

## SUMMARY

«THE SOUND-SIGNS  
OF THE EGYPTIAN WRITING AS A SYSTEM»  
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The book «The sound-signs of the Egyptian writing as a system» is intended not as a summary of all the already known facts concerning the writing of the Ancient Egyptians but as an investigation of its several aspects, which are neither self-evident nor well-known.

The Egyptians were absolutely independent in creation of their phonetico-ideographic system of writing and borrowed nothing from the other people contemporary with them. But it is still not clear how this system came into being, so far as its inner contents and not its outward form is concerned, the very essence of the system (subsystem) of the sound-signs (phonograms), being the most mysterious.

In fact, two principal moments are unknown to our science: a) Did these hundreds of phonograms exist as a system or were they a purely accidental assemblage of sound-signs? b) What are the Egyptian phonograms, taking into consideration not their outward appearance but their nature in relation to the language. That is with what unit of language the Egyptian sound-signs are to be correlated?

The solution of the latter problem would give us the possibility to determine the place of the Egyptian system of sound-signs among the other phonetic systems of writing and therefore to qualify the general character of the whole system of the Egyptian writing with a greater precision.

An answer to these theoretical questions depends on the solution of several other subordinate problems, for instance, that of a possibility of classification of the Egyptian sound-signs holding to the phonetic principle, whereas the systematization accepted in Egyptology, according to their appearance, has nothing to do with the phonetic side. It is curious to note that these cardinal questions have so far not been answered, although, as is known, more than 150 years have elapsed since J. F. Champollion's decipherment of the Egyptian hieroglyphs. It seems to us that all these problems are solvable if the totality of the Egyptian sound-signs is considered as a system.

Even at first sight it is evident that we have here a compound object of investigation, whose elements (sound-signs) are interconnected, possess the attribute of hierarchy and form an organic whole, that is something more than a mechanical sum.

Therefore it is possible to apply the system approach, which is the foundation of modern scientific knowledge, to the investigation of the Egyptian sound-signs. Only this approach enables, firstly, to determine the purpose, tasks, and scientific principles of our investigation and, secondly, to create such an apparatus of analysis, that will reveal the inner connections and relations of the sound-signs, since a study of any system requires its own method.

As to the character or nature of the Egyptian sound-signs from the point of view of the relations of the phonograms to the language, that is their correlation with any element of language, it depends entirely on the proof of the fact what units of the sound chain of language were discerned by the Egyptians.

Thus it should be borne in mind while reading this book, however unwanted that may seem, that the book does not deal with sounds of the Egyptian language, their quality being almost completely unknown, but is wholly devoted to the problem of conveyance of sounds by sound-signs.

It is also necessary to note, that it is not any particular kind of the old Egyptian writing (i. e. hieroglyphics, semihieroglyphics and hieratic writing), that was here subjected to study, but the writing as a whole, since all the kinds of writing existed in one system.

In this respect it may not be out of place to draw the reader's attention to the fact that the origin of the outward forms of signs in all the kinds of writing previously mentioned don't enter into the limits of our research.

Our investigation of the system of sound-signs concerns those old phases of development of the Egyptian writing, when it reflected the synthetic stages of the Egyptian language (Old and Middle Egyptian). It does not touch Late Egyptian, when the type of language, its phonological and grammatical structure changed, although the earlier outward form of organization of the writing was preserved, the form, which naturally did already not tally with the new contents.

At last, some words about the degree of precision in our numerical data. This investigation is based on the statistical registration of data derived from the Egyptian sources, that is the sound-signs, and consequently, their attributes (the consonants conveyed by them) by the method of the rectangular coordinates in a plane, proposed in our book. It is quite evident, that all our main conclusions follow from the table I—VI compiled by us, which fact gave us an opportunity of reducing our verbal discussion to a minimum. But, of course, the exact initial data on the quantity and

quality of the sound-signs (and, hence, of the two-consonant links) can never be obtained. That is why our numerical data have naturally a relative, not absolute value.

The chapter-headings indicate, on the whole, the plan and scope of the work: Introduction (pp. 7—14); Study of the system (subsystem) of the sound-signs prior to the formation of the system approach (Chapter I, pp. 15—58); The purpose and problems of studying the system (subsystem) of the sound-signs from the point of view of the system approach (Chapter II, pp. 59—66); The internal form of the organization of the system of the sound-signs (the internal connections as a formative factor. Chapter III, pp. 67—132); The outward form of the organization of the system of the sound-signs (the character of the phonograms. Chapter IV, pp. 133—145); Conclusion (pp. 146—148).

In the Introduction there are discussed the general problems which were already mentioned.

Chapter I deals with the brief history of the concepts of the system of the Egyptian sound-signs beginning from the Graeco-Roman Antiquity, that is the history which is prior to the formation of the system approach. This history is not only interesting and instructive from the point of view of the change and development of some notions. It affords a possibility to form an idea of the purpose, problems and tasks of our research. A marked interest to the Egyptian writing makes its first appearance as early as the Graeco-Roman Antiquity.

The three basic periods make themselves transparent in the course of the evolution of the concepts of both general system and its subsystems (especially the subsystem of the sound-signs), the periods which may conventionally be defined as the «antique», «heroic» and «classic» ones.

Unfortunately the authors who have touched upon the problem are neither precise nor accurate with regard to their own opinions and ideas concerning the Egyptian writing, and more often than not replace them either by discourses about the formation of the hieroglyphic writing or by the history of the decipherment. Therefore, we had to reconstruct ourselves the conceptual models of systems and subsystems of the Egyptian writing, which task, as a rule, presented no inconsiderable difficulties. For this purpose we accepted a convenient and visual graphic method of «insertion» well demonstrating how inferior subsystems go into superior ones.

