolemaic receipt notes that dates of Ptolemaic receipts indicate that many taxpayers found it possible and convenient to make their payments of grain not from the threshing floor, but after the harvest season.²⁸

The dates of the receipts of the Diospolis Magna granary, of course, support this more recent view. There is no trace of such concentration of payments about the harvest season as to suggest that taxpayers were under any compulsion to yield their taxes at the threshing floor.

Not only the dates, but also the amounts recorded for payments of grain taxes on the Diospolis Magna granary receipts are incongruous with the prevailing opinion of Ptolemaic grain tax collection methods. The only theory I have been able to construct to account for the distribution of amounts paid on those receipts has involved two conclusions: First, that payment of grain for taxes was ordinarily made in installments; second, that the size of payment was in part determined by the means of transportation available to the taxpayer. If all taxes were removed from a man's crop on the threshing floor, those taxes could hardly be paid in separate installments; and if the taxpayer furnished transportation to the granary, it is hardly likely that transportation occurred after taxpayer and grain tax had been parted.

I have no new explanation for the *γεννηματοφύλακας* and their duties as outlined in *P. Teb.* 27. I do believe that the situation described in that document cannot be taken as representing the method of grain tax collection at all times and in all places in Ptolemaic Egypt. The best evidence of the Diospolis Magna receipts—and, so far as I can tell from more casual readings, all other receipts—is that grain taxes were paid in installments from the time of harvest till the end of the regnal year, when they were due in full, and that they were transported by the taxpayer directly to the state granary.

SECTION FIVE: TAXPAYERS

It is possible to suggest a certain number of family relationships among the taxpayers whose names are recorded on Diospolis Magna granary receipts, and I have provided a list of possibly-related individuals at the end of this section.

Apart from such connections, however, little concerning individuals can be learned from the receipts. Addresses and occupations are nowhere recorded,

27. 'Light on Taxes in Kind in Roman Egypt,' *Proceedings of the IX International Congress of Papyrology*, 1961.

28. 'On the Collection of Revenues in Grain in Ptolemaic Egypt,' *Studien zur Papyrologie und antiken Wirtschaftsgeschichte: Friedrich Oertel zum achtzigsten Geburtstag gewidmet*, 1964, pp. 7-16.

nor are the scars and status-designations sometimes recorded on contracts, affidavits, and other of the weightier Ptolemaic documents. Even the nationality of individuals cannot surely be guessed from their names.

We know that Egyptians sometimes took Greek names. Among the Diospolis Magna receipts we find a trace of this practice in the Ἐρμόφιλος Ἡρακλείδου of *O. Bod.* 179, who is there described as ὄς και Θετιμη(.). Egyptians might also give their sons Greek names: In *WO* 723 we find a Δωσίθεος Παχράτου.²⁹

There is little evidence of the reverse of this process, i.e. of Greeks taking Egyptian names. The nearest thing to it is the creation of Greek names incorporating the names of Egyptian cult-gods—so on *O. Bod.* 186 the father of Σωκράτης is named Ἰσιδωρος. In general, one may suppose that convenience and snobbery combined to prevent Greeks from adopting Egyptian names and to encourage Egyptians to take Greek ones: Convenience, because the language of official documents in second-century Diospolis Magna was Greek, and a Greek name would be less subject to mutilation thereon than an Egyptian name; snobbery, because the ruling class was Greek, and a man of political or economic ambitions might have been more acceptable under a Greek name.

Still, in general, one cannot identify the nationality of a taxpayer from his name, and this difficulty extends to Semitic names, the third nationality represented to any extent on Diospolis Magna receipts. In the following discussion, I intend to consider the *nationalities of taxpayers' names*, rather than the nationalities of taxpayers themselves. Where, as is sometimes the case, a man's name seems to be of a different nationality than his patronym, I have described his name as Greek if either is Greek; Semitic or Egyptian only if both name and patronym seem to be of that nationality.

Greek names account for a total sixty-nine percent of all taxpayers' names recorded on published Diospolis Magna receipts. Egyptian names make up eighteen percent, Semitic names some eight percent; the remaining five percent of the receipts seem to record joint payments by two or more persons whose names are of different nationalities and the effect of nationality on these payments cannot be weighed. Taxpayers appear to make payments in the different grains in numbers appropriate to their overall proportions (see Table 25); late payments, too, occur in equivalent proportions by persons whose names are of the different nationalities (see Table 26). There appears to be no significant relationship between the nationality of a taxpayer's name and the season during which he makes payment for current taxes (see Table 27).

In most tax-phrase groups, the numbers of payments made by persons with Egyptian and Semitic names are too small to be analyzed separately in a chi-square test. There is, however, no significant difference in the proportions of taxpayers with Greek names to those with other sorts of names among the various groups (see Table 28). Groups One, Two, and Three exhibit no significant dif-

29. For the earliness and frequency of intermarriage between Egyptians and Greeks, see Peremans, *Vreemdelingen*, p. 285.

ference in the proportions of Greek, Egyptian, and other names among them (see Table 29). It seems safe to state that the nationality of taxpayers' names is in no way related to the various phrases that describe the taxes they pay.³⁰

Nor do the proportions of nationalities of taxpayers' names seem to shift during the course of the century spanned by receipts of the Diospolis Magna formula: A chi-square test analyzing the proportions of Greek to other names among taxpayers during successive periods yields no significant result (see Table 30), and a runs-test indicates a random distribution of Greek and other names in chronological order (see Table 31).

There does seem to be some correlation between the nationality of a taxpayer's name and the amount of payment recorded on his receipts. In almost every group, the averages and medians of payments in wheat made by taxpayers with Greek names are larger than those of payments made by taxpayers whose names are of some other sort. A chi-square medians test indicates a high degree of difference between the median size of payments made by persons with Greek names and that of payments made by persons with other sorts of names (see Table 32).

If my earlier statements regarding the regulation of sizes of payments for current grain taxes were sound—if, that is to say, the sizes of these payments reflect the amounts it was convenient to transport on donkeys—the explanation for the significant difference in amounts paid by persons with Greek and persons with other sorts of names is not readily apparent. I hesitate to suggest that donkeys owned by persons with Greek names were able to carry more than those owned by others. But a frequency chart of sizes of payments shows a far higher proportion of payments by Greek-named persons falling into ranges of amounts that could be carried by four or more donkeys than is the case with payments made by other persons (see Table 33). This suggests that taxpayers with Greek names used more donkeys than those with other names.

It may also be, as I have suggested, that very high amounts recorded on single receipts represent sums of earlier payments rather than single deliveries of grain by eight or more donkeys; thus the higher proportion of such amounts ascribed to persons with Greek names may indicate that they did in truth pay more for taxes. The assessment of this statistical evidence offers a substantial basis for the conclusion that hellenic origin or hellenization did indeed produce prosperity in Ptolemaic Egypt.

Either explanation, or a combination of the two, is plausible, for Greeks, as the ruling classes, may be expected to have owned larger farms than native Egyptians, and therefore to have owned more farm animals and to have paid more grain into the government treasury from their larger crops. The native Egyptians who took Greek names would also be likely to have been those who were relatively well-propertied.

30. Peremans (*Vreemdelingen*, p. 278) finds that, in the third century, most Ptolemaic taxes fell on subjects regardless of their nationality.

Taxpayers Possibly Related

Διονύσιος Χαιρήμονος	WO 1533	117 B.C.
Ἄγαθοκλῆς Διονυσίου	<i>O. Bod.</i> 190	115
Δίφιλος Ἀλεξάνδρου	<i>O. Bod.</i> 171	147
	<i>O. Bod.</i> 176	145
	<i>O. Bod.</i> 169	139
	<i>O. Bod.</i> 172	136
	<i>O. Bod.</i> 174	134
	<i>O. Bod.</i> 180	132
	<i>O. Bod.</i> 181	131
Σῶσος Ἀλεξάνδρου	<i>O. Bod.</i> 170	148
	<i>O. Bod.</i> 175	145
Δωσίθεος Παχράτου	WO 723	157
Δωσίθεος Πύρρου	WO 724	157
Ἑλλην Δωσιθέου	<i>O. Bod.</i> 160	157
	<i>O. Cam.</i> 137	157
Ἡρακλείδης Ἑρμοκλέους	BGU 1447	139
	WO 734	139
	WO 735	139
	WO 742	135
	WO 740	135
	WO 745	132
	WO 746	132
	WO 747	131
	WO 748	131
	BGU 1433	c.130
Ἡρακλείδης Ἡρακλείδου	WO 752	132
Ἑρμόφιλος Ἡρακλείδου	<i>O. Bod.</i> 179	122
Ἀμμόνιος Ἑρμοφίλου	WO 1521	130
Ἰσάκις Στράτωνος	WO 731	153
	<i>O. Bod.</i> 164	151
Ἰσάκις καὶ Στράτων Στράτωνος	<i>O. Bod.</i> 163	155
Στράτων Στράτωνος	<i>O. Bod.</i> 158	160
Περκῆς Ψευθώτου	<i>O. Strassb.</i> 314	143
.....Ψευθώτου	<i>O. Bod.</i> 166	142
Νεχθμάνθης Ψευθώτου	<i>O. Asb.</i> 6	135
	<i>O. Bod.</i> 183	128
Πολλοὺς Ἀβδαίου	<i>O. Cam.</i> 10	157
Ἰωσήπος Ἀβδαίου	WO 721	157

SECTION SIX: THE TAXES IN GRAIN

Of the grain taxes towards which the payments recorded on receipts of the Diospolis Magna formula were paid, it may first be said that there is no reason to believe that any of them was levied only on one grain. In the case of two tax-phrase groups, no payments are recorded on published receipts for any grain other than wheat. Those groups, however, are Six, with only two receipts, and Seven, with nine receipts. As the overall proportions of receipts recording payments of wheat to receipts recording payments of other grains is forty-six to seven, or nearly seven to one, there is no reason to suppose that the absence of payments in grains other than wheat in Groups Six and Seven is due to anything but chance.

Nor do any of these taxes seem to have been levied on persons of one particular nationality. Group Six, with its two receipts, is the only one of my tax-phrase groups whose receipts describe payments by persons of only one nationality—and both receipts are issued to the same taxpayer.

Real differences—if there were any—in season of payment among the various taxes are difficult to assess, because of the nature of the evidence (see above, pp. 60-61); from the evidence we have, it seems quite likely that all taxes in grain were paid in installments all during the months from harvest till the end of the regnal year. And the amounts of those installments depend more on the nature of the transportation used to get them to the granary—donkeys, as I have suggested (above, pp. 58-60)—than on anything to do with the taxes themselves. Only in the cases of very large amounts, where the record may indicate the sums of earlier installments rather than single transports by many donkeys, do the amounts recorded in any way reflect the total amount actually paid for the tax—and then only as a suggestion of how high that total amount might be.

One can, then, describe the grain taxes of second-century Diospolis Magna; one can describe them as a group, their grains, amounts of single payments, seasons of payment, method of payment, taxpayers, and granary officials. The difficulty comes in trying to distinguish these taxes one from another.

How does the tax described as paid *ὑπὲρ τοῦ τόπου* differ from that described as *εἰς τὴν ἐπιγραφήν ὑπὲρ τοῦ τόπου*? And how do these differ from that described as paid *ἐξ ἀντιδιαγραφῆς*? Is there no way to distinguish these taxes save by the phrase used to describe them? No way to understand them except by guessing at an interpretation of the sense of the Greek phrase?

There is one respect in which the seven groups of receipts are not identical, and that is in their overall chronology—the years in which they were issued. Some three-quarters of a century—from 164 to 88 B.C.—are spanned by the dates of the Diospolis Magna granary receipts. The distribution of receipts of the seven tax-phrase groups within this period of time is, as a glance at the table of signatures (above, pp. 47-49) makes clear, far from random; a runs-test on the dates of any two groups of documents will yield a highly significant result.

Two explanations suggest themselves regarding the non-random chrono-

logical distribution of receipts bearing the different tax-phrases. First, it may be that taxes in grain were introduced or revoked during the seventy-six years covered by the dates of the receipts—for instance, it may be that the tax εἰς τὸ (fraction) ἄρτόβρις does not appear before the year 123 because it was not introduced until around that time.

Or it may be, in some cases, that a certain tax was differently described in different periods. Thus Group One documents may begin to appear in 156, while Group Two documents cease to appear in that year, for the reason that the tax-receipt writers had decided, instead of writing ὑπὲρ τοῦ τόπου, to omit the tax-phrase in connection with payments of this sort.

For Groups One (No Tax Phrase), Two ('Ὑπὲρ τοῦ τόπου), and Three (Εἰς τὴν ἐπιγραφὴν ὑπὲρ τοῦ τόπου), I believe the second explanation to be correct. It can hardly be that the lack of Group Three receipts between 162 and 148, and again after 134, is accidental, for we have receipts of other groups during these periods. Similarly, accident cannot account for the absence of Group Two receipts between 156 and 142; nor for the absence of Group One receipts before 156, between 151 and 143, and between 143 and 129.

The introduction and revocation of taxes can hardly be the explanation here. It seems highly unlikely that the tax εἰς τὴν ἐπιγραφὴν was revoked after 162, reintroduced in 148, and re-revoked after 134; that, meanwhile, another tax, identical for all we can see, called ὑπὲρ τοῦ τόπου, was introduced in 163 and revoked in 156, then reintroduced in 140.

