

Det Kongelige Danske Videnskabernes Selskab

Historisk-filologiske Meddelelser, bind **34**, nr. 4

Dan. Hist. Filol. Medd. **34**, no. 4 (1955)

SOME ANCIENT
EGYPTIAN PAINTS AND PIGMENTS

A Lexicographical Study

BY

ERIK IVERSEN



København 1955

i kommission hos Ejnar Munksgaard

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Biologiske Skrifter (4°) <i>(Biologie)</i>	Dan. Biol. Skr.

Selskabets sekretariat og postadresse: Dantes plads 5, København V.

L'adresse postale du secrétariat de l'Académie est:

*Det Kongelige Danske Videnskabernes Selskab,
Dantes plads 5, København V, Danmark.*

Selskabets kommissionær: EJNAR MUNKSGAARD's forlag, Nørregade 6, København K.

Les publications sont en vente chez le commissionnaire:

EJNAR MUNKSGAARD, éditeur, Nørregade 6, København K, Danmark.

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Printed in Denmark
Bianco Lunos Bogtrykkeri A-S

To
JAROSLAV ČERNÝ

The present study has been inspired by Sir ALAN GARDINER'S reflexions on Egyptian lexicography as expressed in the preface to his *Ancient Egyptian Onomastica*. It deals with a small group of materials belonging to the Egyptian *materia technica*, but also used for therapeutic purposes, and the range of the investigations has deliberately been limited to a restricted number of substances, because it was intended as an illustration of a method of approach as well as a study in lexicography.

The vocabulary expressing the different substances and materials used for practical purposes has always presented special difficulties in Egyptian lexicography, because the proper translation and understanding of the individual terms presupposed a technical knowledge, and a knowledge in such widely different and in themselves unlimited fields as medicine and its history, botany, zoology, and chemistry, which was rarely combined with the necessary philological training.

Nevertheless a considerable amount of highly important and most useful work has been made by a number of scholars from SCHWEINFURTH to EBBELL, but unfortunately many of their results have had some difficulties in getting proper acknowledgement.

Owing to the undeniable fact that not all results were equally well founded they were received by e. g. the *Wörterbuch* with certain amount of scepticism and suspicion, and apparently in order not to authorise translations which the editors considered doubtful and uncertain they assumed the practical standpoint of confining their information concerning the majority of the vocables belonging to this group, to such general statements as whether the individual substances were "officinell verwendet",

were found in the materia medica, or belonged to the animal vegetable or mineral kingdom.

But this attitude from what is rightly considered the official authority on Egyptian lexicography led to a general reluctance to translate the terms in question in the current publications.

It became customary either not to translate them at all, or to give them approximate or purely conventional translations, a procedure which did not always further the proper understanding of the texts.

It is obvious that this was hardly a satisfactory or tenable state of affairs, but the fact remained that only very rarely was it possible to give an obvious and convincing translation of any term based on consideration of the philological evidence alone.

Owing to the widespread use of the different materials and the natural vagueness in the Egyptian conception of their nature and properties, it was generally extremely difficult to draw satisfactory conclusions from the textual evidence.

The substances were mostly common and their designations were probably well-known to any professional Egyptian and consequently did not call for special commentaries or comments in the ordinary texts.

The main difficulty at a modern reconstruction of the vocabulary therefore was that a certain knowledge about what materials to look for in the texts, and a certain insight into their main characteristics, their properties, and their principal employments were almost indispensable if the meagre information of the texts should be turned into conclusive evidence.

As far as the technical material is concerned we were in the fortunate position that a considerable amount of knowledge about the actual materials used for practical purposes by the Egyptian artist or craftsman could be gained directly from archaeological evidence.

This material has been collected and made accessible to lay readers in a most admirable way by LUCAS in his *Ancient Egyptian Materials*, which gives an almost complete list of such substances as have been scientifically or chemically established in Archaeology, and it provides invaluable information about the basic materials actually used in Egypt for practical purposes throughout the greater parts of its traceable history.

The material obtained from LUCAS can often be illustrated and in certain cases even supplied from CAMPBELL THOMPSON'S accounts of the Assyrian evidence, and much useful information concerning the ancient conceptions of the nature of the different materials as well as their supposed or actual qualities can be gained from a variety of classical authors, mainly THEOPHRASTUS and PLINY.

We are less fortunate as far as the *materia medica* is concerned, but a good many substances used for technical purposes were also used directly in medicine.

Medicine was throughout Antiquity a most international science and a good deal of useful information can therefore be gained from the classical *corpus medicum*, where e. g. an authority as CELSUS gives a considerable amount of information about the properties of the various substances. The material must be collected critically, though, after a careful sifting away of the later, not Egyptian, substances.

As far as an insight into the specific Egyptian material is concerned, DIOSCORIDES' *materia medica* is of invaluable importance, because it provides information about the Egyptian provenience of a great many ingredients, and even supplies what is supposed to be their Egyptian names in several cases. And although they are generally unrecognisable in their Greek form, these names are nevertheless most important as clues to the substance of the Egyptian *materia medica* as such.

From these and related sources we are able to collect a substantial amount of useful information which permits us to approach the texts with much greater chances of success, and a fortuitous hint or an obscure adjective may very often become significant and important when illustrated by this practical evidence.

As a whole it may be said to provide some sort of a historical basis for the investigations, and the dangers of mistakes and guesses are to a certain extent limited by the very limitation of the possibilities.

It will be realised, however, that it is most important that the material illustrating the use and the occurrence of the various terms should be collected on the broadest basis possible, and not limited to any particular text-group.

Even the present study will show that such sources as e. g. the *Book of the Dead* with its rubrics, magical and ritual texts with information concerning the application of different ingredients, and the late "hermetic" texts from Edfu and Dendera are invaluable for our purpose when considered together with the practical and professional sources.

It may even be put down as a general rule that the more 'out of place' a certain word is in a certain text group, the greater are the chances that it may be provided with a useful explanatory remark.