The Graeco-Roman Antiquity (see pp. 16—20) possessed valuable information on the system of the Egyptian writing and its subsystems, e. g. on the general phonetico-ideographic character of this system (see fig. 1), as well as on the presence of two subsystems (Plato), the quantitative structure of the elementary subsystem of sound-signs, the «alphabetic» one, and the starting point of its reading (Plutarch), direction of the signs in a line (Herodotus). Plato in his «Philebus» (18d) made an interesting statement con-

cerning the internal connections existing between the signs of the script («Thot saw that there existed a connection between the signs which led to a unity»), but nevertheless, the idea of a symbolical nature of the Egyptian script was at that time given undoubted preference, as is perfectly clear from the celebrated «Hieroglyphica» by Horapollo.

In the XVIII-th century a number of theoretically interesting evaluations of the general system of the Egyptian script started to be formulated, while some speculative but rather valuable conjectures concerning several aspects of this system, e. g. those of unquestionable existence of sound-signs (W. Warburton, K. Niebuhr), of suppression of vowels and of existence of the semantic determinatives (J. de Guignes) were made.

A «heroic» period in the study of the system of the Egyptian script was opened in 1822 when J.—F. Champollion deciphered the Egyptian hieroglyphs, having defined the general system of the script as a phonetico-ideographic one, and all the sound-signs as alphabetic (almost 260!). The decipherment only then became possible when an amount of practical knowledge of the Egyptian writing was added to a certain theoretical evaluation of the whole system of this script (see pp. 22—25). Champollion distinguished between two subsystems in this phonetico-ideographic system, a phonetic and an ideographic ones, together with three elementary subsystems of figurative, symbolic, and phonetical signs. The founder of Egyptology has thus not completely succeeded in definition of the nature of sound-signs, having combined them in one inferior elementary system in which he, moreover, thought to have found a little less than 50 signs denoting vowels.

In 1837 R. Lepsius reduced this alphabet to less than two scores of the signs which, in his opinion, denoted 12 consonants and 3 vowels. He also put forward a hypothesis concerning the syllabic origin of the alphabetic signs, having thus for the first time raised the question of the nature of the sound-signs in the Egyptian script.

As a great merit on Lepsius's part must be concept of the subsystem of «intermediate» signs which existed side by side with the subsystems of phonetic (alphabetic) and ideographic signs, having included in this subsystem, apart from the properly «intermediate» signs (ideograms used as phonograms), the determinatives (see fig. 5). It is this group of signs from which further subsystems of sound-signs were later singled out.

Lepsius also has a merit of an attempt to put transliteration of the signs of the Egyptian script on a scientific footing. For this purpose he made use of his «standard» alphabet which was created on the basis of the Latin alphabet (see fig. 6). This, one might think, purely technical point reflects the views concerning the vowels as expressed by the Egyptian script which are characteristic of the 60-ies of the last century. According to Lepsius, 7 of the 28 signs of the alphabet denoted vowels.

However, Lepsius, strange as it may seem, had, in contrast to Champollion, an opinion that the ideographic principle was predominant in the system of the Egyptian writing.

Lepsius's partisans, having accepted his idea of a syllabic nature of the alphabet, were first to have singled out a new elementary subsystem in the subsystem of sound-signs, apart from the alphabetic one, the subsystem of syllabic signs. In this respect Bunsen's ideas of a system of the Egyptian script are noteworthy (see p. 34, fig. 7).

Together with this one, Champollion's opinion of a rather more phonetic system of script were being developed in 60-ies and 70-ies of the last century. The adherents of this principle (S. Birch, J. de Rougé, H. Brugsch), having acknowledged existence of the second elementary subsystem of sound-signs (the syllabic one), refused to single out that of «intermediate» or «mixed» signs. Their conceptual models (see fig. 8, 10, 12) when compared with that of Champollion (see fig. 3) show that they are the same as far as the level of subsystems is concerned. The difference between them develops only on the level of elementary subsystems. It may be noted, in passing, that Brugsch himself had drawn up his conceptual model of coordination of structures of system of the Egyptians script and its subsystems (see fig. 11).

One noteworthy detail more — E. de Rougé describes, separately, 15 signs denoting three sounds each without, however, combining them in a specific elementary subsystem. This attitude may be considered as a starting point of forming an idea of a third variety of the sound-signs, apart from the alphabetic and syllabic ones.

The «heroic» period in the study of the system of the Egyptian script was closed 19 September 1874. This day a decision concerning quantity and quality of one of the elementary subsystems of sound-signs, the alphabetic one, was made at the II International Congress of Orientalists held in London (see fig. 13). Six signs of this alphabet were fixed as denoting vowels. A «legislative», not scientific, approach towards the problem marked the end of a period which lasted more than 50 years.

As a chief achievement of the «heroic» period, there should certainly be considered the concept of the general phonetico-ideographic nature of the system of the Egyptian writing. In the field of the subsystem of sound-signs the idea of the letters being subdivided into two varieties of signs, the alphabetic and syllabic ones, was taking a firm root.

Certain ideas concerning external relations between these types of sound-signs were also being formed, e. g. the idea of making use of alphabetic signs as phonetic complements. However, quality and quantity of the signs of the so-called alphabet still remained to be defined, at least were not defined exactly, whereas the idea of the second subsystem of sound-signs being a syllabic one was no-

thing more than a conjecture, which was still to be proved, to be accepted or discarded as worthless.

The subsystem of ideographic signs was reduced to two elementary subsystems of determinatives, whereas concerning other types of these signs scholars were not of one opinion.

In 1889 a new, «classical», period began (see p. 45 f.). By that time Egyptology had accumulated considerable evidence to show the kinship of Egyptian with the Semitic languages and an idea of the suppression of vowels in the Egyptian script quite in line with the Semitic graphic systems had been developed.