No: The best explanation of the alternating occurrences of receipts of the tax-phrases I have called One, Two, and Three is that all three describe the same tax—the commonest tax on grain—and the different writers, in different periods, described it differently for the purpose of the receipts. Philotas seems always to have described this tax as εἰς τὴν ἐπιγραφὴν ὑπὲρ τοῦ τόπου; Asclepiades, in the one receipt we have from his hand, shortened the phrase to ὑπὲρ τοῦ τόπου. Panas' earliest receipt reverts to the εἰς τὴν ἐπιγραφὴν ὑπὲρ τοῦ τόπου phrasing; during the remainder of his office, he wrote simply ὑπὲρ τοῦ τόπου. Ambryon, in his earliest receipts, described this tax as paid ὑπὲρ τοῦ τόπου; in his later receipts he simply omits the tax-phrase.

Pooris and Hermon used the phrase εἰς τὴν ἐπιγραφὴν ὑπὲρ τοῦ τόπου; Asclepiades omitted the tax-phrase. Ptolemy the sitologus used εἰς τὴν ἐπιγραφὴν ὑπὲρ τοῦ τόπου, or simply ὑπὲρ τοῦ τόπου; he seems to have preferred the longer phrase. His contemporary, Heraclides, once used εἰς τὴν ἐπιγραφὴν ὑπὲρ τοῦ τόπου, ordinarily he used ὑπὲρ τοῦ τόπου only. All the later receipt writers who have left us their signatures used ὑπὲρ τοῦ τόπου exclusively, except for Amethystes, who once omits the phrase, and Antiochus, who, in the years 97-89, omits the tax-phrase on all his receipts.

The interpretation of the other, smaller, tax-phrase groups is less certain. I believe that the receipts of Group Four—those that record payments for specified places—are issued for the same basic grain tax as those of Groups One, Two, and Three; place-names are perhaps included because the places they name lie outside the topos whose taxes were ordinarily paid into the Diospolis Magna gran-

ary. The Group Four receipts appear only in the years 157 to 153, and (one receipt only) 144; it may be that in other periods payments for these out-of-the-topos places were made to granaries in other cities; it may be simply that Panas and Ambryon were the only writers scrupulous enough to record them specifically—that other writers merely recorded them as payments under the phrases One, Two, or Three. Amounts of payment in Group Four are slightly higher in the median than those in other groups. If payments for out-of-the-topos places had to be transported farther, it would be understandable that they should tend to be larger. Because a long journey would take a man's time, he would try to transport as much at a time as he possibly could.

In the case of Groups Five and Six, I have grave doubts as to their existence. The readings of many of the tax-phrases are disputed; in half the relevant documents the tax-year (often at this period written εἰς τὸ xx L) is omitted, while the tax-phrase (εἰς τὸ <ἀπ>) appears. Almost no other Diospolis Magna granary receipts omit tax-years, and it is tempting to believe that these Group Five documents should have the tax-year restored in place of the tax-phrase, being thereafter assigned to Group One. Group Six documents, after a similar restoration of tax-year, could be assignable to Group Four. I have preserved Groups Five and Six, however, for two reasons: In the first place, none of the editors who has seen the receipts has been able to read a tax-year where I should like to restore it; in the second place, at least three of the Group Five receipts (*O. Ash.* 6, *WO* 752, and *WO* 1527) seem to have both tax-year and tax-phrase—however disputable the second.

If Group Five is real, and not a mirage, it may indeed represent a new tax introduced before 123 B.C. For it is hard to suppose that, with three phrases to choose from, Antigenes and Pau() should have wanted to introduce a fourth that described the same tax.

Group Six must bear the same relationship to Group Five that Group Four bears to Groups One, Two, and Three.

The phrase ἐξ ἀντιδιαγραφῆς seems to suggest rather a method of payment than the title of a tax. According to *LSJ*, the phrase is used when taxes in kind are paid in cash. I fail to see how such a transaction could be described by the Diospolis Magna receipts that include the phrase ἐξ ἀντιδιαγραφῆς. If a taxpayer wished, and were permitted, to substitute species for kind in payments for taxes in grain, would he present his cash to the granary, rather than to the state bank? If to the bank, surely it would not be the granary that issued receipt; if to the granary, would the taxpayer be said, in the terms of the receipts, to have measured in so much grain—rather than to have paid so much cash in place of grain?

Heichelheim's interpretation³¹ of the phrase ἐξ ἀντιδιαγραφῆς is that it refers to a transfer of, as it were, funds, from one account to another. Grain production was so much at the heart of the Ptolemaic economy, and grain so frequently a medium of exchange, that private citizens, as well as the state, might keep accounts of grain in their city's granary, making deposits and withdrawals as we do

31. *RE* Suppl. VI, s.v. 'sitos,' p. 871.

with banked money. A payment of taxes ἐξ ἀντιδιαγραφῆς, then, would be made when the taxpayer transferred grain from his private account to the account of the crown.

Heichelheim's explanation accounts very neatly for most of the features of the receipts of Group Seven. Consider their dates, for example: Six of the receipts are assigned to the years from 139 to 132, the remaining two to 154 and 117. Very likely, most receipt-writers neglected to distinguish between payments made by bank draft and those made by delivery of grain; the reason for the concentration of receipts bearing the phrase ἐξ ἀντιδιαγραφῆς during the thirties is simply that Ptolemy the sitologus and Heraclides were more careful than other writers in designating method, as well as purpose, of payments of grain to the state.

The phrase ἐξ ἀντιδιαγραφῆς occurs in receipts that describe payments ὑπὲρ τοῦ τόπου or εἰς τὴν ἐπιγραφὴν. Apart from the utility of isolating this group for study, there seems to be no reason not to assign these payments to the sets of receipts that are described by those phrases alone.

One of the Diospolis Magna receipts for payments ἐξ ἀντιδιαγραφῆς (BGU 1447) also describes the payment as κατὰ τὸ χρη(ματισμὸν) τοῦ τοπ(άρχου?), and a similar phrase—κατὰ χρη() τοῦ οἰκονόμου—appears in connection with a payment ἐξ ἀντιδιαγραφῆς on *O. Strassb.* 305, a receipt not of the Diospolis Magna formula. It may be that some payments made by transfers of grain from private accounts were due to official action, possibly in cases of tax default or fraud.

Since interpretation of the tax-phrases from the Diospolis Magna receipts has been a matter of some scholarly controversy, it will not be out of place to compare the interpretation arrived at in this study with interpretations set forth in the past.

Wilcken, in his *Griechische Ostraka*, was working from much of the same material that I have gathered to study in this work; the interpretation of tax-phrases he expressed was much like that I have put forth above. The main land tax, in his opinion, was what was paid on receipts that bore no tax-phrase, and also on those designating payments ὑπὲρ τοῦ τόπου and εἰς τὴν ἐπιγραφὴν. Phrases that describe tax-payments by geographical names, he thought, are parallel to, only more concrete than, those marked ὑπὲρ τοῦ τόπου³²

As with methods of grain-tax collection (see above, pp. 61-63), so with the interpretation of tax-phrases. The publication of the Tebtunis papyri in 1902 furnished new kinds of information, the interpretation of which seemed to many scholars to refute Wilcken's views. Grenfell and Hunt³³ noting that in the Tebtunis tax-registers it was the ἀπροβιὰ or variations upon it that most frequently appeared, believed that that tax must be regarded as the general land tax in Ptolemaic Egypt. They dismissed Wilcken's similar claims for the εἰς τὴν ἐπιγραφὴν

32. *WO* I, pp. 194, 306, and 308.

33. *Tebtunis Papyri* I, pp. 38-40.

and related taxes as 'ingenious,' and suggested, on *a priori* grounds, that εἰς τὴν ἐπιγραφὴν could only be interpreted to mean 'for the supplementary tax,' an impost secondary to the main land tax, the ἀρταβεία.

Heichelheim seems to have accepted Grenfell and Hunt's opinion of the relationship between ἀρταβεία and εἰς τὴν ἐπιγραφὴν;³⁴ Préaux certainly did, for she describes the εἰς τὴν ἐπιγραφὴν as an 'imposition supplémentaire' which 'alourdit les charges du paysan'.³⁵

Preisigke, on the other hand, seems to have accepted Wilcken's view of the phrase εἰς τὴν ἐπιγραφὴν—that it simply described payments made 'towards the tax-receipts-account', i.e., for the main land tax.³⁶ And Tait, to judge from his brief but pointed remark³⁷ appended to his text of a receipt for payment of ninety artabs of wheat εἰς τὴν ἐπιγραφὴν, held to Wilcken's opinion in this respect—even though he, Tait, has contrived to read references to the ἀρταβεία on Diospolis Magna receipts (see above, p. 6).

Tait further remarks, in reference to the text of a receipt not of the Diospolis Magna formula, that payments towards the ἀρταβεία are found on receipts only from the later part of the Ptolemaic period.³⁸ As he notes in that same place, Ptolemaic receipts exist that record payment for both ἐπιγραφὴ and ἀρταβεία; on such receipts, ἐπιγραφὴ is always mentioned first.

On the basis of the Diospolis Magna receipts alone we can reject Grenfell and Hunt's interpretation of the relationship between ἀρταβεία and ἐπιγραφὴ. In the first place, the ἐπιγραφὴ payments—and those ὑπὲρ τοῦ τόπου and without tax phrase, which we have shown reason to believe were identical with the ἐπιγραφὴ in significance—occurred in great number throughout the period spanned by the dates of these receipts. Payments for any form of ἀρταβεία, on the other hand, are not attested before 123. Unless we are to believe that, at least in Diospolis Magna, the main land tax was not assessed before 123, or that no receipts for it have been preserved when we have so many that record payment for a supposedly 'secondary' tax, we can only deduce that the main land tax in Diospolis Magna was in fact that described by the phrases of tax-phrase Groups One through Four.

Although no single receipt of the Diospolis Magna formula records payment for both ἐπιγραφὴ and ἀρταβεία, we have found reason to suppose that there may have been a distinction in the sense of those two tax phrases. Since, as Tait points out, other receipts record payment for both ἐπιγραφὴ and ἀρταβεία, we may take it as certain that the sense of the two phrases was distinct. And the

34. *RE* Suppl. VI, s.v. 'sitos,' p. 868.

35. *L'économie royale*, p. 132.

36. *Girouesen*, p. 148.

37. *Ostraca in the Bodleian Library*, p. 26, *O. Bod.* 150: "The large amount here paid for ἐπιγραφὴ scarcely agrees with the theory, which seems at present to be generally accepted, that ἐπιγραφὴ means 'extra tax'."

38. *Op. cit.*, p. 43, *O. Bod.* 255.

άρταβειά appears only on the later Ptolemaic receipts, while ἐπιγραφή is the earlier and more frequent.

Whether either of these sorts of taxes—those described by tax-phrase Groups One through Four, or those related to the ἀρταβειά—represents the ἐκφόριον exacted from γεωργοὶ βασιλικοὶ (land-rent from tenants of royal land), or rather a φόρος (tax) exacted from holders of γῆ ἐν ἀρείσει (privately-owned land)³⁹ cannot be decided from the Ptolemaic receipts, since these neither use the term ἐκφόριον nor designate the status of the persons and lands on which they fall.

Schwahn lists as examples of the ἐκφόριον payments of the tax-phrases making up Groups One through Four; the ἀρταβειά and the fraction-of-artab payments he assigns to holders of temple land and of γῆ ἐν ἀρείσει.⁴⁰ According to Rostovtzeff, the ἀρταβειά fell on cleruch and βασιλικὸς γεωργός alike.⁴¹

From the preponderance of Greek names among the tax-payers in every tax-phrase group of the Diospolis Magna granary receipts, I am inclined to believe that the receipts were issued to holders of γῆ ἐν ἀρείσει—whether exclusively or or along with βασιλικοὶ γεωργοί, I cannot say. If these imposts fell on holders of γῆ ἐν ἀρείσει, they were taxes—φόροι—rather than rent—ἐκφόριον. But, as Rostovtzeff suggests, and also Préaux, in assigning single taxes to cleruch and βασιλικὸς γεωργός alike, the latter may have had to pay φόροι as well as ἐκφόριον; in that case, all the taxes described by receipts of the Diospolis Magna formula may have been paid by holders both of βασιλική γῆ and of γῆ ἐν ἀρείσει.

SECTION SEVEN: SUMMARY

This study was begun under the premise that there remain, among the stores of surviving Ptolemaic materials, great numbers of documents that are generically related, and whose contribution to our understanding of Ptolemaic society and economy cannot properly be discerned except as the information provided by them is studied together, in sets.

The Diospolis Magna granary receipts form such a group. Documents of a single kind, of a nearly-invariable formula, of one city and one century—any one is a fair example of its kind; any ten, randomly selected, a fair suggestion of the limits of the variability of the group. And still, each receipt furnishes information—amounts, dates, names of taxpayers and of granary officials—whose significance can only be assessed in comparison with similar information from

39. For a discussion of categories of land and landholders in Ptolemaic Egypt, see Rostovtzeff, *Social and Economic History of the Hellenistic World*, pp. 1381 ff.