For the final consideration of the material it seems a useful and profitable procedure to divide it up into small groups of related substances. All information gained about one substance is then liable to throw light on the group as a whole, and the identification of one material will often facilitate the identification of the others, by a simple process of elimination, a practical advantage inversely proportional to the size of the group.

It is the aim of the present study to illustrate the practical difficulties, and maybe also some of the results obtainable by applying this method to a small group of closely related materials, the translations of which have been subject to much uncertainty and some confusion.

𓆎, Malachite, Verdigris.

𓆎. The word is used with varying determinatives to express different notions all associated with its original meaning "green, fresh".

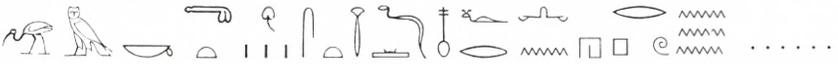
As a colour.

(a) green. In the orthography 𓆎  and its variants, the word is frequently used as an ordinary colour adjective with the common and well established meaning "green", corresponding to Coptic ⲠⲚⲟⲩ (χλωρός), "be raw, fresh, green" (CRUM, 403 a).

(b) blue. In some cases, however, it is apparently used for certain blue-green nuances, which we should consider blue, e. g. Pap. med. Berl. Vs. I. 9, where it is used for the colour of the veins as seen through the skin:



“You shall anoint her breast, arms and shoulders with oil”



“If you find her veins light blue and not sunk in”

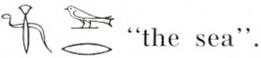


“If you find them sunk into the skin of her limbs”



“If you find them dark blue.”

On this background it is questionable whether the word should be translated “green” or “blue” in such cases as e. g.



(c) grey, yellow. In such cases as Kahun VI. 23, where we find it used about the sickly colour of the face of a female patient



“If you find her face green”), it is obviously used about the pale, grey or yellowish shades of green, a use which is important for the understanding of other contexts.

In the well-known ceremony called , the word  is used sometimes to denote the colour of one of the calves, and the question arises what colour is actually meant, as it is obvious that it cannot be green in the ordinary sense of the word.

The other colours of these representations do not present any difficulties, , , and , being clear and unambiguous about white, black and red animals, respectively. The fourth colour given is generally ,¹ which is unquestionably used about piebald, chequered animals, which is clear from such cases as

¹ The colour  , which interchanges with *dšr* and *km* will be considered separately elsewhere.

Deir el Bahri V pl. CXXXIV, ib, VI, pl. CLXI,¹ and ROSELLINI, *Monumenti storici* I. XLI. 3, where  actually represents the ordinary white and grey variety spotted with black.

It is a puzzling fact that  always in these cases replaces , because this does not seem to go with the explanation found on the Ramesseum astracon published by GARDINER in his *onomastica* (On. Ram. B 1. vol. I, 22). We are here told that a bull of the colour  is a red one (         

Egyptians used  for 'le rose et les teintes fauves' and 'les teintes tirant sur le rouge et le rose', although unfortunately without documentation. He also points out, however, that the modern fellahs use أخض to denote grey colours in animals (Sphinx 18 106): 'pour eux (les fellahs) un ane gris est vert (أخض) ou bleu (أزرق)' and it will be seen from any Arabic dictionary that أخض is not only used about the actual green colour, but also about the colour of water and the sky, and about grey animals, e. g. horses, all uses which in a remarkable way seem to illustrate the various uses of .

We shall not, however, pursue any further this tricky colour investigation, which actually falls outside the scope of our investigation, but it will be seen that although there is no doubt that the fundamental meaning of the word is green, it could also be used about the blue, grey and yellow shades of this colour, in accordance with the vague and wide-spread employment of all ancient colour-adjectives. It should be noticed, however, that the ordinary word for yellow, from the 12th Dynasty at any rate, was ꜥnj.

II. As a mineral.

For reasons which will be apparent later, we shall treat the two orthographic variants  ¹  and     as one word, in spite of the fact that *Wörterbuch* I 267 keeps them separate as two words with the respective meaning of I "grüner Stein" (ob grüner Feldspat, Smaragd o. ä.) and II "Ein mineralischer grüner Farbstoff".

The Egyptians themselves did not distinguish between what we should call "stones" and "minerals",¹ and most certainly they had nothing which could be compared to our method of classification. It is therefore natural that external characteristics such as e. g. the colour became one of the main criteria for their classification of the different specimens.

¹ The word   would include both. Compare, however, the use of ꜥr. w for the 'hard' pigments p. 21.

As a general rule, therefore, it must be realized that whenever the word occurs in the texts it should be understood as a stone or a mineral of green colour,¹ the consistency of which permits it to be ground.

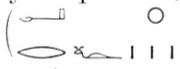
E. It occurs fairly often in the medical texts, as an ingredient in various prescriptions:

Against a purulent burn () London med. 15.14. Eb. 68.13 (nd) to reduce swellings () Hearst 15.17 (nd) to cool () Hearst 15.6 to dispel (dr) () Hearst 6.13. Ebers 44.16 () to dispel () Ebers 63.7-8 (nd), Ebers 56.9-10 (nd), Eb. 57.14, Eb. 57-16, Eb. 60.4.7. (nd), Ebers 55.12. 62.20.

In Eye-ointments Ebers 61.8.7 (nd) 63.4. 62.2 (nd) Ebers 56.2. Against Eb. 60.9 (nd), Ebers 57.7 (nd), Eb. 61.4. To dispel trembling Ebers 79.4. Ebers 11.8 (nd). To dispel worms Ebers 17.2 () ib. 18.4. To dispel Ebers 89.5 (nd), Ebers 89.8 (tm tm).

¹ Its green colour is especially mentioned in the incantation Ebers 60. 17, which begins "The wtd is coming, the green one is coming."

re II D. The true consistency of the Egyptian green eye-paint in its final and prepared form is still obscured by the fact already mentioned that relatively few specimens of the prepared cosmetic have survived, and that the nature of the different fats and resins with which it was prepared has been difficult to establish chemically, owing to their natural decomposition (LUCAS, *Materials*³ p. 100).