In 1889 in the «Zeitschrift für Ägyptische Sprache und Alterthumskunde» appeared a leader, no doubt, written by A. Erman himself, in which the Egyptian alphabet had been fixed as consisting of 24 signs, none among them denoting a vowel (see fig. 15). Thus the structure of one of the elementary subsystems of sound-signs was established for good and all. However, Erman then envisaged as the only type of sound-signs other than alphabetic, the syllabic ones. More than that, in the general system of the script he distinguished «word-signs» which corresponded to the Lepsius's «intermediate» ones from the sound and ideographic signs and in so doing proclaimed these «word-signs», that is, words, as those from which the phonetic ones had developed.

In 1908 K. Sethe defined the alphabetic signs as one-consonant signs and showed that the so-called syllabic ones were in actual fact two-consonant signs. At the same time Sethe singled out the group of three-consonant signs as a separate elementary subsystem. Thus all the three elementary subsystems of sound-signs were determined. In contrast to Erman, the general system of the Egyptian script was viewed by Sethe as consisting of two elementary subsystems, those of sound- and ideographic signs. Sethe's idea did not find universal acceptance. Erman, for example, had never agreed with the idea of existence of the three-consonant signs. But with time, a rather more phonetic point of view had won. In this respect A. Gardiner's conceptual model is noteworthy, being, as a whole, a replica of Sethe's model (see figs. 18 and 17).

Thus during a comparatively short period of time there took place a decisive shift in understanding the structure of the subsystems of the Egyptian script, especially of that of sound-signs. The conclusions reached during the «classic» period are typical and characteristic of a sequence of decades up to this day.

But however important might have been the achievements of the «classic» period, this period did not outgrow the limits of elementarism, which consisted of searches in quest of initial elements, and did not raise the problem of an internal form of organization of the sound-signs, that is, whether they formed a system or just were a chaotic and accidental collection of signs. Neither was this period able to answer, convincingly and unequivocally, the question of a nature of the Egyptian phonograms in their con-

nection with the language, although a number of opinions had been made public concerning their relation to either separate sounds of speech, syllables or words.

In Chapter II which is devoted to the purpose of our book the main problem concerns a possibility of applying the modern system approach to the investigation of the Egyptian script. The word «system» was sometimes used with regard to the Egyptian script even as early as Champollion's time, but it was used in its everyday, colloquial sense of «sum», «totality» of separate elements (signs), which were however studied separately, without any attempt at finding a certain approach or method of investigation. Now efficacy of a system approach has made itself apparent in more fields of science than one and is universally acknowledged, which fact is bound up with the still growing tendency to study phenomena in their interconnections. There is no doubt whatever, that the Egyptian script is a complex object and thus is to be treated on the grounds of the system approach. This approach first of all enables us to see what is to be studied in the system of the Egyptian script. Unfortunately the general system theory has not been fully developed yet and there does not exist and can hardly exist a universal definition of the concept «System».

That is why we take, as a starting point, those characteristic features of the concept «System» which have been elucidated by the author of the general system theory L. von Bertalanffy and his followers. Among these features there is, first of all, a plurality of elements, their interconnections, that is their relations and connections, a cooperation between attributes of the elements, that is relations and connections between inseparable attributes of the elements, their integrity, orderliness, regularity and stability.

To these one may add their hierarchism which presupposes the fact that the element of a superior system forms itself a system. It is evident that these general requirements addressed to the concept of «System» may be applied to the Egyptian script as a specific system.

We are prevailed upon this conclusion by a model constructed by us, the model of a coordination of structures of the system and subsystems of the Egyptian script (see fig. 20). It is almost identical with the models characteristic of the «classic» period but for a further subdivision of the general system of the Egyptian script into two subgroups: those of pronounceable and mute signs (they are outlined with a dotted line), since in the subsystem of ideographic signs which were not phonetic, pictographic and properly ideographic ones were connected with a certain sound complex. It is noteworthy that our model, as a whole, corresponds with the hierarchy of systematical groups in biology (see p. 64, n. 9).

By connecting the main features of the modern concept of «System» with what remained unelucidated during the «classic» period one is led to a conclusion that an important problem of connections

and relations between the attributes of sound-signs, that is, qualities that are inseparable from them, or to be more precise, between consonant structures of the signs, has altogether not been touched.

Therefore, the system of the sound-signs possessed two forms of organization. One of them (the external form or structure, that is, the signs themselves and their connections in the writing) has more or less been investigated, apart from the problem of the nature of the Egyptian phonograms in relation to a unit of speech.

But the internal form of organization of the sound-signs, that is, an inner hidden mechanism of fundamental and leading relations and connections between the attributes of the sound-signs (consonants) or a formative factor (i. e. system-forming factor), is still unknown.

It is to be added only that existence of the two forms of organization for the system of sound-signs is undoubtedly bound up with the fact of this system having two kinds of surroundings: the general system of writing and speech. The external form (structure) of phonograms was a means of connection with the general system of writing whereas the internal form was the same with the source of the phonetic writing, speech.

Chapter III contains the main part of the book. In it the internal form of organization of the system (subsystem) of sound-signs is investigated, that is, the internal relations as a system-forming factor.

Any system has its own scientific principles of investigation together with a certain method of investigation. Solution of the problem which interests us here depends on an abstract dismemberment of attributes of the sound-signs, that is a dismemberment of consonantal complex denoted by them into further indivisible elements with the purpose of comparison of their behaviour and connections.

In search of such an apparatus of dismemberment we are helped by a consideration of any alphabetic system. Every one of them possesses a certain order in a sequence of letters along an imagined alphabetic line. The conventional length of this line is determined by a number of letters of the alphabet and so the alphabetic line is a linear number. An alphabetic line has a starting point of reading (the first letter of the alphabet) and an end of reading (the last letter), every separate letter being a linear unit of scale and, moreover, in accordance with the rules regulating any alphabetic system given the alphabetic line has a direction. Therefore the ideal alphabetic line plays a role of the alphabetic axis on which may count off the bearings of separate letters.