40. Schwahn, *RE V A*, s.v. 'Tele,' pp. 272 and 287.

41. *Op. cit.*, p. 286.

the other receipts. Modern notions of Ptolemaic grain taxes and their administration cannot fairly be tested by information from single, but only by information from all, the receipts.

A study of related documents such as these furnishes two sorts of information. It provides a frame of reference by which to judge the significance of single documents, whether those within the study itself, or others yet to be published. It further provides some bases for judging current opinion on matters of historical interest, supporting or controverting these opinions or, in some cases, supplying reasons for disqualifying the evidence of the related documents as irrelevant where they may previously have been appealed to as evidence.

The information gathered in this study makes it possible to assess the significance of single Diospolis Magna granary receipts with respect to their dates and with respect to the amounts paid on them. It can easily be determined, for example, whether any single receipt is an early or a late example of the Diospolis Magna receipts in general or, in particular, of any subdivision of those receipts. It can likewise be determined whether any single receipt was paid early or late in the season, or whether it records a large or a small payment, compared to the majority, or with respect to any determined percentage, of the Diospolis Magna receipts in general, or of any set of them.

On an even more basic level, the sort of information gathered here may help to establish secure texts and dates for single receipts. The prosopography and chronology of receipt-writers and countersigners in Part Two, Section One may help to determine the reign to which any signed and dated receipt should be assigned. The general formulaic developments and idiosyncracies of individual writers noted in Part Two, Section Two, will make it possible, in some cases, to restore the texts of damaged receipts, and, in cases where the dates of receipts are entirely unreadable, to suggest an approximate date. The discussion of the correlation between superscript payments and payments in the main texts of the Diospolis Magna granary receipts (Part One, Section Eight) will make it possible to judge from the size of a main-text payment what fraction ought to appear in a superscript—or, on rare occasions, to judge from the superscript fraction the general size of the main-text payment.

Much of the material gathered in this study has, of itself, some historical interest. The study, for example, of the functions of the granary officials (Part Two, Section One) who wrote and countersigned the Diospolis Magna granary receipts indicates that there were several changes in the relationships of these two sorts of officials during the seventy-odd years spanned by the dates of the receipts. Awareness of such bureaucratic developments prevents our accepting such general assertions as that the writer of receipts can at all times be identified as a *σιτολόγος* or that the countersigner must be identified as an *ἀντιγραφεύς*.

The analysis of the nationalities of taxpayers' names is of some interest in supporting the general notion that nationalities were not a determining factor in the assessment of the kinds of taxes for which the Diospolis Magna granary receipts were issued; the prevalence of Greek names among the taxpayers named

on these receipts indicates the extent to which second-century Diospolis had been hellenized—whether genetically or culturally we cannot determine from the receipts themselves. The relatively large amounts of grain paid by persons whose names are Greek indicate to what degree the hellenized portion of the population was economically advanced over the rest.

But the chief areas of historical interest touched upon in this study are those concerned with the number and kind of taxes paid in Ptolemaic Egypt, and the method used in that period and at that place to pay and to collect those taxes.

An analysis of the phrases used to describe the grain taxes for whose payment the Diospolis Magna granary receipts were issued indicates that these payments were exacted for only three sorts of taxes: Those recorded in superscripts marked $\text{\iota\rho\omicron\upsilon \pi\rho\omicron\upsilon}$ or $\text{\iota\rho\omicron\varsigma \kappa\rho\iota\theta\eta\varsigma}$; those described as paid for some fraction of an artab; and those variously described as paid for the topos, for the tax-assessment for the topos, for some place whose name is recorded, or for a tax-year without any tax-phrase. This analysis substantially reduces the numbers of grain taxes commonly cited by scholars; further analysis alters the relationship commonly described between the artab-taxes and others. The receipts indicate that artab-taxes were introduced at a later date than those described by other phrases, and that they were less commonly assessed than the others.

Scholars have commonly asserted that, in the Ptolemaic period, government officials extracted grain taxes in toto from the grower's crop before that crop was released from the threshing floor. Among the surviving Diospolis Magna receipts, however, we find some that record multiple payments toward a single tax in a single year. The amounts of these multiple payments, moreover, are quite in line with amounts recorded where we know of only one payment made for the taxes of a single year. We may therefore suppose that most of the Diospolis Magna receipts record, not the sum of, but only installments toward, the taxes of single years.

The dates of the Diospolis Magna granary receipts, set out in a frequency chart arranged by the months of the Gregorian calendar, form a regular curve from March to September, with peak numbers of payment occurring in June and July. This indicates that, far from being submitted in the season of threshing, taxpayers' installments toward their grain taxes were delivered to the granary during the course of some six months after the harvest. Payments of grain for taxes between the beginning of the regnal year and the season of harvest almost never occur except when they are submitted to make up arrears for the taxes of the preceding year.

INDICES

Introduction
The purpose of this book is to provide a comprehensive overview of the current state of research in the field of artificial intelligence. It covers a wide range of topics, from the foundations of logic and set theory to the latest developments in machine learning and neural networks.

The book is organized into several parts. The first part deals with the foundations of artificial intelligence, including logic, set theory, and the theory of computation. The second part covers the history and philosophy of artificial intelligence, and the third part discusses the current state of research in the field.

The fourth part of the book is devoted to the applications of artificial intelligence, and the fifth part discusses the future of the field. The book is intended for students and researchers in the field of artificial intelligence, and it provides a valuable resource for anyone interested in the subject.

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I. PERSONAL NAMES

A. Granary Officials

The letters S and CS after officials' names refer to the chronological tables of signatures and countersignatures, above, pp. 47-51. The dates at which each official seems to have been active are given before the numbers of pages on which each is referred to. When a name is found both in signatures and in countersignatures at about the same date, it may be considered that one individual has both issued and countersigned receipts of that period: So Antigenes S 13 probably = Antigenes CS 18; Asclepiades S 7 probably = Asclepiades CS 11; Ptolemy the sitologus, S 8, probably = Ptolemy CS 16. Heraclides S 9, on the other hand, is probably not the same person as Heraclides CS 17; see above, p. 45.

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Πτολεμαῖος, CS 16, 136-132: 20, 33, 45, 46, 50, 53.
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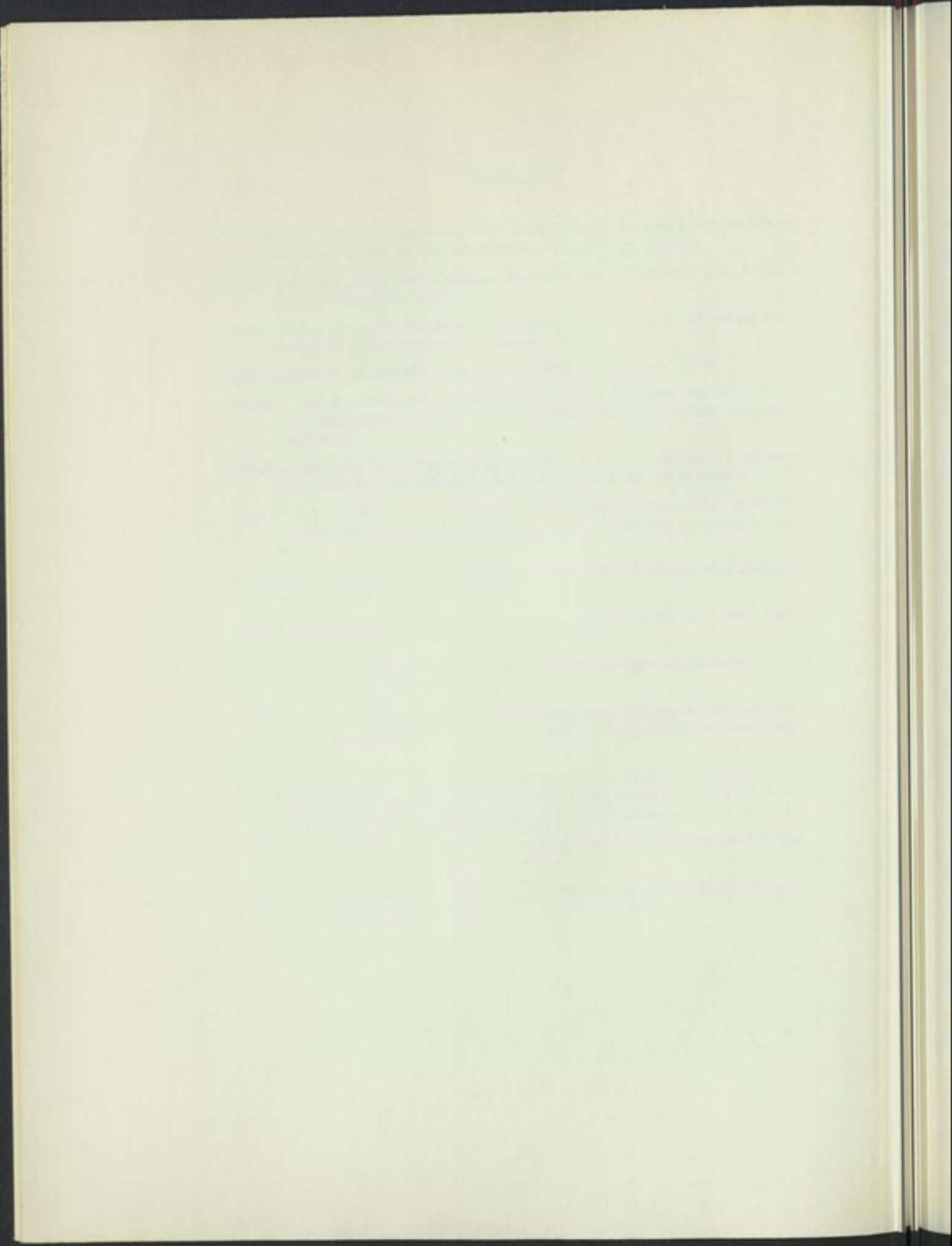


TABLE 1
 Numbers of Grain-Tax Payments per
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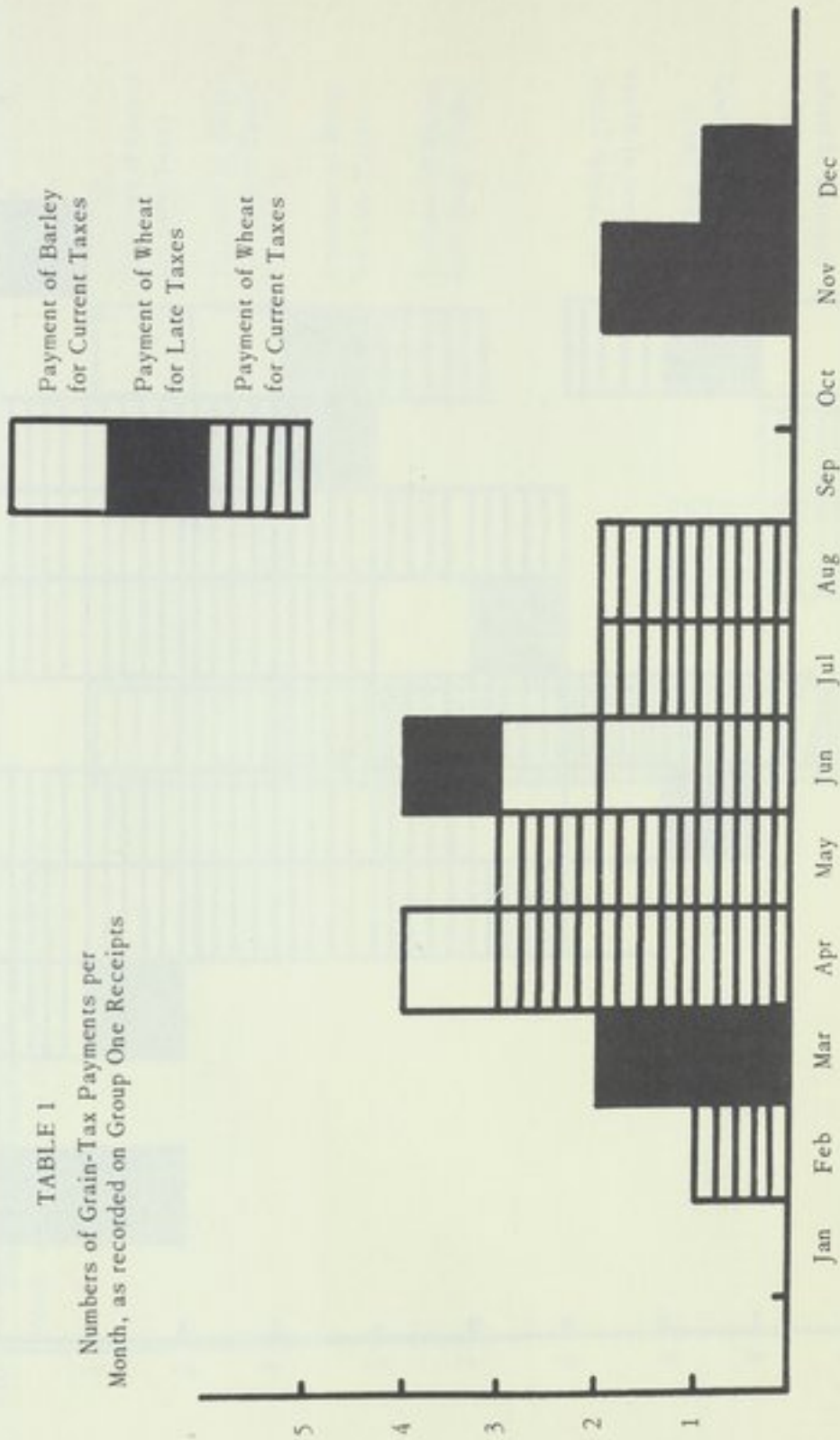