About the nature of the raw material and main ingredient of the paste as such there is no possible doubt, however, this having in all cases been found to be the hydrated carbonate of copper known as malachite¹ (LUCAS, *Materials*, p. 99), which has been found abundantly in the graves: "As fragments of the raw material (see F. 5), as stains on palettes and stones on which it was ground, in the prepared state as paste, or more frequently as powder, in crude form in small linen or leather bags ( see Kahun 20.37  Mereruka pl. 203)² already from Tasian, Badarian and predynastic times" (LUCAS, loc. cit.).

Considering the fact that apart from the necessary constituents such as fats and resins, the paste contained no other raw material of any importance, and that the name of the paste was identical with that of the raw material, there can be no possible doubt about the meaning of w3d in this occurrence, where it can only be understood as malachite, or naturally the corresponding material obtained from other sources as verdigris.

re II C. Similarly it is a well-established fact that the main natural ingredient in the ordinary green pigment of Ancient Egypt was powdered malachite (LUCAS *op. cit.* 396). It was in fact the green most approved of by the Ancients,³ and malachite, verdigris and chrysocolla, have been chemically established as

¹ The specimen examined by LORET and FLORENCE (*op. cit.*) was chrysocolla, another natural ore of copper (LUCAS *op. cit.* 242) frequently found together with malachite, and by the Egyptians probably not terminologically distinguished from it generally. (See, however, II F. 2). For the identification of the classical term chrysocolla and malachite, see CAMPBELL-THOMPSON, *Chemistry* p. 95: "Malachite was the chrysocolla of Plinius."

² When measured in dbn, it was probably the crude mineral, and when measured in rf probably the powder.

³ W. SMITH, *Dictionary of Greek and Roman Antiquities*, 263.

ingredients of Egyptian paint by LUCAS as well as by several others (*Materials* p. 396-97).

It seems, as a matter of fact, to have been the only natural material ever used for green paint or pigment, when this was not obtained artificially from green frit () or by mixing blue frit () with yellow ochre (LUCAS, *loc. cit.*).

It is therefore clear that also in this instance, where w3d is used as a pigment and a constituent in ordinary green paint, it can only be understood as that which was its main and only natural raw material, malachite, or vedigris.

re II E. When comparing the therapeutic uses of the different substances of the Ancient materia medica, it must always be remembered that the different ingredients had a much wider range of employment than we should consider natural, owing to the fact that they were not only employed because of their specific effectiveness against specific ailments but just as much because of certain general "theoretical" qualities which they were supposed to possess, such as adstringency, softening, cooling, warming, etc.¹

This gives each of the common drugs a very wide range of employment against a great variety of ailments, and it is therefore dangerous and often impossible to try to identify a drug from its therapeutic use.

Nevertheless it must be permissible in the present case to point out certain characteristic conformities between the use of malachite and verdigris in Ancient medicine, and the use of  in Egyptian medical texts.

PLINY (33.28) as well as DIOSCURIDES² mentions the use of malachite as a remedy for various ailments of the eye, a use

¹ For these qualities or 'virtues' of the medicaments see CELSUS, *de medicina* V 1—17.

² PLINY speaks of chrysocola, and DIOSCURIDES V, 92 about copper rust, verdigris. The chapter has the heading περί τοῦ σχώληκος, but his therapeutic remarks are explicitly stated to cover all sorts of greens of copper. That this also includes malachite is clear from the preceding chapter where he speaks about the natural copper rust from the mines, which is certainly malachite, (See BERENDES' remarks in his translation of materia medica p. 512).

which is so very characteristic of the employment of 𓄏 in Pap. Ebers. PLINY mentions it as an ingredient of collyres and DIOSCURIDES points out that it has the power to call forth tears (water) in the eyes, which is probably a reference to a similar use as the one mentioned in Ebers 60.4, where it is used to dispel the disappearance or drying up of the water in the eyes (ḥ is used about the disappearance or evaporation of water f. inst. by boiling see Wtb. I 223).

Still more significant is DIOSCURIDES' remark that it is especially useful against boils and malignant growths of the gums, because this is exactly what it is used for EBERS 89.5 (compare also 89.8).

Its use as a purgative is not mentioned by the Greek authors, but PLINY mentions its use as an emetic (33.28).

In all these cases malachite is therefore the only natural translation of $\text{w}3\text{ḏ}$ and there is no reason to believe that it should not be translated similarly also in those cases where the context does not at present permit us to prove it.

re II A and B. More uncertain is the identification of $\text{w}3\text{ḏ}$ in those cases in which it is mentioned among the precious stones such as ḥnm.t , ḥr.tjw (amethyst?) and $\text{mfk}3\text{.t}$ (turquoise), because in these cases we cannot be certain that it was not used for other green stones or minerals which the Egyptians would identify with malachite owing to their green colour.¹

However, in those cases in which it occurs in the lists together with $\text{m}3\text{ḏm.t}$ (galena), the main ingredient in the black eye-paint, and in those cases in which it is mentioned together with other pigments or raw materials for pigments such as ḥnj.t (orpiment) ḥtj (ochre) or ḏb^c (charcoal), we can be absolutely certain that malachite was meant. Even the cases in which it occurs as material for objects do not speak against this identification, as malachite was actually used for the making of beads, amulets, and similar ornaments (LUCAS *op. cit.* 457), although rarely, owing to its being cheap and common.