A consideration of the alphabet as an alphabetic line whose conventional quantity can be determined by one dimension corresponds to a one-dimensional concept of the alphabetic system, while attaching an exceptional importance to the Egyptian «alphabet»,

does indeed reflect a firm prejudice in favour of any sound system of script being necessarily of a *linear* or *one-dimensional* nature.

However, the very existence of an immense number of two- and three-consonant signs demands rejecting this prejudice when studying the system of the sound-signs of the Egyptian script. These signs cannot be counted off on one axis since neither the starting point of their reading, nor a linear measure, neither the end of their reading, nor, at last, their direction can be determined.

A qualitative predominance of the two-consonant signs over the other sound-signs leads one to the conclusion of a probability of the *two-dimensional* concept of the script, that is, the script considered as system arranged in a plane.

That is why the scientific principle of studying of the internal form of organization of the Egyptian script must be an analytic one, that is it must consist in a dismemberment of attributes of the signs into component members by two independent alphabetic axes having common starting point and end of reading. Since, apart from the two-consonant signs, there were the elementary subsystems of three- and one-consonant («alphabetic») signs, our premise presupposes a necessity of the latter's simplification into *two-consonant links*, which as well as the two-consonant signs can be arranged in a plane as a place of registration, dismemberment and comparison of the two-consonant links and their formative elements by two dimensions.

It is especially noteworthy that we attach no attributes to the sound-signs (for instance the phonetic value), but confine ourselves to a fixation of the bearings of the two-consonant links formed by them as well as that of their attributes. Although the object of our investigation possesses no geometric nature, a geometric image formed by the system of rectangular coordinates resembling that of Descartes may serve as a convenient working apparatus of effectuating of the principle outlined above.

As is known, the Cartesian system serves as a means of establishing the bearings of any point in a plane by pair of numbers. Apart from that this system is often made use of in tables and graphs to visualize a functional dependence between two quantities. It is important to us that with the help of this system we are making a step from the one-dimensional concept of sound-signs towards the two-dimensional one, in a plane, thus determining the bearings of two-consonant links by two alphabetic axes, whose point of intersection serves as the origin and as a starting point of reading of the links.

But seeing that the Egyptian signs could not have a direction from the bottom upwards we were obliged to turn the quadrant I having two positive directions of the axes by  $90^\circ$  as the watch goes (see fig. 21). Thus placed, the quadrant is convenient as a surface to put the two-consonant links on by the two consonants which form them. For this purpose we divided both the axes into 24 equal

sections (unities of scale), by the number of the signs constituting the Egyptian «alphabet». Having drawn direct lines parallel to these axes through the points of intersection of those sections with the axes, we have obtained a grid consisting of 576 squares (see fig. 22), which is the number of all the combinations possible between two consonants of two-consonant links.

Our main task has thus presented itself in singling out practically all the two-consonant links, which in actual fact existed in the script, out of the Egyptian two-consonant and three-consonant signs as well as the words written by the one-consonant signs for the purpose of fixing them on the grid and elucidating the behaviour of their attributes. It is to be added that the horizontal axis was taken as the axis of the second consonants of two-consonant links, whereas the vertical one is the axis of the first. That is why the numeration of the signs in all the tables (it is given in square brackets) has the direction from above downwards for the second consonant and from left to right for the first one.

Before proceeding to singling out the two-consonant links we had shortly to describe the sound-signs of the Egyptian writing with the view of determining their conventional quantity (pp. 75—81).

We have thus singled out 188 two-consonant signs according to their possibility to express the specific combinations of the consonants (159 of them are externally differentiated) and 133 three-consonant signs (110 of them are externally differentiated). If to add to this number, the 36 one-consonant signs for 24 Egyptian consonants (33 of them are externally differentiated), one is justified in forming the conclusion, that quantitatively the system of sound-signs consisted of 357 signs, whereas 274 of them were externally differentiated. This number equalling approximately a half of all the signs in use, whereas the ideographic signs were also, at least in part, pronounceable (this fact is indicated in our model on fig. 20). This formal estimation alone shows, by the way, a predominance of the sound principle in the Egyptian script. One may easily fix, in the grid, all the means of denoting the two-consonant links possible in the Egyptian script by both the two- and one-consonant signs. As for the three-consonant sound-signs, they may be dismembered into two two-consonant links formed by the first and second consonants (or by the «left» part of the sign) or by the second and third ones (or by the «right» part of the sign), that is, on the principle «2 consonants (+1)» or «(1+) 2 consonants». For example, the sign *nfr* is twice fixed as *nf(+r)* and *(n+)fr*.

A consideration, with the help of the grid, of the two-consonant links (see table I and a subsidiary table on p. 83), denoted by the two-consonant signs at once reveals a certain paradox. The 188 two-consonant signs were not at all active in rendering two-consonant links of different kinds, having conveyed, of 576 theoretically possible links, just 138. For example, going by the alphabe-

tic axis of the second consonant, in five cases all the 24 links could altogether not be rendered (those having *f*, *h*, *h*, *š*, *g* as the second consonant). Whereas going by the axis of the first consonant no link can be rendered with *d* as the first consonant.

438 «white spots» (i. e. blanks) among the 576 squares in table I obviously show the necessity of compensating or making up for deficiency by signs of other kinds. When three-consonant words were written out by two-consonant signs we encounter a curious phenomenon that may conventionally be termed as «a falling out of the two-consonant chain» the necessity of which remains unexplained by us (see pp. 84—85). The matter is that a two-consonant sign + a one-consonant one or a one-consonant + two-consonant signs are often used for writing down a three-consonant word, but sometimes a special three-consonant sign is used instead. So we have an example of duplicating the sign used to denote the two-consonant links.