TABLE 2
 Numbers of Grain-Tax Payments per
 Month, as recorded on Group Two Receipts

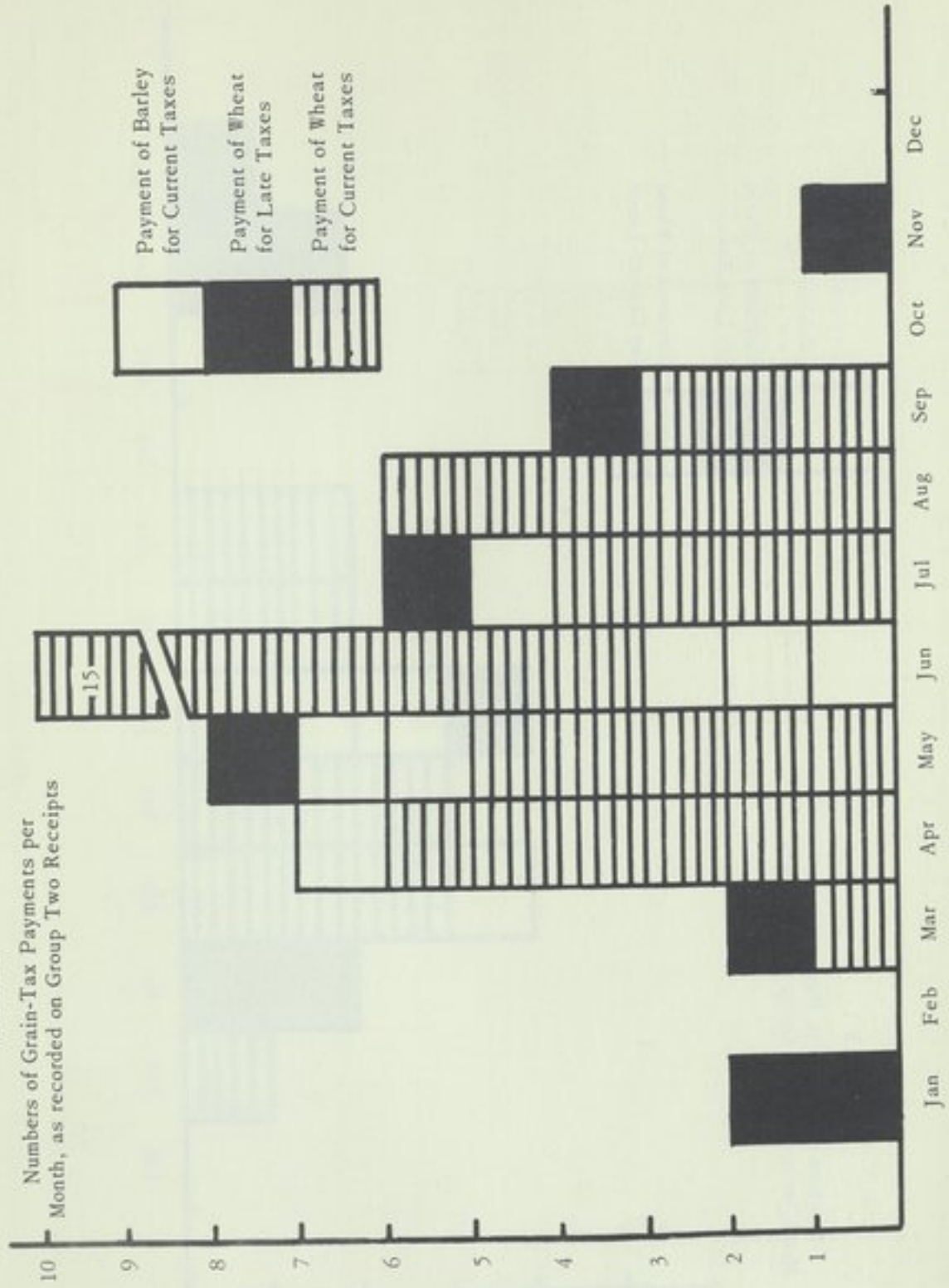


TABLE 3
 Numbers of Grain-Tax Payments per
 Month, as recorded on Group Three Receipts

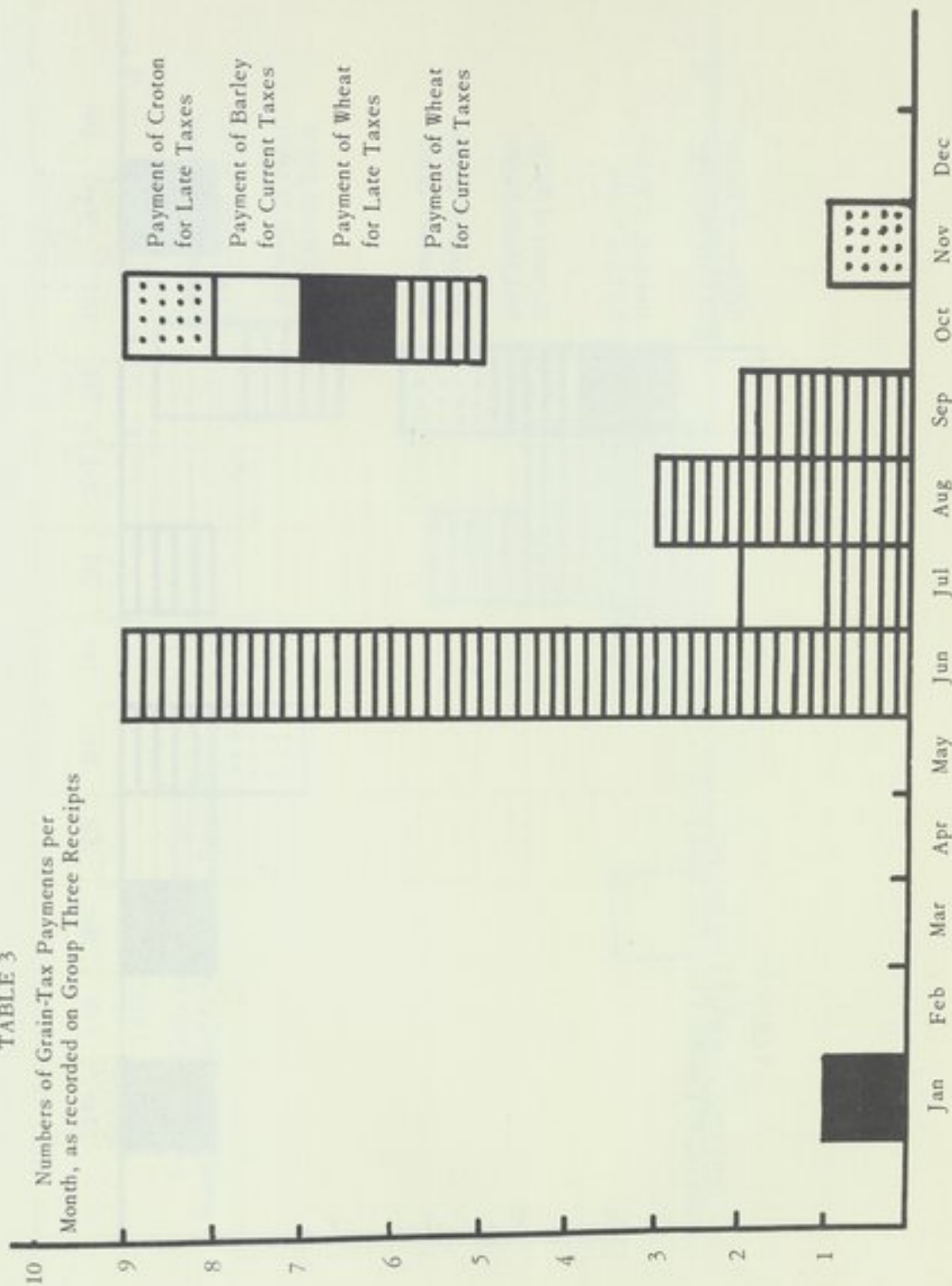


TABLE 4
 Numbers of Grain-Tax Payments per
 Month, as recorded on Group Four Receipts