¹ Compare CAMPBELL-THOMPSON'S remarks (*On the Chemistry of the Ancient Assyrians*, London 1925 p. 94) about the use of the corresponding Assyrian word mušgarru , which as a 'stone' is used for malachite, serpentine, green jasper, (and 'emerald'), of which he considers the latter as a "merchants' garbling" of mušgarru . JENSEN (quoted by CAMPBELL-THOMPSON p. 95) derives the word malachite from meluhja , Arabia or Sinai.

re F. 1. As already mentioned, BREASTED's suggestion that  in  should mean powder is improbable because we are told that the stuff must be ground before being used. That wꜣd is malachite seems probable.

re 2. CLÈRE has shown me that  should be read , and that the compound  occurs several times in the rubrics of the *Book of the Dead* (chap. 100/129. LEPSIUS, *Todtb.* LII (129). chap. 133 Nu. Budge, B. of D. 175) and is also found in Edfou (Chassinat, VI 203.3  .

I shall try to show in a separate article that  is the well known material *ἰός σκωληξ* (DIOSCURIDES V 92) or 'aerugo vermicularis' (PLINY 34.28 'scolecia') 'wormlike verdigris', much used in the ancient materia medica.  is related to the word  (Ebers. 51.5) found several times in the same prescription and its variant (Ebers 25.6) with the characteristic determinative , meaning 'worms' (.

3. , where the reading of  is doubtful although the meaning "boat" is clear, has been taken to mean copper rust, verdigris or carbonate of copper from boats, K. B. HOFMAN, *Über Msdm.t*, quoted by LORET and FLORENCE.

4. , where the reading of  is doubtful but the meaning clear, is as the name states ordinary "green of copper" "*vert de gris*", as has already been established by LORET and FLORENCE *op. cit.* p. 161.

5. Owing to the ordinary meaning of  (Wtb. II 347-48)  probably means quite simply "four lumps of malachite".

Before concluding, one apparent exception from the rule of the identity of *w3d* and malachite must be mentioned.

It is a well-established fact that one of the main uses of malachite in Ancient Egypt was its employment as raw material for the common green glaze and the artificial green frit, (LUCAS *op. cit* 19). As this green frit corresponds to the blue frit which was called *hsbd.t* because its main ingredient was lapis lazuli (*hsbd*) it would be natural if the green frit was also called after its main ingredient in which case its name should be **w3d.t* after *w3d* "malachite".

This is not the case, however, as the well-known name of the green frit is *mfk3.tj*, called after *mfk3.t* "turquoise". The explanation is quite simple, however, since it is clear that what the Egyptians wanted to imitate with their green glaze, was most certainly not the common and easily accessible malachite, but the much rarer and much more valuable turquoise. It was therefore quite natural that the glaze should be called after the precious stone which it imitated and not after the cheap raw material, a problem which did not arise with *hsbd*, where the raw material and the stone to be reproduced were identical.

This is also the reason why we are told in the *Book of the Dead* (Chap. CLIX. LEPSIUS, *Todtenbuch*. Bl. 76) that the  sign itself, when used as an amulet should be made of  and not of malachite.

It must also be mentioned that although malachite was very frequently and most commonly used as a source of metallic copper, being the richest in copper of all ores (LUCAS *op. cit.* p. 243) this use is not in any way established by the use of  in the texts. This is probably due to the fact that we know nothing about Egyptian metallurgy from literary sources, and to the fact that in this use malachite was probably included in the ordinary word for copper ore  .

As the result of the foregoing elucidations it would seem, therefore, that the practical employment of the material  as well as all evidence of the meaning of the word from the literary sources justifies the translation malachite or verdigris in all cases.¹

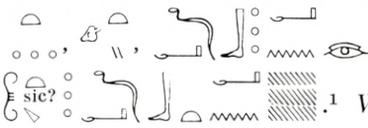
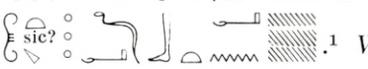
  ,  , $\omega\chi\rho\alpha$, **Ochre.**

DEVAUD has shown in an article published in *Recueil* (39, 1929, 20) that the two orthographic variants   and  , do in fact represent one single word, the occasional substitution of  for  being due to a misinterpretation of the underlying hieratic draft, in which the sign in question (MÖLLER, *Palaeographie* I, II No. 90 and 437) could actually be transliterated either way.

He has also shown that the correct reading is  and points out that the word stj is etymologically connected with  in   "Nubia", and consequently translates "terre de Nubie", tentatively suggesting this to be "la couleur blanche".

The two writings interchange very frequently, also in the present material, in a way which fully corroborates DEVAUD's statement, and shows that they cover one single substance.

We find such parallel passages as              

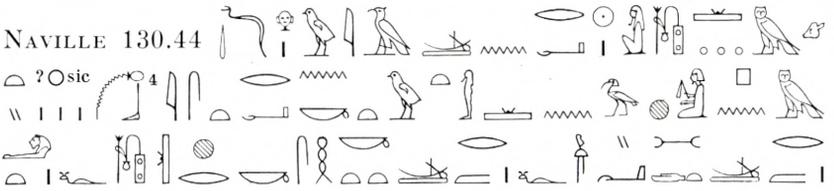
change in the ordinary lists of pigments f. inst. Karnak  corresponding to Luxor   ^{sic?} . ¹ *Wörterbuch* reads stj in accordance

with DEVAUD and translates "Ein mineralischer Stoff aus Nubien".²

In the discussion about the rendering of the sign it seems to have been overlooked, however, that the demotic form of the word gives the final proof of its reading by the spelling stj.³ The hieroglyphic writing with  should therefore be considered an erroneous, or at any rate an incorrect rendering of the hieratic sign, which in this case should always be rendered .

The general nature of the material involved is determined by the fact already mentioned, that it is found in the lists enumerating the different raw materials for paints and pigments such as lapis lazuli, charcoal, and orpiment, and it is very often found in the texts as an ordinary material used in writing or painting.

A couple of examples illustrating the latter use have already been quoted above, and several others are found: *Todtb.* ed.



¹ See the accompanying collection of lists of pigments p. 26-27.