Thus we see, by the example of the two-consonant links expressed by two-consonant signs, the necessity of compensating or making up for their deficiency by other signs and a possibility of duplicating them by other signs.

133 three-consonant signs could render not more than 95 two-consonant links of different kinds by their two first consonants (i. e. the «left» part. See table II and the subsidiary table on pp. 87—89). But it is only in two cases that all the 24 links by the second consonant could altogether not be rendered (those having *h*, *k* as the second consonant), and only in one case with the first *h*.

It is evident that the two-consonant links formed by the first and second consonants of the three-consonant signs were considerably less numerous than the links rendered by the two-consonant signs (138 and 95). Nevertheless even the three-consonant signs could render the links which were lacking in the two-consonant signs (e. g. 3 links with *f* as a second consonant and 3 links with *d* as a first one). In all, there appears about 50 absolutely new links (see p. 90). On the other hand, the three-consonant signs could altogether not render, by their initial two consonants, a little more than 90 links expressed by the two-consonant signs.

Almost the same conclusion is reached when the links formed by second and third consonants (i. e. the «right» part) of the three-consonant signs are considered. The links of this variety were as many as 94 (see table III and the subsidiary table on pp. 92—94).

It will not be out of place to point out a curious fact in the field of the organization of the system of the sound-signs, that the three-consonant signs were selected in such a way that the number of the links formed by their «left» and «right» parts was almost the same (95 and 94!).

Investigating the right-hand links of the three-consonant signs we conclude that it is in 5 cases that all the 24 links by the alphabe-

tic axis of the second consonant could not be expressed (in other words, there could not exist the three-consonant signs with *h*, *h*, *s*, *š*, *k* as the third consonant). So far as the alphabetic axis of the first consonant was concerned, there were gaps, in all the 24 links in two cases only, with *h* and *k* as the third.

Nevertheless the three-consonant signs were able to express about 30 completely new links by their «right» part and these links fill the gaps left by the two-consonant signs. However, the «right» part of these signs cannot express more than 120 links rendered by the two-consonant signs and by the «left» part of the three-consonant ones.

Nevertheless the 133 three-consonant signs denote, by their «right» and «left» parts, 155 links (see the cumulative table 4 on pp. 97—101), and, as a rule, these links did not coincide with one another. The three-consonant signs gave greater quantity of links than the two-consonant signs, but these links were limited in their function by the third consonants from left and right.

Going back to the two-consonant signs we find out that only in 67 cases of the 138 separate links these signs fill the gaps left by the three-consonant ones. As a rule, the two- and three-consonant signs denoted different links although there are cases of duplicating the same links. In all, these signs formed 221 two-consonant links, thus compensating and duplicating one another.

Immediately there arises a question for us to answer: in what way the remaining 355 links of the 576 theoretically possible were formed?

To solve this questions we must follow only one way — to study behaviour of the third elementary system of sound-signs, i. e. that of the one-consonant or «alphabetic» signs, but to study them not in isolation but from the point of view of their capacity to create two-consonant links.

An investigation of the spelling of Egyptian words made in this very aspect reveals an overwhelming picture of almost unlimited possibilities these «alphabetic» signs had, to create the two-consonant links. Table III clearly shows that the one-consonant signs could form 457 (!) links of the 576 theoretically possible, that is twice as much as all the remaining sound-signs could. Moreover, 240 links could be formed only by the one-consonant signs. Therefore, the one-consonant signs could not only render all those 221 links which the signs of other kinds were able to express, by duplicating them, but, in addition to this number, also form 240 links, filling the gaps left by the other signs. Thus we are entitled to an assertion that the links which even the one-consonant signs could not form could be expressed by no other signs.

Significance the Egyptian «alphabet» had and the role it played are now revealed to us from a completely new point of view, quite unsuspected earlier, and this point of view is not of an external kind but an internal one. Its external, if one may say so, significance

is rather modest. It chiefly concerns the use of «alphabetic» signs as phonetic complements to ascertain reading of that part of the phonetic complexes of words that was expressed by the other sound-signs as well as independent letters to write a limited number of short words with. Whereas its internal importance lay in their capacity to create 240 two-consonant links and to duplicate 221 still more, which could also be expressed by the other signs.

Champollion, being a man of genius, intuitively felt an outstanding importance of the Egyptian «alphabet» but estimated its importance on the basis of the large number of signs singled out by him which he considered to be alphabetic ones. However, importance of the signs of the «alphabet» (36 in all, together with the homophones, 33 of them are externally differentiated for 24 Egyptian consonants) does not concern a quantitative aspect but wholly lies in a qualitative one and depends on their unlimited capacity to create two-consonant links.

Having investigated the possibilities of all the three elementary subsystems to create two-consonant links, we can now attempt at reaching the main purpose of our work — to specify the internal form of organization, the hidden mechanism of leading connections and relations between attributes of the sound-signs (consonants), that is, the connections capable to form a system, using interrelationship of the two-consonant links as a ground.

Having combined all over main tables (tables I—IV) we can now mentally imagine a cumulative one of the two-consonant links rendered by all sorts of the sound signs. To make this table visual we chose the method of a «phonovision» in which every single elementary subsystem is designated by its own mark (e. g. several kinds of hatching).

Table V drawn along these lines clearly demonstrates that there are no complete empty rows by the two alphabetic axes, whereas in the majority of cases all the 24 squares are filled (see also cumulative table 6 on p. 105 and a table of comparison on pp. 108—119). Table V shows all kinds of formation of all the 461 two-consonant links of the 576 theoretically possible and all peculiarities of such a formation.