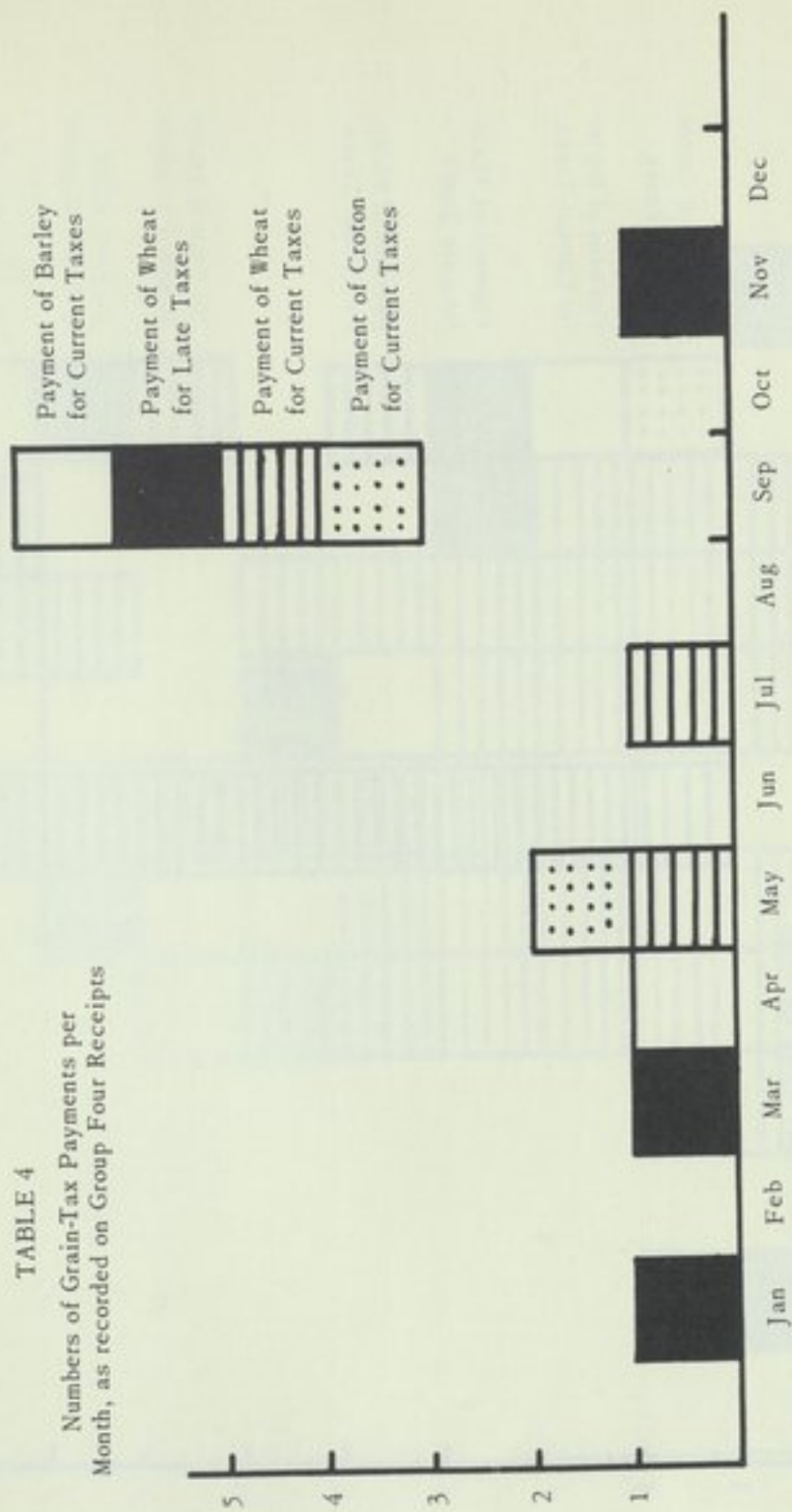


TABLE 5

Numbers of Grain-Tax Payments per Month, as recorded on Group Five Receipts

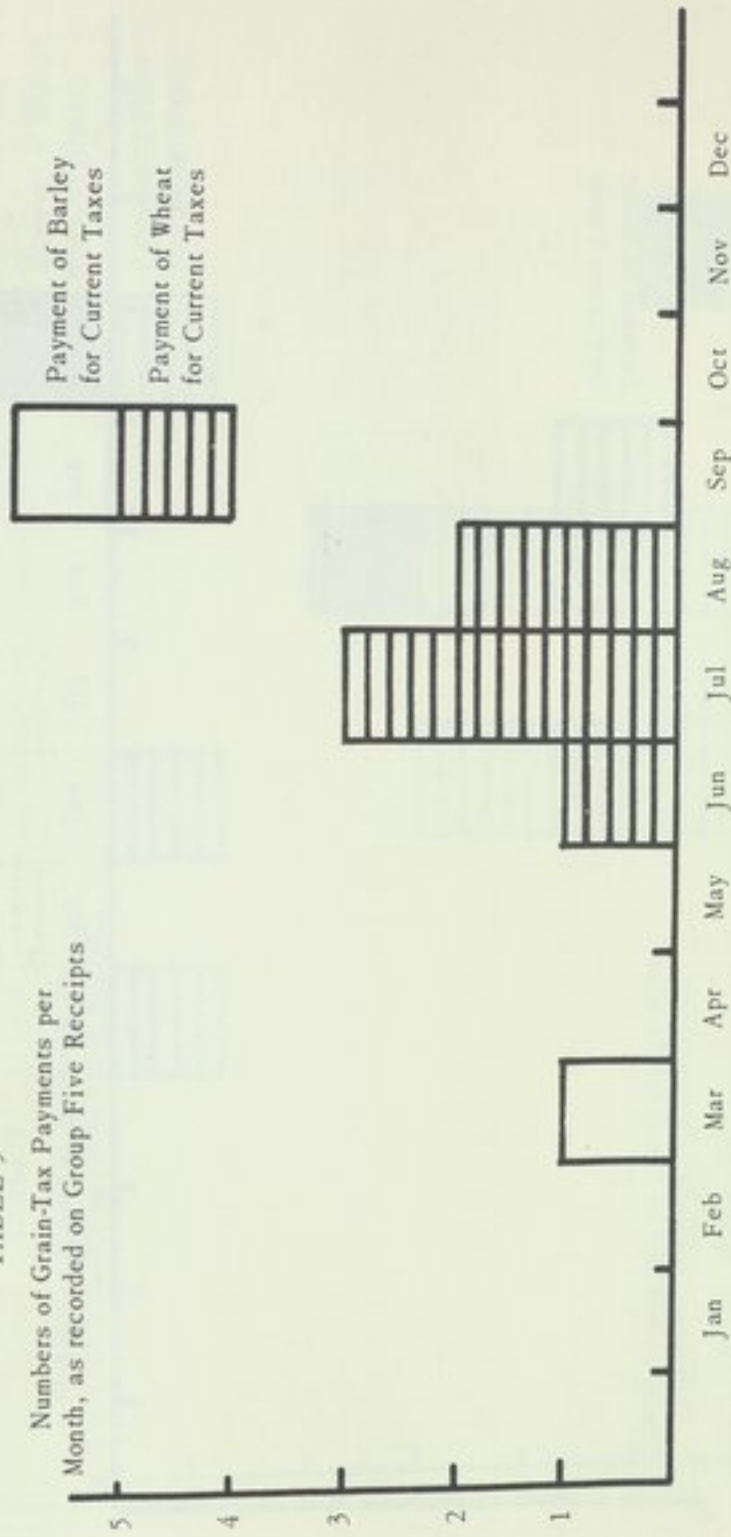


TABLE 6

Numbers of Grain-Tax Payments per Month, as recorded on Group Six Receipts

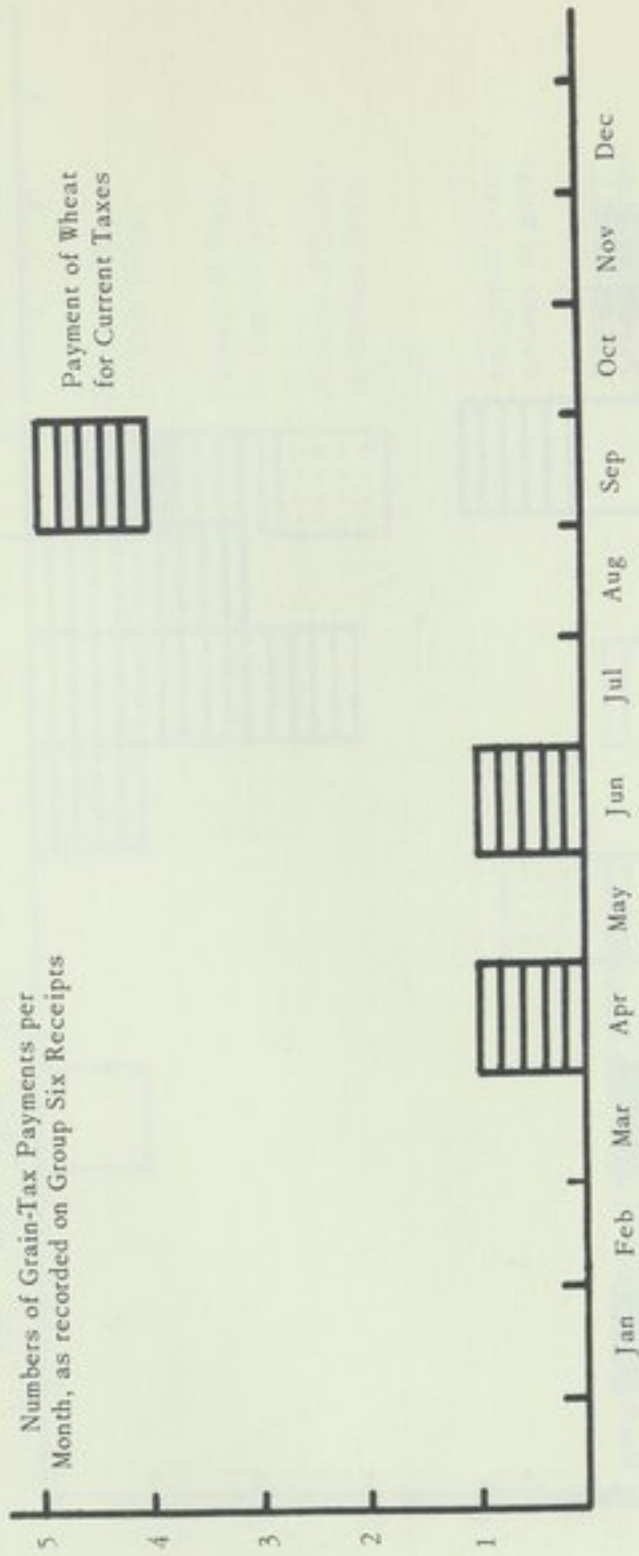


TABLE 7
 Numbers of Grain-Tax Payments per
 Month, as recorded on Group Seven Receipts

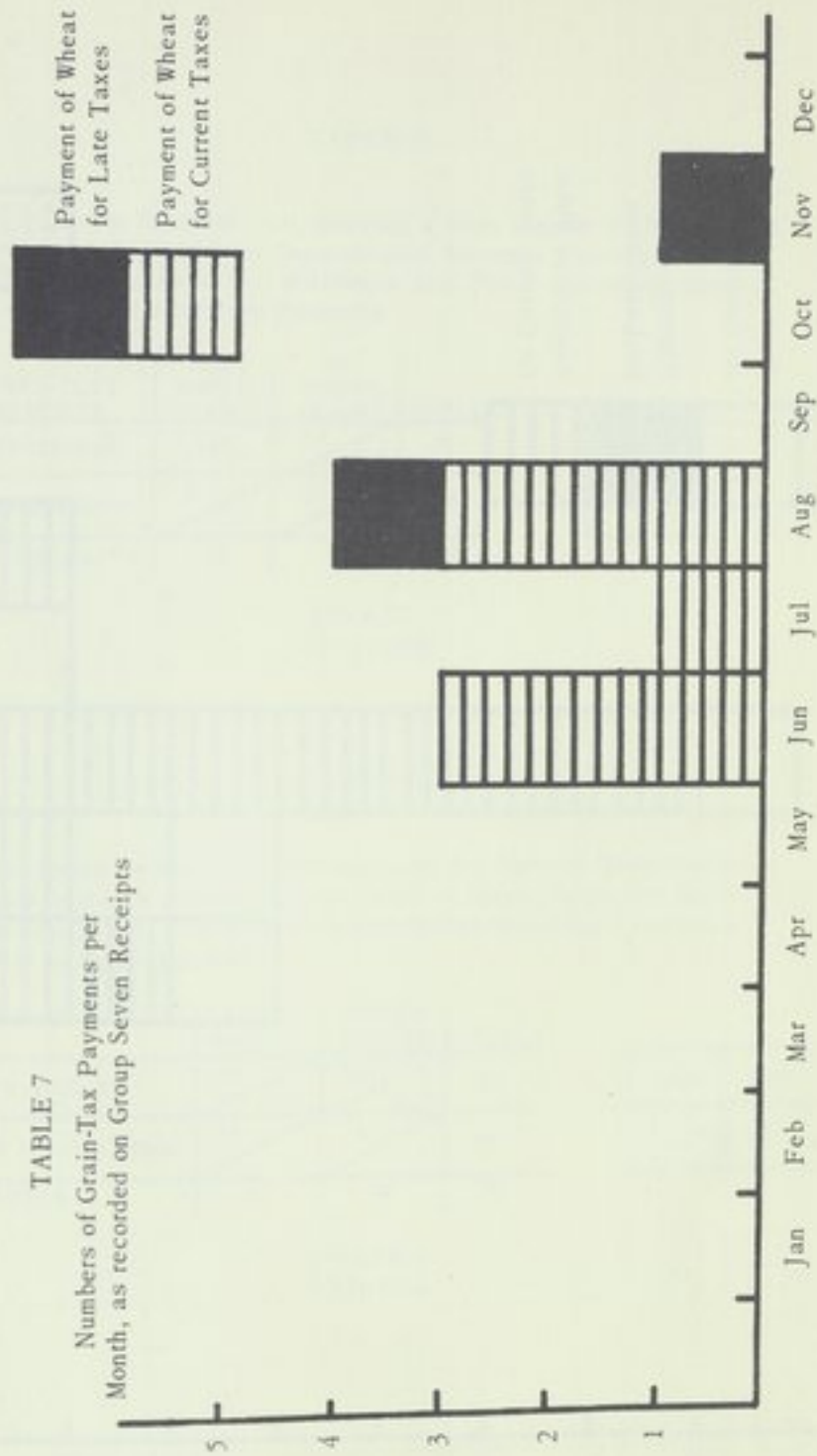


TABLE 8
 Numbers of Grain-Tax Payments per
 Month, as recorded on Group Eight Receipts

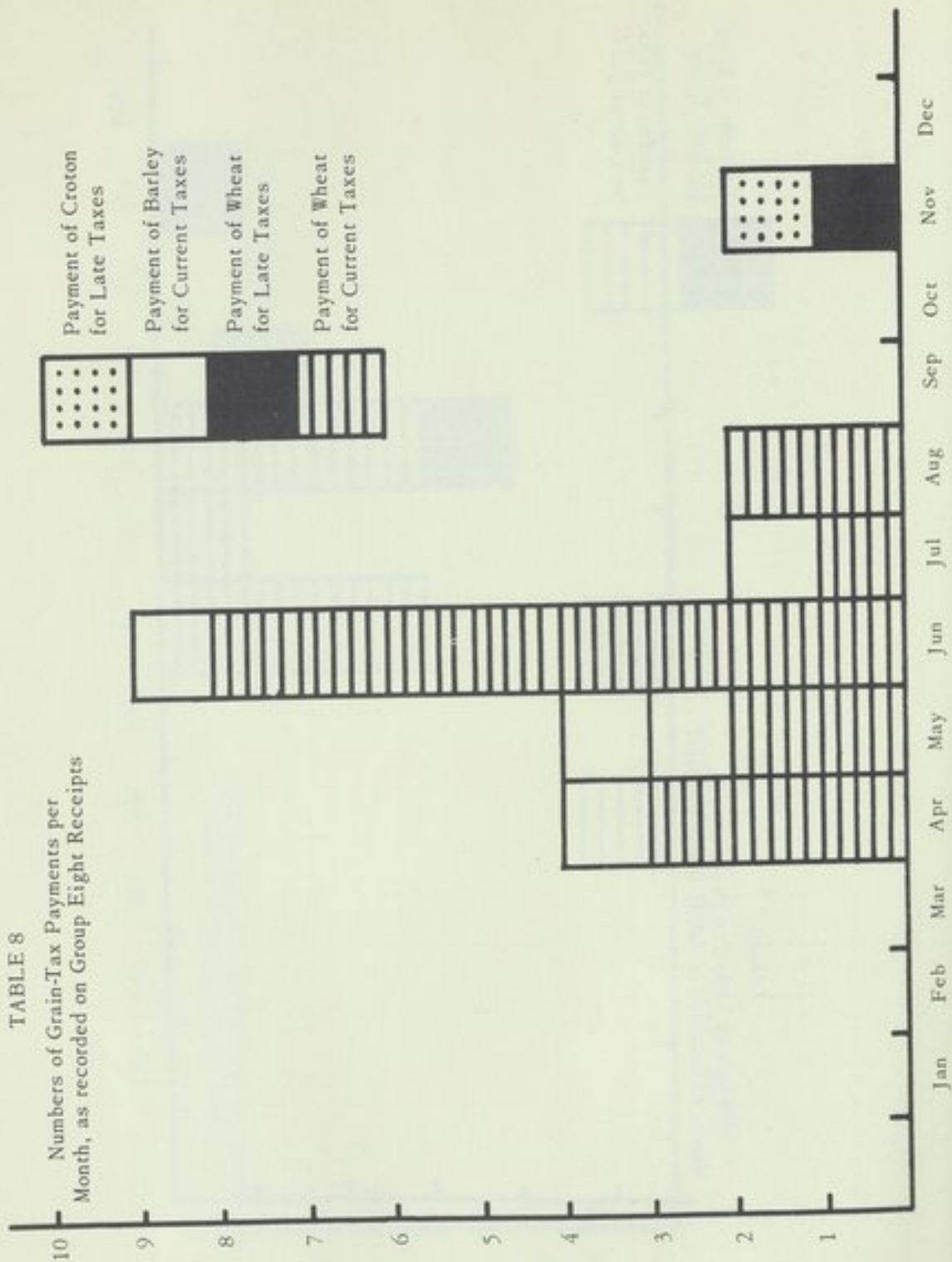


TABLE 9

Chi-Square Medians Test Showing a High Degree of Difference between the Number of Superscripted Receipts Recording Below-the-Median Lower-Text Payments and Those Recording Above-the-Median Lower-Text Payments