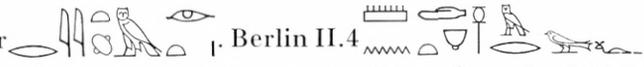
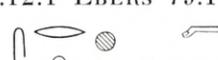
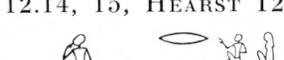
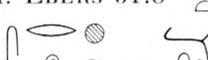
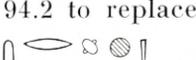
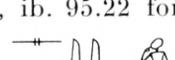
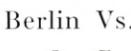
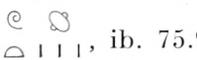
² The original reading was *hn.tj* BRUGSCH, *Wörterbuch* (III 1113) and GARDINER, *Pap. Koller* p.41 note 14. *Literary Texts of the New Kingdom* I Leipzig 1911.

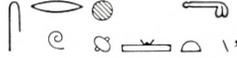
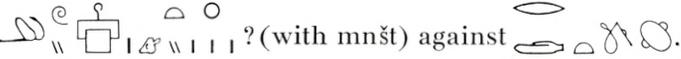
³ *The Demotic Magical Papyrus* ed. GRIFFITH 29/28, Vs. 22/7, 23/4 (N.B. not 24/ as the index has it). GRIFFITH translates "stj-stone", but it is beyond any doubt the same word as here. 29/28 and 22/7 it is called *stj n t3 nhs*, "stj from Nubia", and it is used as an ingredient in an eye paint, just as we find our word *stj* used in *Pap. Ebers* (61.9, 62.2.) In the last instance it is called *stj* stone from Syria (*h3r*), and it is used being smeared on one foot, while the other is smeared

with clay (.

⁴  which does not occur elsewhere can hardly be taken as "pure stj" in a technical sense, considering the textual variants, it must mean

ritually pure (*Pap. Nu* ed. BUDGE has  "written with stj on a clean place"). The actual picture is found in the vignette NAVILLE I CXLIV.

ib. 62.12.16. dr  Berlin II.4 
 EBERS 95.7 for the breast. London 15.15 
 EBERS 62.8 dr  (together with mnšt.) ib. 62.12
 (mnšt.) EBERS 50.18 
 HEARST 4.15.16. dr . EBERS 50.3, 7, 10. dr 
. EBERS 15.20  ib. 14.19. EBERS
 43.12 dr šnc. EBERS 44.14, 45.8.11 dr . HEARST
 6.12, 7.3.8. EBERS 78.5.11, 12, 13  (with mnšt.).
 HEARST 12.4 (mnšt). HEARST.12.1 EBERS 79.1 
 (mnšt). EBERS 78.19,  HEARST 12.8,
 12.14, 15, HEARST 12.6, 7, 16, 17. ib. 13.2. EBERS 64.7. 
 HEARST 2.7. EBERS 44.11, 45.18,21, 45.12,
 Berlin 10.3 to treat the heart.  HEARST IV.5 to let the
 heart accept bread. EBERS 51.8 
 EBERS 85.19, 20, 86.1, 2.  EBERS 89.2, 4, 5, 7, 11, for
 the teeth.  EBERS 94.2 to replace the uterus, ib. 95.22 for
 the vulva. HEARST 4.8  ib. 4.12 dr 
 EBERS 41.18 for the  Berlin Vs. II,11; 
 EBERS 27.5 dr  (prob.  with mnšt) EBERS
 23.16. EBERS 72.5 dr.  ib. 75.9 
 EBERS 55.8, 14  EBERS

79.12, 15, 18 , ib. 92.17. dr 
 Hearst 2.13. šrwḥ gs ḥb.tj. EBERS 67.10 
 EBERS 56.5  (with mnšt) against .

It will be seen that generally speaking the therapeutic use of the substance is not very conclusive in itself, owing to the wide and loose application of the drug, but a comparison between the use of stj and the other pigments in the medical texts will show that they are to a great extent used for the same ailments and very often together, in the same prescriptions. This tends to show that these closely related materials were also from a therapeutic point of view regarded as belonging to a defined group with identical medical qualities.

Only one characteristic application of stj should be mentioned from Ebers 67.10, where it is used for the liver, because this use is attested for Sinopic earth in *Dioscurides materia medica* (V, 111 in *Berenides'* edition).

Considering that we are dealing with a pigment, the fundamental background for establishing the nature of its raw material must necessarily be to ascertain its colour.

As far as I am aware, we have no direct evidence about this, and some scholars have considered it to be red¹ and others yellow², or white.

From the passages quoted from the *Book of the Dead* we get indirect evidence, however, in those cases in which the vignettes are preserved.

I have not had any opportunity to examine the vignettes from the two papyri quoted above, but similar representations from other coloured drawings in other copies of the *Book of the Dead* show that the boat of Re, which we are told should be painted with stj, is yellow, and so are in several cases the figures painted in the boat.³

This is in itself sufficient to establish that stj must be considered

¹ GARDINER *op. cit.* 41 note 14. DEVAUD in his above-mentioned article enumerates the various translations.

² DARESSY, *Ostraca*, Cat. Gen. I No. 25247 p. 64.

³ See f. inst. *Pap. Anhai* ed. BUDGE pl. 6 and also ib. pl. 8, where the gods in the boat are partly yellow.

a yellow substance, which limits the possibilities as to the nature of its rawmaterial considerably.

LUCAS has shown that only two natural yellow pigments were used by the Egyptians, one being yellow ochre and the other orpiment (*Materials* II 399), of which the former is a natural oxide of iron (ib. 396) mixed with clay and the latter a natural sulphide of arsenic (ib. 399).

Both these materials have been chemically established as ingredients in Egyptian paints, and we have seen that stj is undoubtedly a clay or argil. Considering that, in certain cases at any rate, its yellow colour can be established, the natural consequence is to identify it with yellow ochre, an identification which was proposed already long ago by DARESSY,¹ but has never gained the general acceptance it deserves. As for the therapeutic use of the material, we have already seen that DIOSCURIDES recommends Sinopic clay² for the liver (cf. EBERS 67.10 No. 36 in the list above), but his general information about the medical use of the ochres is too vague to be of any real help: "Er (the ochre) hat adstringierende, Faulniss machende Kraft, vertheilt Entzündungen und Geschwülste" (V 108, in BERENDES' ed.).