Quantitative peculiarities of duplicating the links by the sound-signs seem to be such as shown on table on pp. 119—122. By the number of the two-consonant links (of the 461 possible), the sound-signs arrange themselves as follows:

1. One-consonant signs alone . . . . .	240
2. One- and two-consonant signs . . . . .	65
3. One-consonant signs+the «left» part of the three-consonant signs . . . . .	37
4. One-consonant signs+the «right» part of the three-consonant signs . . . . .	34
5. One-consonant signs+two-consonant signs+the «left» part of the three-consonant signs . . . . .	23

6. One-consonant signs+two-consonant signs+the «right» part of the three-consonant signs . . . . .	25
7. One-consonant signs+the «left» and «right» parts of the three-consonant signs . . . . .	12
8. All kinds of signs . . . . .	21

These data shows that all the two-consonant links were divided, according to the means of their expression by the sound-signs into 8 groups, whereas duplication of the links depended on both a qualitative type of the sound-signs and certain quantitative interrelations. The two- and three-consonant signs were not endowed with the capacity peculiar to the one-consonant signs, independently to create two-consonant links. They duplicated on another and were themselves duplicated by the one-consonant signs according to several definite rules. Thus, the links formed by the two-consonant signs needs must be duplicated by the links created by the one-consonant signs or by those of the «left» or «right» parts of the three-consonant signs. And if, for example, a two-consonant link expressed by a two-consonant sign could not be duplicated by a link constituted by the one-consonant signs, neither could it be duplicated by the links extracted from the «left» or «right» parts of the three-consonant sign.

There also existed certain quantitative relations between the links. For instance, the number of the links rendered by the one-consonant signs and the «left» part of the three-consonant ones almost equals that of the links similarly (but with the «right» part instead) formed: 37 and 34. This is also true of the links which were duplicated by the one- and two-consonant signs and the «right» parts of the three-consonant ones and the same and «left» part instead: 25 and 23.

There must also have existed a certain regularity in selection of the sound-signs whose links duplicated one another in accordance with the direction of the alphabetic axes. For instance, all the two-consonant links with *š* as the second consonant were rendered either by the one-consonant sign only or the two-consonant signs only or at last both the one-consonant signs and the «left» part of three-consonant signs, whereas the links having *h* and *k* as the second consonant were rendered either by the one-consonant alone, or by both the one-consonant and the two-consonant signs.

Therefore the sound-signs did not simply co-exist side by side with one another thus forming a haphazard collection or a mechanical sum of signs but constituted a system built on complex formative relations. As an internal formative factor of this system served the functional interrelationship of signs which found its expression in compensating by one elementary subsystem of sound-signs the deficiencies of another, as well as in a certain internal regularity of duplicating these links by the sound-signs.

As any phonetic system of script, the Egyptian one was created

to reflect the auditory speech, that is a system of different nature. But any alphabetic script was invented to render by its 20—40 letters, separate sounds of speech, the phonemes, thereby *statically* reflecting the auditory speech. The Egyptian system of more than 350 sound-signs did not render separate sounds of speech, but more than 460 pairs of consonants which it was possible to arrange in pairs in Egyptian. Thus the sound-signs of different kinds did not serve as means of rendering these links independent one another, but were functionally bound up, thereby *dynamically* reflecting the sequence of sounds of speech. In other words the dynamical, compensatory and duplicating function of the three kinds of sound-signs when rendering the two-consonant links constituted the internal form of organization, the formative factor of the system of the Egyptian sound-signs.

As was already mentioned, of the 576 theoretically possible two-consonant links we could extract not more than 461, whereas 115 squares in the grid remained empty (see table V and the subsidiary table on pp. 124—125).

The problem of these gaps is of utmost importance. They make evident the impossibility of formation of a number of the two-consonant links in writing and accordingly impossibility of close proximity for the same number of sounds in speech. Among these «white spots» 36 pairs of links (72 links) constitute mirror reflexions of each other (e. g. *h'* and *'h*, *pb* and *bp*, etc.). This symmetry is possibly thus revealed as a feature determining the internal form of organization of the system of sound-signs but this conjecture calls for a thorough investigation. However, some of the blanks can be filled by the two-consonant links extracted from foreign names written in Egyptian (Nubian, Semitic, etc., see p. 127), which fact is certainly interesting for those who study these allophonological systems of language and script.

The «white spots» can also, in part, be filled by the two-consonant links reflected by Late-Egyptian words (see p. 127). This peculiarity reveals tremendous phonological changes that took place in Late-Egyptian but this question certainly calls for a special investigation.

And now, the last observation concerning the internal form of organization of the Egyptian sound-signs: was this organization realized by the Egyptians themselves, and if so, to what extent?

Strange it may seem, this question must be answered affirmatively. It follows from their two-dimensional approach towards their sound-signs in classification. As is known, the Egyptians had training appliances for memorising the signs. In some of these reference-texts the signs were grouped together on phonetic principles. In the so-called «Hieroglyphic Dictionary» of the I century A. D. (Pap. Carlsberg VII) on two pages preserved the signs were arranged, first of all, by the first sound (see pp. 129—130), that is, we might

say, by the alphabetic axis of the first consonant (fig. 23). But nevertheless the second-consonant was also taken into consideration. This our surmise is proved by comparison of the arrangement of some of the signs in the «Hieroglyphic Dictionary» and in our Tables (see p. 130).

Although the «Hieroglyphic Dictionary» reflects the concepts of the script characteristic rather of the late period in the history of Egypt, it preserves an intuitive approach of the Egyptians to the classification of the sound-signs in two dimensions.

The same approach was in all probability preserved even by the Copts who in their exercises for learning the alphabet by heart used to group the letters by pairs of consonants, thereby creating the two-consonant links. This fact is indicated by a school-exercise of the IV century A. D. on papyrus and another one preserved on the wall of the tomb N 23 in Beni Hasan (see p. 132, n. 31, 32; p. 131, fig. 24).