LOWER-TEXT PAYMENTS	WITH SUPER-SCRIPT	NO SUPER-SCRIPT	TOTALS
OVER MEDIAN	13 7.5	14 19.5	27
UNDER MEDIAN	2 7.5	25 19.5	27
TOTALS	15	39	54

4.03	1.55
2.70	1.04

$$\chi^2=9.32$$

$$.01 > p > .001$$

TABLE 10

Chi-Square Medians Test Showing that the Sums of Installments Paid by Single Persons for the Taxes of Single Years Are Significantly Higher with Respect to their Median than Single Payments Paid by Single Persons

	OVER MEDIAN	UNDER MEDIAN	TOTALS
SINGLE PAYMENTS	28 31.5	35 31.5	63
SUMS OF INSTALLMENTS	11 7.5	4 7.5	15
TOTALS	39	39	78

.3889	.3889
1.6333	1.6333

$$\chi^2=4.0444$$

$$.05 > p > .02$$

TABLE 11

Chi-Square Medians Test Showing No Significant Difference
Between Sizes of Current Payments in Barley and Wheat

	OVER MEDIAN	UNDER MEDIAN	TOTALS
WHEAT	42 41.5	41 41.5	83
BARLEY	6 6.5	7 6.5	13
TOTALS	48	48	96

.006	.006
.006	.006

$$\chi^2 = .088$$

$$.8 > p > .7$$

TABLE 12

Chi-Square Test Showing Significant Difference Between Sizes
of Payments of Wheat for Late and for Current Taxes

	OVER MEDIAN	UNDER MEDIAN	TOTALS
CURRENT WHEAT	45 41.5	38 41.5	83
LATE WHEAT	5 8.5	12 8.5	17
TOTALS	50	50	100

.2951	.2951
1.4412	1.4412

$$\chi^2 = 3.4726$$

$$.1 > p > .05$$

TABLE 13

Size of Current Wheat Payments in the Eight Tax-Phrase Groups

	1	2	3	4	5	6	7	8
MEANS	24.02	18.70	30.30	16.75	6.99	85.92	10.42	[.23]
MEDIANS	10	13 1/3	14 5/12	16 1/4	7 1/2	85 23/25	5 19/20	[1/6]

Size of Late Wheat Payments in the Eight Tax-Phrase Groups

	1	2	3	4	5	6	7	8
MEANS	6.86	17.14	20.67	22.21	---	---	2	[.23]
MEDIANS	6	10 11/12	20 2/3	22 1/5	---	---	2	[1/6]

TABLE 14

Kruskal-Wallis Test Showing No Significant Difference Between Current Wheat Payment Sizes in the Seven Tax-Phrase Groups

1	2	3	4 & 6	5	7
10.5	1 47.5	7	21	2	4.5
16	3 50	8	52	14.5	10.5
17	4.5 54	14.5	67	29	19
25	6 55	22	76	30	24
36	9 56	26	82	37.5	28
40	12 57	31.5	<u>298</u>	<u>45</u>	47.5
43	13 60	44		158	49
53	19 61	46			<u>70</u>
59	19 62.5	51			252.5
80	23 64	58			
<u>81</u>	27 66	62.5			
460.5	31.5 68	65			
	33 69	73			
	34 71	74.5			
	35 72	<u>83</u>			
	37.5 74.5	<u>666</u>			
	39 77				
	41 78				
	42 <u>79</u>				
	1651				

$$\frac{12}{N(N+1)} \left[\frac{r_1^2}{n_1} + \frac{r_2^2}{n_2} + \frac{r_3^2}{n_3} + \frac{r_{4&6}^2}{n_{4&6}} + \frac{r_5^2}{n_5} + \frac{r_7^2}{n_7} \right] - 3(N+1)$$

$$\frac{12}{83(84)} \left[\frac{212060.25}{11} + \frac{2725801}{38} + \frac{443556}{15} + \frac{88804}{5} + \frac{24964}{6} + \frac{63756.25}{8} \right] - 3(84)$$

6.9866

.3 > p > .2

TABLE 15

Chi-Square Medians Test Showing No Significant Difference Between Amounts Paid for Current Wheat Taxes in the Various Tax-Phrase Groups

	OVER MEDIAN	UNDER MEDIAN	TOTALS		
GROUP 1	5 5.5	6 5.5	11	.0454	.0454
GROUP 2	19 18.5	18 18.5	37	.0135	.0135
GROUP 3	9 7.5	6 7.5	15	.3000	.3000
GROUPS 4 & 6	4 2.5	1 2.5	5	.9000	.9000
GROUP 5	1 3	5 3	6	1.3333	1.3333
GROUP 7	3 4	5 4	8	.2500	.2500
TOTALS	41	41	82		

$$\chi^2 = 5.68$$

$$.5 > p > .3$$

TABLE 16

Chi-Square Medians Test Showing No Significant Difference Between Sizes of Current Wheat Payments in Successive Chronological Periods

	OVER MEDIAN	UNDER MEDIAN	TOTALS		
164-150	11 10.5	10 10.5	21	.0238	.0238
148-130	15 13	11 13	26	.3076	.3076
129-119	8 11	14 11	22	.8181	.8181
118-88	5 4.5	4 4.5	9	.0556	.0556
TOTALS	39	39	78		

$$\chi^2 = 2.4102$$

$$.5 > p > .3$$

TABLE 17
 Numbers and Sizes of Payments
 for Wheat and Barley

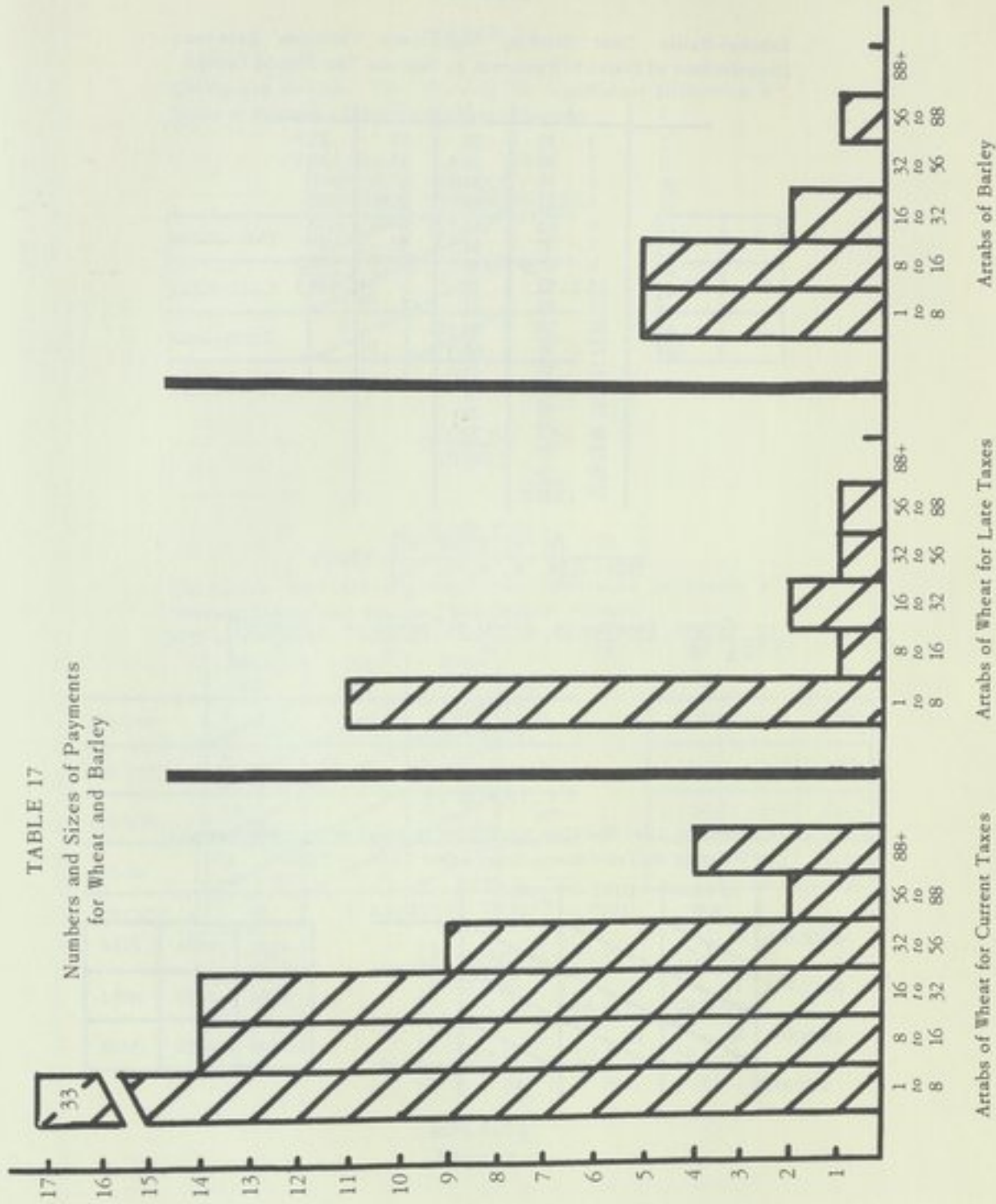


TABLE 18

Kruskal-Wallis Test Showing Significant Variation Between Distributions of Dates of Payments in Various Tax-Phrase Groups

1	2	3	5	7
1	2	31	20	22.5
9	3	34.5	22.5	34.5
10	4	37	24	41
11	5	41	29	49.5
12	6	43	34.5	60.5
13.5	7	46	34.5	63
25	8	47.5	38	297.5
44	13.5	51	39	348.5
53	15	54	41	
68.5	16	55	49.5	
247	17	56	60.5	
	18	57	65	
	19	58	67	
	21	59	71	
	26	62	72	
	27	70	667.5	
	29	73		
	29	1140.5		

$$\frac{12}{N(N+1)} \left[\frac{r_1^2}{n_1} + \frac{r_2^2}{n_2} + \frac{r_3^2}{n_3} + \frac{r_4^2}{n_4} + \frac{r_5^2}{n_5} \right] - 3(N+1)$$

$$\frac{12}{73(74)} \left[\frac{61009}{10} + \frac{1300740.25}{35} + \frac{445556.25}{15} + \frac{88506.25}{6} + \frac{121452.25}{7} \right] - 3(74)$$

$$11.40248$$

$$.05 > p > .02$$

TABLE 19

Chi-Square Test Showing Significant Difference Between Seasons of Payment in Tax-Phrase Groups One Through Three

	APRIL- MAY	JUNE- JULY	AUG- SEPT	TOTALS
GROUP 1	6 3.02	3 5.15	2 2.83	11
GROUP 2	11 9.87	16 16.84	9 9.29	36
GROUP 3	0 4.11	10 7.02	5 3.87	15
TOTALS	17	29	16	62

1.4326	.8976	.2434
.1294	.0419	.0091
4.1100	1.2650	.3328

$$\chi^2 = 9.4528$$

$$.1 > p > .05$$

TABLE 20

Chi-Square Medians Test Showing No Significant Difference in Sizes of Payments Made in Different Seasons

	AT OR OVER MEDIAN	UNDER MEDIAN	TOTALS
APRIL-MAY	11 11	11 11	22
JUNE-JULY	18 16	14 16	32
AUG-SEPT	8 10	12 10	20
TOTALS	37	37	74

0	0
.25	.25
.40	.40

$$\chi^2 = 1.30$$

$$.3 > p > .2$$

TABLE 21

Chi-Square Test Showing Significant Difference in Season of Payment During Successive Chronological Periods

	APRIL- MAY	JUNE- JULY	AUG- SEPT	TOTALS
164-150	4 5.82	14 11.65	5 5.53	23
148-130	2 6.58	15 13.17	9 6.25	26
129-119	10 5.07	7 10.12	3 4.81	20
118-88	4 2.53	4 5.06	2 2.41	10
TOTALS	20	40	19	79

.5690	.4740	.0508
3.1879	.2543	1.2100
4.7939	.9619	.6811
.8541	.2221	.0698

$$\chi^2 = 13.3299$$

$$.05 > p > .02$$

TABLE 22

Numbers of Payments per Month, as recorded
on All the Diospolis Magna Receipts:
Wheat for Current Taxes