PLINY is more explicit and there is undoubtedly a marked concordance between his information about the medical use of ochres³ and the corresponding use of stj.

Besides its ordinary astringent and mollifying qualities—for which compare the examples quoted under the heading 1 and 2 in the above list—he mentions some very characteristic uses: "contra hulcera in humere sita, veluti, oris sedis," which has a direct parallel in EBERS 27,9 (No. 1 whd.w m r). He mentions its use as a clyster, for which compare EBERS 27,20 31,12 (No. 4), and its use against different ailments of the eyes (No. 7, 8, 9, 10 above), and he recommends it against snake bites, and as an

¹ *Cat. Gen.* I p. 64, where  is found on an ostracon (no. 25247) together with such pigments as e. g. lapis-lazuli, and translated by "ochre jaune". GARDINER has also recognised it as some sort of clay in his edition of *Pap. Koller* mentioned above. In *Pap. Brit. Mus.* IIIrd Ser. II. 18 n. 5 he has "ochre(?)", while EDGERTON-WILSON, *Hist. Records* 102. 15 a has 'red pigment(?)'.

² Irrespective of their colour, we can consider the different ochres as a unity seen from a medical point of view, and the Sinopic clay and rubrica of PLINY and DIOSCURIDES are undoubtedly red ochres (LUCAS *Materials*³ p. 398). Also PLINY gives the medical qualities of the different ochres under one heading (35.16 in LITTRÉ's edition): "omnis autem rubrica siccata," etc.

³ 35.13 and 14 in LITTRÉ's edition.

antidote (cf. No. 33 above and also No. 21, as bites by human beings were considered poisonous in Antiquity).

It will be admitted that this concordance in the therapeutic use of the two materials is too close to be accidental, and the translation 'ochre' is therefore definitely supported by the evidence of the medical texts.

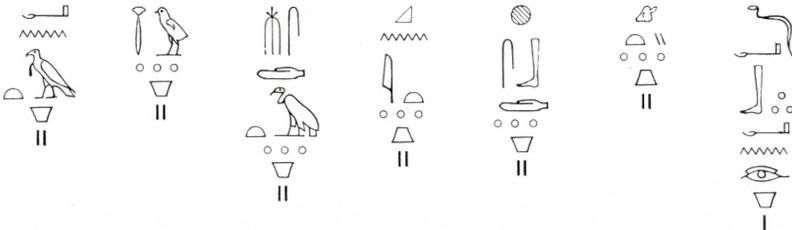
Finally it is also supported from what we know about the provenance of ochres in Ancient Egypt, about which LUCAS states that they are found principally near Aswan, and in the oases of the western desert (*Materials*,³ p. 269) as we have seen that the Nubian origin of Egyptian ochre is expressed in its very name, which is related to the word for Nubia, and the addition of n t' nhs "from Nubia", added to the word stj in the Demotic text quoted above.

It would therefore seem that all evidence supports DARESSY'S proposal, and that stj should always in correct renderings be translated as 'ochre'.

With regards to the colour it must be remembered, however, that ὤχρα covers a fairly wide range of colour nuances from yellow and brown towards red.¹ The same was probably the case with stj, which seems to denote a consistency rather than a defined colour. It is therefore undoubtedly used not only about the bright, canary coloured variety of the material but also about the dull-brown shade very frequently found in the actual paintings (LUCAS, *Materials*¹, 144).

Lists of pigments and painting materials.

I. Karnak (WOLF, *Das schöne Test v. Opet*. (v. Sieglin Expedition, Leipzig 1931 Bd. V).



¹ PAULY-WISSOWA (1937) XVII 2, p. 1772, mentions ὤχρα as: "Die gelben bis bräunlichen Eisenoxydverbindungen" used as pigments by the Ancients.

, *μίλτος*, **Red ochre.**

The word occurs in contexts which clearly demonstrates that it is used as a material for painting and writing: *MARIETTE*,

Abydos I 52. "fixed in writing next to "Re" in the horizon, outlined with mnš." Similarly in a partly destroyed passage from

Dendera (MARIETTE IV. 35) "carved upon it with stj (?) (or) with mnš" and in a passage from Edfu, which I have been unable to verify from the reference given by *BRUGSCH (Wtb. Suppl.*

VI. 610)

The same material is found in another passage at *Dendera (MARIETTE I 71 l. 11)* as a product of the oasis

Wörterbuch (II 89) translates "ein mineralischer Stoff" "auch als (gelber) Farbstoff", but it will be seen that the examples quoted above, which also include the references of the *Wörterbuch*, do not give any definite clue to the actual colour of the material, and no justification for the translation "yellow".¹

The word is also fairly common in the medical texts as an adstringent and drying agent, but as is often the case with the different substances of the *materia medica*, their use is too widespread and unspecific to be of any great help in their identification.

EBERS 27.5 dr (prob. *ib. 56.2* *[m ır.t]. ib. 57.4 dr* *m ır.tj.*

¹ Provided that drf refers to Re m 3h. t—which cannot be established with certainty owing to the condition of the text—the first example might be stretched to intimate a red colour, as the sun, that is the actual sun-disk, is generally red in Egyptian paintings. It is also yellow sometimes, though.

ib. 57.14 dr  m irtj. ib. 63.1 dr . ib. 57.18 dr . ib. 17.18, 59.15 dr  m irtj. 62.12, 13, 16 dr . ib. 62.8 dr  m irtj. 63.9 phr. t (phr.t) n irtj. 63.8  m irtj. ib. 67.21 69.131?) . ib. 69.8 . London 15.11  . EBERS 70.11  London 14.3  EBERS 78.13.16.  HEARST XI.17, XII.4.  HEARST 12.11, 17, 13.2 , HEARST 13.5,  HEARST 13.9  EBERS 79.1 dr  m db^c.w. EBERS 91.2  92.5. . EBERS 27.7. . EBERS 24.8 . EBERS 43.20 dr . EBERS 63.5 dr . EBERS 64.16, 19. 65.7 dr  m tp. EBERS 87.16 dr  EBERS 80.7, 83.21, 83.7  ih.t nb.t. EBERS 88.9 . EBERS 92.8, 15 dr . HEARST XI.9 . London 3.6 .