The Egyptians, even on abandoning their original script for the static system of the alphabetic writing kept in their memory the dynamic relations of their old system of sound-signs.

In the last chapter (IV) the most important aspect of *external* form of organization of the sound-signs is being investigated, that is, the character and nature of the sound-signs are determined. The solution of this problem wholly depends on an answer to the question, with what unit of the spoken chain the Egyptian sound-signs can be correlated, as for instance, the letters are correlated with the phonemes and the syllables with the syllabemes.

It is quite evident that the Egyptian phonograms were not letters, that is, they did not denote separate phonemes, the phonetic signs consisting of the one-, two-, and three-consonant signs. Neither were they syllabemes, so they could not be traced back to syllables. The conjecture of the syllabic nature of phonograms was rejected as early as the «classic» period in connection with establishment of the fact that the so-called «syllabic signs» were in actual fact the two- and three-consonant ones. To this we may add that syllables as purely phonetic units are not connected with sense and therefore cannot be expressed by signs having a certain semantic value, that is, by pictures of objects, which fact is so perfectly instanced by the Egyptian signs. At last, in connection with a limited number of syllables in a language, the Egyptian syllabary could not consist of 350 signs. Neither can the Egyptian sound-signs be correlated with words, although the latter are semantic units of language, and this fact is demonstrated by spelling of phonograms themselves. It is known that all the Egyptian words (with but rare exceptions) were followed by a sense determinative. If the sound-signs had originated in words, they would have preserved their determinatives. But this is never the case with the Egyptian sound-signs and therefore they could not be correlated with words.



It is clear that the Egyptian sound-signs must be correlated with some other unit of language that must have a semantic value which fact is witnessed by the outward form of signs. In order to determine this phonetic unit one must direct one's attention to the way in which the Egyptians themselves realized the segmentation of their spoken chain.

We have no treatises dealing with this problem but a conclusion about it can be formed on the basis of graphic device of using specific semantico-syntactical signals, the «red points». As we had earlier established, they were used for segmentation of literary texts into syntagmas, the units, first of all, semantic. A syntagma could coincide either with a sentence, a part of a sentence, a word-group (i. e. grammatically connected autonomous words), or a single word, that is the syntagma could not be considered a source-unit of origin of phonograms. But it is of utmost importance that the Egyptians did realise the segmentation of their spoken chain as a whole into elements having a semantic value and not a phonetic and a grammatical ones. This fact definitely directs us to a search of such a unity of language, correlated with the Egyptian sound-signs, but only among *semantic* units.

Such a limit-unit further indivisible and retaining a semantic value can only be constituted by a semantic part of the word, the *morpheme* (i. e. prefix, root, suffix, ending).

We may describe certain features characterizing the morpheme as a morphological unit. The morpheme does not constitute an independent unit, being a word-element. Therefore it possesses, unlike the word, no nominative function. But the morpheme expresses a certain concept, that is, it has a certain meaning. Morphemes express concepts both objective and grammatical. The first morphemes are radical, the second ones — grammatical, auxiliary, denoting grammatical attributes and relations. The morpheme has no motivated connection between the phonemes which constitute its phonetic shell and its semantic value (beside a few onomatopoeic morphemes). At last, the morpheme as a word-element is a repetition-unit. Therefore it serves as a material for construction of words as much as the words for word-groups and sentences.

All the features mentioned which characterize the morphemes are applicable in their entirety to the Egyptian morpheme (see pp. 138—139). One thing is certain, that the Egyptians who did not single out purely phonetic units of language (phonemes and syllables), nevertheless felt all the semantic elements of speech, including those which we now call morphemes. This is indicated by accurate spellings of all the auxiliary morphemes, the affixes and inflexions.

The Egyptian sound-signs have striking similarity with the morphemes.

Like the morphemes, they do not constitute independent units but are also part of words written phonetico-ideographically. The Egyptian phonograms, like morphemes, had no nominative function, but they were not void of a semantic value which fact is demonstrated by the outward pictorial form of signs. One may single out, among the phonograms, signs of the type of the radical morpheme and of that of auxiliary ones. The Egyptian phonograms, like morphemes, has no motivated connection between their attributes (i. e. consonants) and outward form, apart from just a few of the onomatopoeic character. At last, sound-signs like morphemes, were repetition-units. It is in possibility of repetition of phonograms as integral and ready units for expression of a certain set of consonants that the essence of the Egyptian script lies.

Out of all these facts one may deduce that the Egyptian sound-signs, in their relation to the language are connected with morphemes, or, to be precise, with the consonantal patterns, the possessors of meaning.

One may think that the astonishing internal form of organization of the system of the Egyptian sound-signs, which was investigated above and shown to be based on the principle of dynamic compensating and duplicating of the three kinds of the sound-signs, when they render the two-consonant links, reflected peculiarities of the system of the Egyptian morphemes. In general it would be tempting to see, in the about 350 phonograms established by us, a more or less precise estimate of basic morphemes in Egyptian, existing at the moment of the beginning of the creation of the Egyptian script, i. e. at the very end of the IV millennium B. C. Appearance of the one-, two-, and three-consonant signs is no doubt connected with the existence of one-, two-, and three consonantal morphemes.

It will not be out of place to mention here that one-consonant signs are not alphabetic, since they did not correspond to phonemes but to the simplest morphemes, consisting of one consonant. Now even that paradoxical fact, well known to Egyptologists that the earlier specimens of writing are more «phonetic» than later ones, since the bulk of words were then written only by the alphabetic signs, can very well be explained. As a matter of fact, these writings are not more phonetic ones but just more primitive, for they use the simplest one-consonant signs.