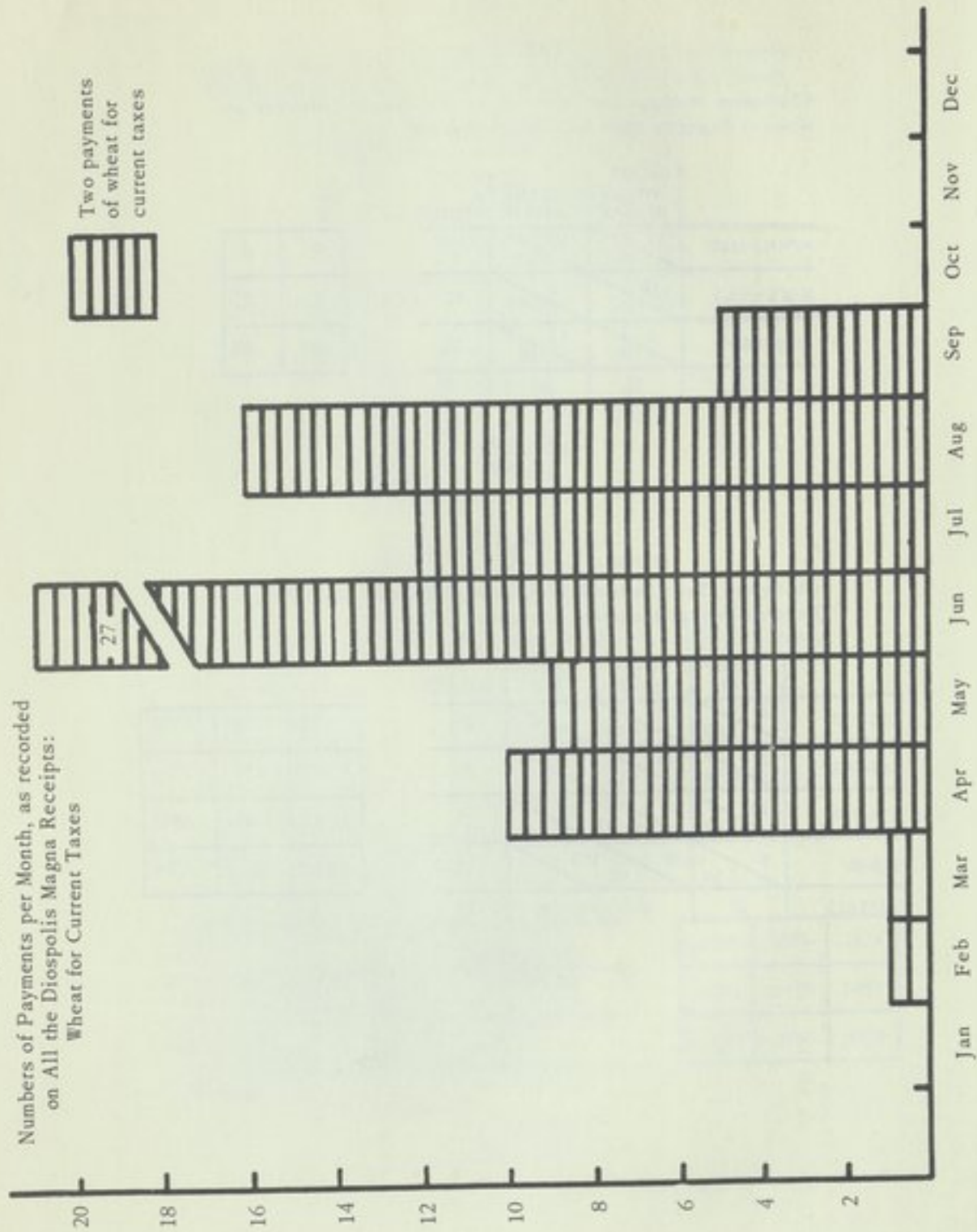


TABLE 23

Numbers of Payments per Month, as recorded
on All the Diospolis Magna Receipts:
Croton and Barley for Current Taxes

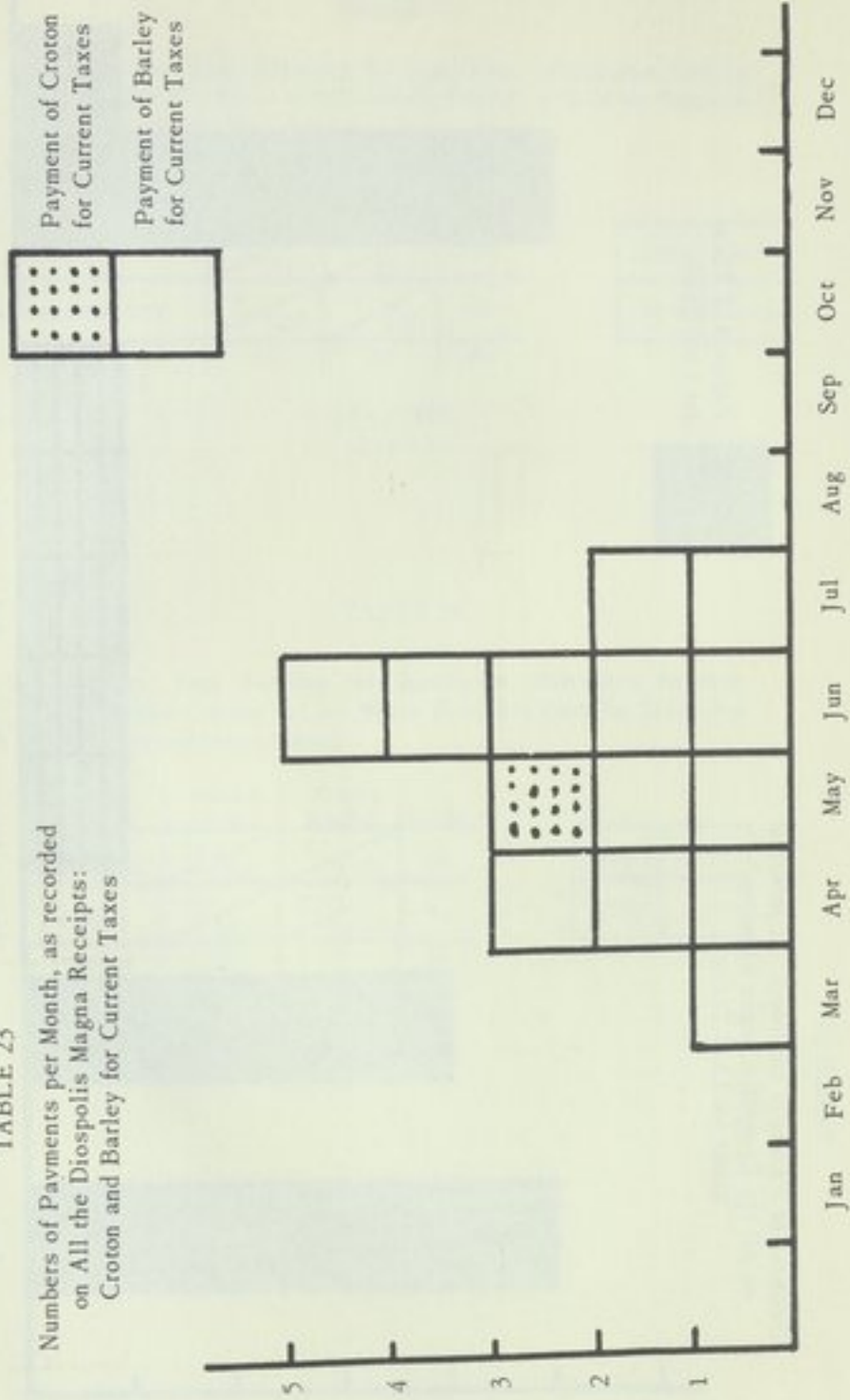


TABLE 24

Numbers of Payments per Month, as recorded
on All the Diospolis Magna Receipts:
Wheat for Late Taxes

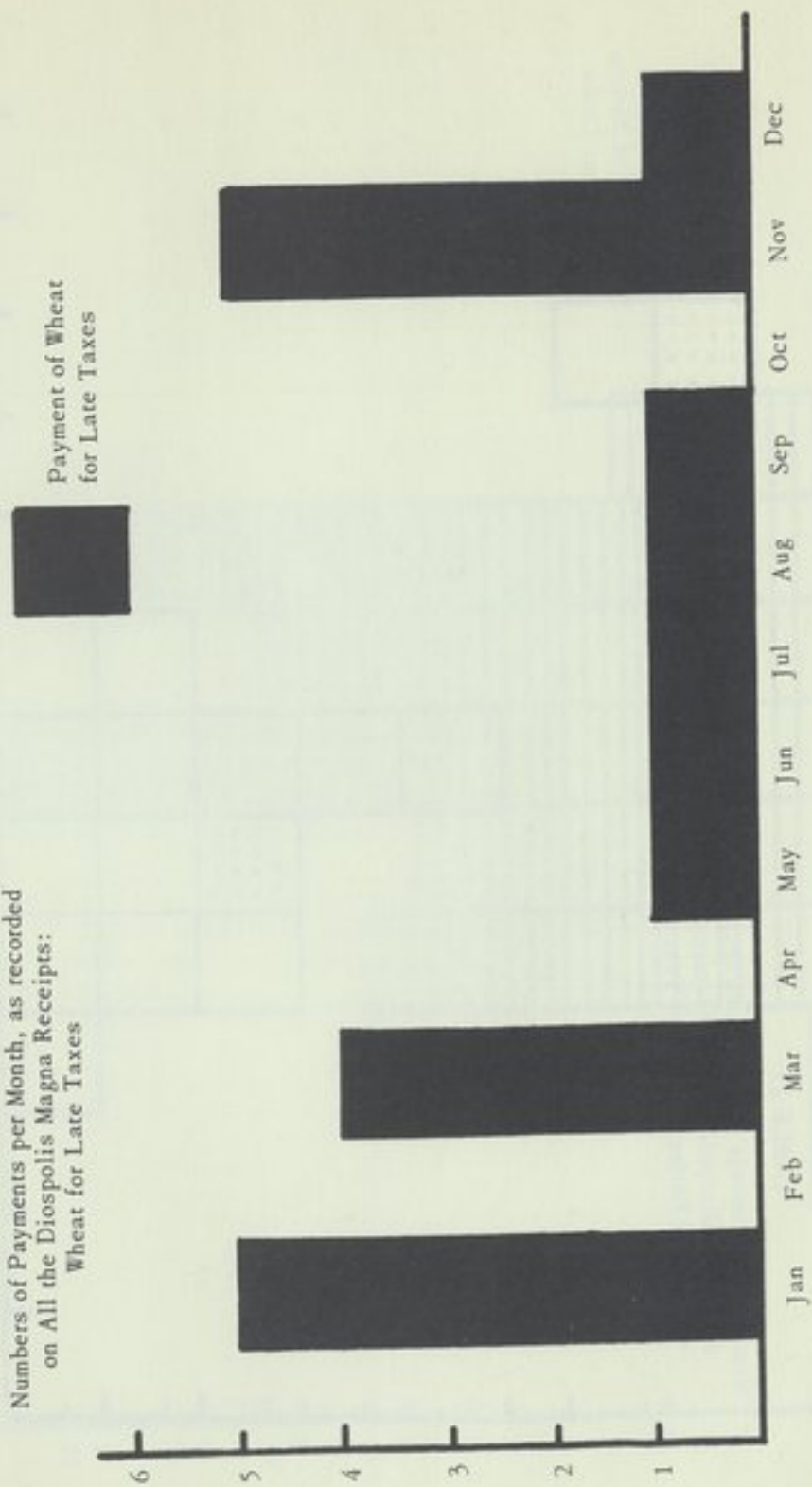


TABLE 25

Chi-Square Test Showing No Significant Difference Between Proportions of Wheat to Other-Grain Payments Made by Taxpayers with Greek and Other Names

	GREEK NAMES	OTHER NAMES	TOTALS
WHEAT	52 53.65	21 19.35	73
BARLEY, ETC.	9 7.35	1 2.65	10
TOTALS	61	22	83

.0507	.1407
.3704	1.0274

$$\chi^2 = 1.7780$$

$$.2 > p > .1$$

TABLE 26

Chi-Square Test Showing No Significant Difference Between Proportions of Current to Late Wheat Payments Made by Taxpayers with Greek and Other Names

	GREEK NAMES	OTHER NAMES	TOTALS
LATE	10 11.15	6 4.85	16
CURRENT	52 50.85	21 22.15	73
TOTALS	62	27	89

.1186	.2727
.0260	.0597

$$\chi^2 = .4770$$

$$.5 > p > .3$$

TABLE 27

Chi-Square Test Showing No Significant Difference Between Seasons of Payments by Persons with Greek and Other Names

	GREEK NAMES	OTHER NAMES	TOTALS		
APR & EARLIER	8 7.8	3 3.2	11	.0051	.0125
MAY	5 5.7	3 2.3	8	.0158	.0391
JUNE	18 17.1	6 6.9	24	.0474	.0117
JULY	8 7.8	3 3.2	11	.0051	.0125
AUG & LATER	14 15.7	8 6.3	22	.1841	.4587
YEAR OR MORE LATE	11 9.9	3 4.1	14	.1222	.2951
TOTALS	64	26	90		

$$\chi^2 = 1.2093$$

$$.95 > p > .9$$

TABLE 28

Chi-Square Test Showing No Significant Difference Between Proportions of Greek to Other Names Among Taxpayers in Various Tax-Phrase Groups