The word is found in the following stock phrases:

- (1)  London 10.13, probably against the unidentified disease , corresponding to

He establishes a connection between mnš.t and Coptic $\overline{\text{μερω}}$, $\overline{\text{μρω}}$, $\overline{\text{μρω}}$, and $\overline{\text{πρω}}$, which he translates minium, a translation which WRESZINSKI has adopted and uses f. inst. in his edition of the papyrus from London (e. g. No. 28 "Mennige"), an identification which is not possible, however, as minium was probably never used as an ingredient in Egyptian paint until Roman times.¹

The etymological relations between mnš.t and the Coptic words $\overline{\text{μερω}}$ and $\overline{\text{πρω}}$ is not quite so easily established, however, as would appear from BRUGSCH's and WRESZINSKI's identifications.

There can be no doubt that Coptic $\overline{\text{πρω}}$ is identical with the word prš found in the Demotic magical papyrus, and by GRIFFITH translated by "minium", "red lead" in the *Index* (No. 310), but $\mu\acute{\iota}\lambda\tau\omicron\varsigma$ in the actual text (V,4. p. 44). The word is used about lamps which must not contain prš when used for magical purposes, a statement made quite clear by GRIFFITH himself by his reference to the corresponding Greek expression $\acute{\alpha}\mu\acute{\iota}\lambda\tau\omicron\varsigma$.

This evidence makes the meaning of prš quite clear and there can be no doubt that it means red ochre ($\mu\acute{\iota}\lambda\tau\omicron\varsigma$), just as its Coptic equivalent $\overline{\text{πρω}}$ (CRUM, 269 b).

The etymological connection between prš and Coptic $\overline{\text{μερω}}$, $\overline{\text{μρω}}$, which means to be red or yellow (CRUM, 183 b), and their mutual relation to mnš is uncertain and obscure, however.

That $\overline{\text{μρω}}$ actually seems to have some connection with $\overline{\text{πρω}}$, at any rate as far as their meaning is concerned, is made probable by the fact that we find $\overline{\text{μρω}}$ rendered as $\rho\omicron\gamma\alpha\pi$ $\overline{\text{πρω}}$ in parallel texts (CRUM *loc. cit.*).

But ČERNY points out that it does not seem possible to derive $\overline{\text{πρω}}$ from mnš, because the change of m into p would be unparallelled, and it is also difficult to establish a direct connection between mnš and $\overline{\text{μρω}}$, because LACAU has shown (*Recueil Champollion* 721) that Coptic r can only originate in Old-Egyptian n when immediately followed by m in an unaccentuated syllable.

But on the other hand he points out that if we concede that $\overline{\text{μρω}}$ is actually derived from mnš, then we shall have to consider it a rule that this change could also take place before $\overline{\text{ω}}$ in an

¹ LUCAS, *Materials* p. 414, "the use of minium (red lead) in Egypt is very unlikely before Roman times."

accented syllable. If we apply this rule to *prš*, this word might be derived from a **pnš*, and in an ostracon from Strassbourg (H 41) copied and supplied by ČERNÝ we do actually find a

word  in one of the usual lists of pigments, but to obscure and confuse the picture even more, at the place where we should expect .

It will be seen that in spite of the linguistic difficulties which cannot be solved at present there is quite a lot of circumstantial evidence which would make an etymological connection between these words probable.

However, as long as we cannot establish its nature properly, we shall have to consider the three words separately, and in the present case confine our study to the textual evidence concerning the use of *mnš*.

We have already seen that the positive information obtainable from the meagre material is that the substance in question is of a clayish nature, that it is used as a pigment as well as for therapeutic purposes, and that it occurs in very close connection with yellow ochre. As far as I can see, only one natural deduction can be drawn from these facts, viz. that we are dealing with red ochre.

We shall therefore see how our general information about this substance corresponds to the use of the word *mnš* in the texts.

LUCAS tells us that red ochre is a naturally occurring red oxide of iron (*Materials* 3rd ed. 104), and that it was the only red pigment used in Ancient Egypt until very late.

Already from predynastic times several red pigments have been chemically established to be red ochre,¹ which was used for painting tombs and by scribes in writing, and the actual substance of which has been frequently found in graves and on palettes (LUCAS *op. cit.* 398-99).

It occurs plentifully in Egypt, mainly at Aswan and in the Western oases, a provenience which corresponds very well to what the Dendera text quoted above tells us about *mnš*.

¹ It must be stressed, however, that although the red ochre used was generally the material as found naturally, it could also be made by heating yellow ochre, and it is in most cases impossible to distinguish this artificial red from the natural substance (LUCAS, *op. cit.* 398-99).

DIOSCURIDES tells us that the Egyptian red ochre was considered among the best (V 112 in BERENDES' ed.) and PLINY (35.13-15) as well as VITRUVIUS (VII 7.2.) mentions the red ochres of Egypt, PLINY under the name of the Egyptian clays sinopis and rubrica.¹

We have already seen that the therapeutic use of mnš is not very conclusive in itself, but it corresponds in a general way to DIOSCURIDES' information about μίλτος (V 112 in BERENDES' translation) "Er har austrocknende, hautbildende, adstringierende Kraft," etc.), and if mnš could actually be regarded as red ochre, it would also explain its constant connection with stj (yellow ochre), as well as its connection with other clayish substances.

As for the first of the two compounds , WRZINSKI translates them as two separate words "mennige und urin", apparently due to the stroke which separates them in EBERS.

It seems more simple, and in fact more natural, to translate "moist mnš" in both cases, the more so as , 'fly's dung' is the only other ingredient mentioned in the first prescription, and mnš is used alone in the second one, and said to be put directly on the eyelid, so that a moistening of the material before its application, would be not only natural but almost necessary to make it stick.