The Egyptians thus created a very interesting phonetic script. Like any other phonetic script, it denoted sounds of speech, but not separate sounds, but sounds in complexes, based on the sound structure of morphemes. Such a system of phonetic script may be qualified as a separate type, morphemic one. This type of script also known with other people. But since the Egyptians paid no regard to the vowels in the script their system of writing may be termed a *consonanto-morphemic*, that is, defective morphemic script. This type of writing we can so far establish with the Egyptians

only. Its relation to a morphemic script may be compared with the relation of some consonanto-alphabetic system (the Phoenician script, for example) to a phonetic one, including vowels (the Greek script, for example).

As for the sound-signs of the morphemic script, by their nature, they are *morphegraphemes*, that is, phonograms reflecting a certain combination of phonemes in a morpheme. Taking the consonantal nature of the Egyptian writing into account, one may term its sound-signs as *consonantal morphegraphemes*, that is one-, two- and three-consonant phonograms correlated to the consonantal shell of the Egyptian morphemes.

Now the consonantal morphegraphemes of the Egyptian script (more than 350 sound-signs) may be classified, not by their outward form, but by their consonantal contents. For this end we have applied the method of rectangular coordinates, that is, having fixed the position of a consonantal morphegrapheme in a plane in relation to the two alphabetic axes (see table VI). Naturally, it was simple to do it for the two-consonant signs (cf. table I), whereas the three-consonant signs we included by their «right» part, that is, by their 2<sup>nd</sup> and 3<sup>rd</sup> consonants (cf. table III). But to bring the simplest, one-consonant signs, into the Table, we were obliged to regard them as signs with the second «zero-consonant» and to measure, on the alphabetic axis of the second consonant, one more section corresponding to this zero-consonant. We thus have obtained an additional vertical column with the numeration accepted in this Table in square brackets, from 1° to 24°, thereby having multiplied the number of squares in the Table to 600. It should be noted here that the Egyptians themselves did not distinguish between the one-consonant signs and the ether signs in any way and when classifying them placed them among the other signs (see p. 130, cf. fig. 23).

In all, as is known, we have singled out 357 sound-signs, whereas 274 of them were externally differentiated. It is to be hoped that the classification of the Egyptian consonantal morphegraphemes will result in a further study of the sound-signs.

In conclusion we should like to dwell upon two interesting problems. The first one touches the estimate of the nature of the Egyptian writing on the highest level of a general system, that is the estimate of the type of the Egyptian writing as a whole. It may be termed as a *consonantal morphemico-ideographic writing*, whereas it should be borne in mind that the phonetic nature in this writing was predominant over the ideographic one, but in aspect quite out of the ordinary — in rendering the sounds of speech in fixed complexes.

Next comes the problem of expediency for the Egyptians of such a type of writing. It was, in all probability, sufficiently purposeful and convenient, which fact is proved by its mere existence for thousands of years.

Having come into being, when the Egyptians did not distinguish between separate sounds of speech and syllables, the consonanto-morphemic script introduced a certain order which was independent from dialectic or individual peculiarities of people. It is possible that the Egyptians wrote with the help of their sound-signs, correlated with morphemes, as easily as we use the morphemes of our language as a prepared material for the construction of words. But making use of such a system of writing by other people for rendering sounds of their speech must have met unsurmountable difficulties. But the existence of the simplest morphegraphemes, i. e. the one-consonant signs may have induced the idea of an «alphabet».

It is astonishing what genius the Egyptians must have possessed to have created, at the very dawn of civilization, such a magnificent system of writing, whose basic source lay not in the system of sounds of speech but in the system of the consonantal skeleton of morphemes.

As we have seen, this system differs radically from all the modern concepts of the phonetic writing but by its own means it reflected the sound aspect of the language only just as well.

EXPLANATION OF THE TABLES

*Table I* The two-consonant links conveyed by means of the two-consonant sound-signs.

*Table II* The two-consonant links conveyed by means of the 1<sup>st</sup> and the 2<sup>nd</sup> consonants of the three-consonant sound-signs (or the «left» part of the three-consonant sound-signs).

*Table III* The two-consonant links conveyed by means of the 2<sup>nd</sup> and the 3<sup>rd</sup> consonants of the three-consonant sound-signs (or the «right» part of the three-consonant sound-signs).

*Table IV* The two-consonant links conveyed by means of the one-consonant (or «alphabetic») sound-signs.

In the numerator the general quantity of the two-consonant links formed by the one-consonant signs is indicated, and in the denominator the quantity of the two-consonant links formed by the one-consonant signs only. In the squares the latter links are additionally outlined.

*Table V* The two-consonant links conveyed by means of all kinds of the sound-signs. The signs are rendered with the help of the method of «phonovision»:



— the one-consonant or «alphabetic» signs;



— the two-consonant signs;



— the 1<sup>st</sup> and the 2<sup>nd</sup> consonants of the three-consonant signs;



— the 2<sup>nd</sup> and the 3<sup>rd</sup> consonants of the three-consonant signs.

*Table VI* The system of the Ancient Egyptian sound-signs (or the consonant morphographemes).

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**ЗВУКОВЫЕ ЗНАКИ  
ЕГИПЕТСКОГО ПИСЬМА  
КАК СИСТЕМА**

*Утверждено к печати  
восточным факультетом ЛГУ*

Редактор *Г. А. Давидова*  
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ИБ № 13374

Сдано в набор 6/X 1976 г. Подписано к печати 13/IX 1978 г. А-12709. Формат 60×90<sup>1/16</sup>. Бум. №1. Печ. л. 11 + 1,5 п. л. вкл. Уч.-изд. л. 14,19. Тираж 2300 экз. Изд. № 3675. Зак. № 1581. Цена 1 р. 40 к.

Главная редакция восточной литературы  
издательства «Наука»  
Москва, К-45, ул. Яндова, 12/1

Ордена Трудового Красного Знамени  
Первая типография издательства «Наука»  
199034, Ленинград, В-34, 3-я лин., д. 12