	GREEK NAMES	OTHER NAMES	TOTALS		
GROUP 1	10 11.83	6 4.17	16	.2831	.8031
GROUP 2	32 32.54	12 11.46	44	.0089	.0254
GROUP 3	12 11.83	4 4.17	16	.0024	.0069
GROUPS 4 & 6	7 7.39	3 2.61	10	.0206	.0583
GROUP 5	5 5.18	2 1.82	7	.0063	.0178
GROUP 7	6 4.44	0 1.56	6	.5481	1.5600
GROUP 8	16 14.79	4 5.21	20	.0990	.2810
TOTALS	88	31	119		

$$\chi^2 = 3.7209$$

$$.8 > p > .7$$

TABLE 29

Chi-Square Test Showing No Significant Difference Between Proportions of Greek, Egyptian, and Other Names Among Taxpayers in Tax-Phrase Groups One, Two, Three

	GREEK NAMES	EGYPTIAN NAMES	OTHER NAMES	TOTALS			
GROUP 1	10 11.37	3 3.37	3 1.26	16	.1651	.0406	2.4124
GROUP 2	32 31.27	10 9.26	2 3.47	44	.0170	.0591	.6227
GROUP 3	12 11.37	3 3.37	1 1.26	16	.0349	.0408	.0537
TOTALS	54	16	6	76			

$$\chi^2 = 3.1296$$

$$.7 > p > .5$$

TABLE 30

Chi-Square Test Showing No Significant Difference Between Proportions of Greek to Other Names Among Taxpayers During Successive Chronological Periods

	GREEK NAMES	OTHER NAMES	TOTALS		
164-150	23 24.90	12 10.10	35	.1450	.3574
148-130	27 22.77	5 9.23	32	.7858	1.9386
129-119	17 18.50	9 7.50	26	.1216	.3000
118-88	7 7.83	4 3.17	11	.0880	.2173
TOTALS	74	30	104		

$$\chi^2 = 3.9537$$

$$.3 > p > .2$$

TABLE 31

Runs Test Showing Random Distribution of Greek and Other Names in Chronological Order on Dated Receipts

Number of Receipts = $N = 102$
 Number of Greek Names = $n_1 = 66$
 Number of Other Names = $n_2 = 36$
 Number of Runs = $r = 41$

$$\frac{r - \left(\frac{2n_1 n_2}{n_1 + n_2} + 1 \right)}{\sqrt{\frac{2n_1 n_2 (2n_1 n_2 - n_1 - n_2)}{(n_1 + n_2)^2 (n_1 + n_2 - 1)}}} = Z$$

$$\frac{41 - \left(\frac{2(66)(36)}{66 + 36} + 1 \right)}{\sqrt{\frac{2(66)(36)[2(66)(36) - 66 - 36]}{(66 + 36)^2 (66 + 36 - 1)}}} = -1.4795$$

$$Z \geq -1.48; p = (2)(.0694) = .1388$$

TABLE 32

Chi-Square Test Showing Significant Difference Between Amounts Paid for Grain Taxes by Taxpayers with Greek and Other Names

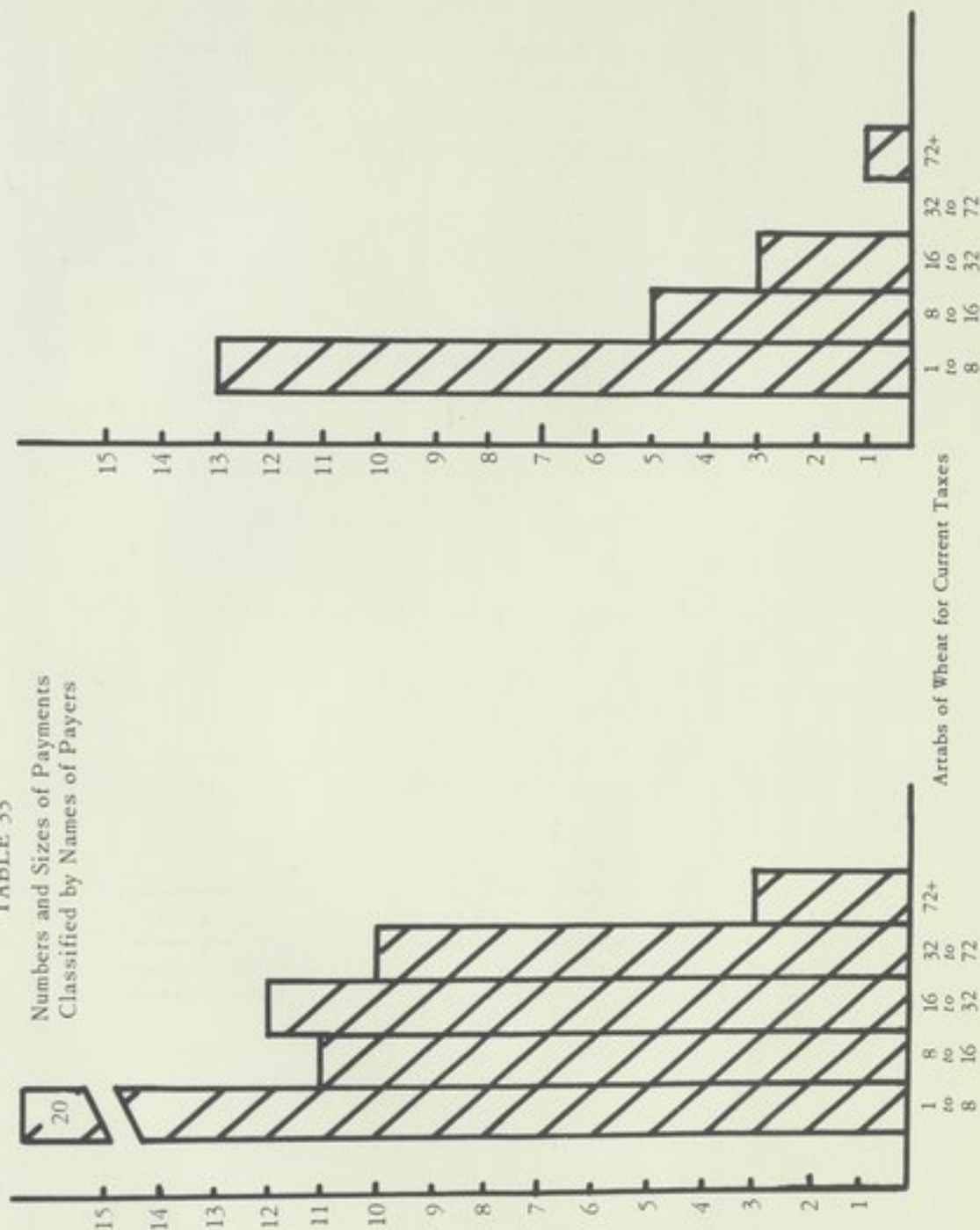
	AT OR OVER MEDIAN	UNDER MEDIAN	TOTALS
GREEK NAMES	44 36.5	29 36.5	73
OTHER NAMES	6 13.5	21 13.5	27
TOTALS	50	50	100

1.5411	1.5411
4.1667	4.1667

$$\chi^2 = 11.4156$$

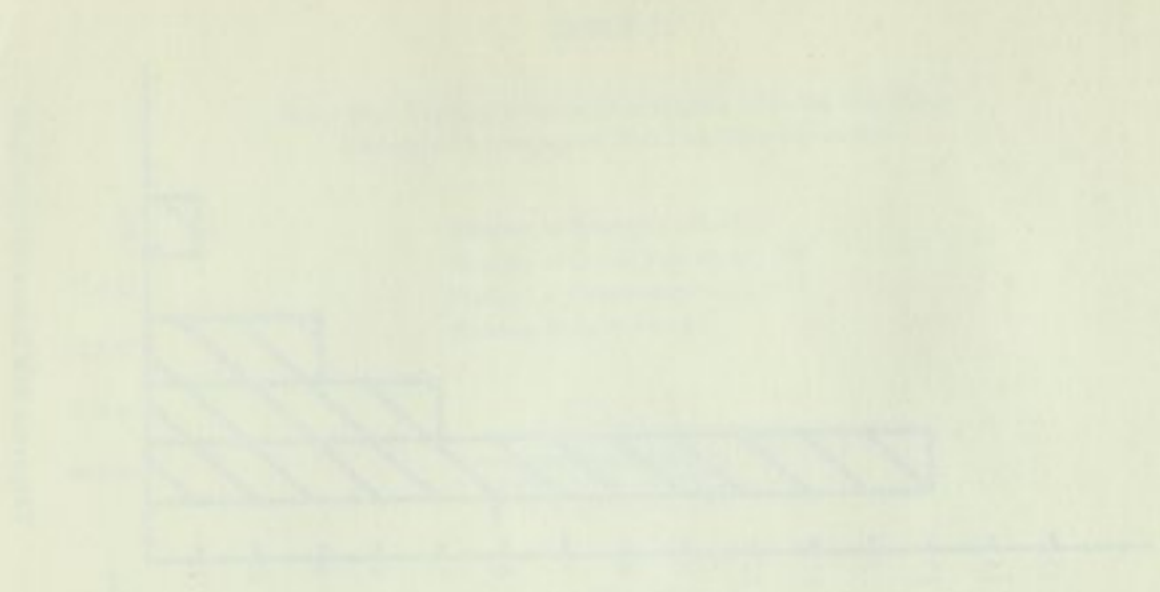
$$.001 > p > .0005$$

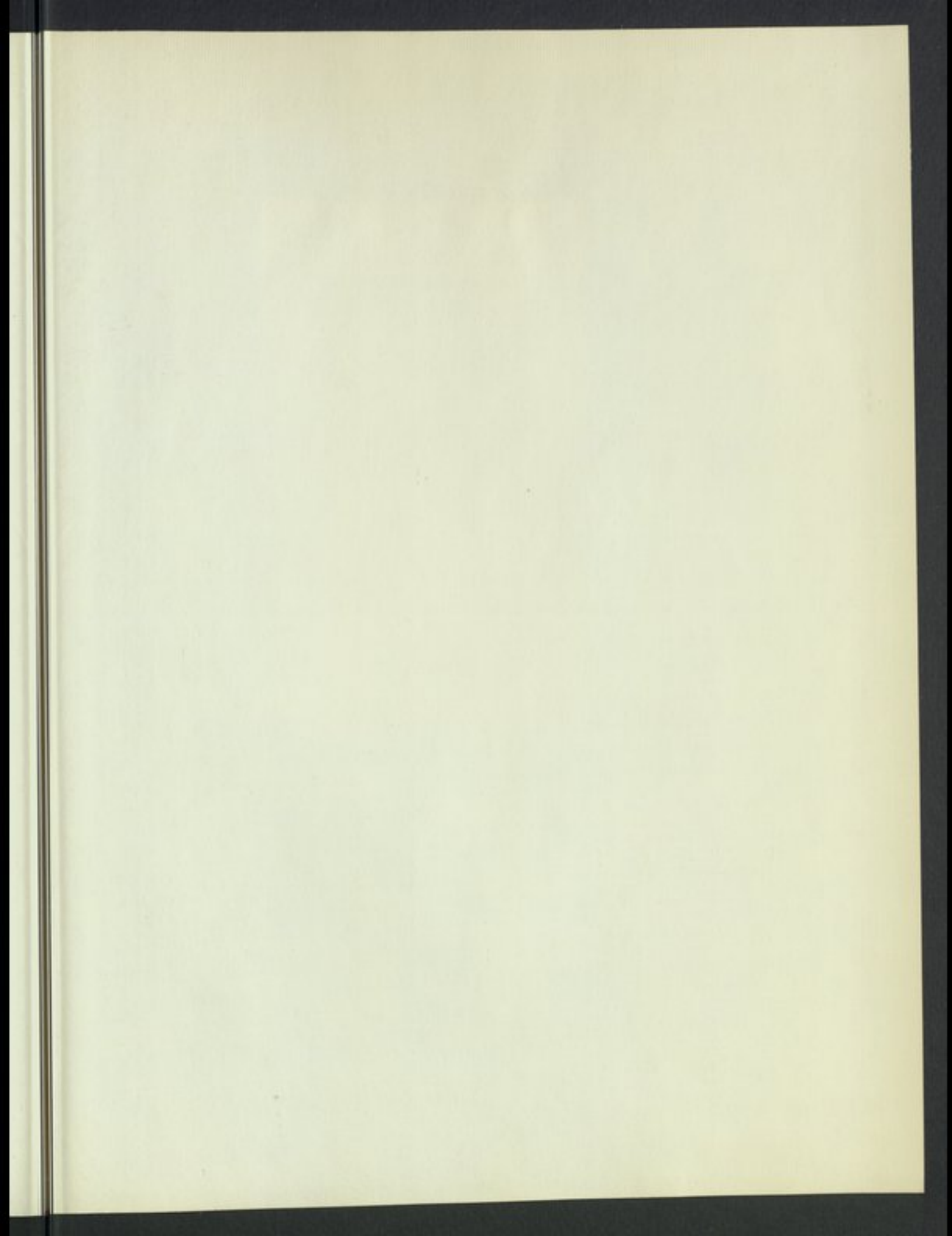
TABLE 33
 Numbers and Sizes of Payments
 Classified by Names of Payers



Taxpayers with Greek Names

Taxpayers with Names of Other Sorts





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