The ailments against which it is used in these two cases, do not permit us to draw any conclusions about the nature of mnš itself, but the application of red ochre upon an epilated eye-lid would be very natural, owing to the astringent and slightly caustic qualities of it.²

 is translated by BRUGSCH as "grüne Farberde", and by WRZINSKI as "frische Mennige", but to understand its real meaning we shall probably have to consider DIOSCURIDES' information that, before being used, the ochres were generally "burnt and washed as Kadmia" (V. 108 in BERENDES' ed.).

This means that they were burnt to make their powder finer,

¹ For the identification of sinopis and rubrica with red ochre see LUCAS p. 398.

² For the caustic properties of ochre see CELSUS, *de medicina* V 8.

and washed in vinegar in an elaborate process, which he describes in the chapter about Kadmia (V. 84), to clean them.

Mnš.t wšd.t would therefore probably mean the natural ochre used directly as it was found, in contrast to the refined product.

Considering the facts thus established, that mnš was used (1) as a pigment and a writing material, (2) that it must be of a clayish nature, (3) that it comes from the western oases, (4) that it is used together with other clays in medicine, (5) that it is especially connected with yellow ochre, (6) that red ochre was a common and well-known substance all over Ancient Egypt, (7) that we do not know the Egyptian name of this material, it will be admitted that this evidence very strongly supports the

identification of  and μίλτος, and that red ochre therefore is the only natural translation of .¹

It must be admitted, however, that the Coptic name of this substance was $\overline{\text{πηρω}}$ and that the connection between the words

$\overline{\text{πηρω}}$ and  remains obscure.

, ἀρδενικόν, **auripigmentum, orpiment.**

The word which the *Wörterbuch* (V. 52) translates "Ein mineralischer Stoff von gelber Farbe" occurs to the best of my knowledge for the first time in one of the lists from the Kahun

papyri (GRIFFITH pl. XX No. 38) as  measured in , and left untranslated by GRIFFITH (p. 51).

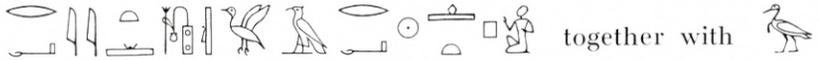
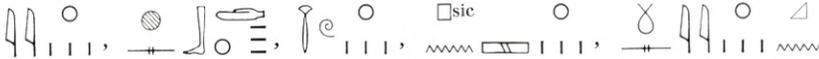
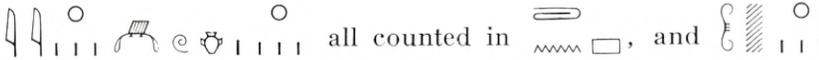
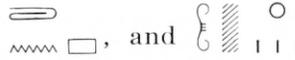
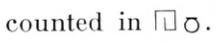
¹ Attention must be drawn to a curious coincidence, which seems to support the identification of mnš.t and μίλτος. It is a well established fact that a special type of boats or vessels were in Greek called μιλτεῖον, with a name derived from the material, because these vessels were mainly used for its storing and transportation (LIDDEL and SCOTT 1932, 1134 a). In Egyptian we find in exactly the same way a type of boats called , a name which is undoubtedly closely related to the word for ochre, . Probably these boats were also originally intended for the transport of the ochre and retained their name also when used for other purposes.

It reappears about the eighteenth dynasty in the offering lists together with paints and ointments as 

or ¹ and it occurs on several ostraca together with similar materials as a raw material *Ostr. Gardiner* 183,11 3-4 (Č)²

^{sic} 
 "a coffin painted with varnish, whose ? is of malachite, and (decorated with ?) *knj*".

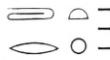
On *Ostr. Strassburg* H 41 (Č) it is found under the heading

 together with 
^{sic}  all counted in , and  counted in .

It also occurs together with *wt-jb* on an ostracon from Thebes,³ and the close relationship between these two materials is proved by the lists published by DARESSY,⁴ where *wt. jb* is

directly explained as *knj*:  "wt-jb, that is (some sort of) *knj*."

That it represents some sort of paint or pigment is evident from such passages as 
"Schu is under her (Nut's) body, painted with *knj*".⁵

In the medical texts it is found but once in the description of a remedy against an obscure ailment, Berlin VII,5, 

¹ The lists will be found at the end of the article about *stj*.
² I am indebted to Prof. ČERNÝ for the references marked C.
³ GARDINER, *Theban Ostraca*, University of Toronto Studies pp. 16 l 16 m. The publication has not been available to me; I have the reference from ČERNÝ.
⁴ Cairo 35936, A.S.A. 16 (1916) p. 221. See *stj*. DARESSY translates 'beurre'.
⁵ BERGMAN, *Hieroglyphische Inschriften*, Wien 1878, pl. 78. 45—46, from BRUGSCH'S *Wörterbuch* VII 1254, where the reference is misprinted, though.

This material,—the mineral of which, as used by the Egyptians, was not poisonous (LUCAS, p. 400),—has been established by chemical analysis as a yellow pigment on various objects, and mural paintings, and the actual raw material was found in a linen bag in the tomb of Tut-ankh-Amun.¹

We are also told (ib.) that its use in Egypt cannot be traced back earlier than the eighteenth dynasty, which tallies very well with its occurrence in the texts.

It does not seem to have been found naturally in Egypt, which is so far astonishing, as it is generally found together with gold and silver ores,² and it is worth mentioning that the periplus directly states that it was an Egyptian export article, so that it seems to have been procured locally in antiquity.³

We shall see that its connection with wt-jb ,⁴ becomes a support for its connection with orpiment as the former with some probability can be identified with sandarac, the other arsenic compound of antiquity.

As seen from an etymological point of view there is hardly any doubt that the word $\begin{matrix} \triangle \\ \text{~~~~~} \end{matrix} \begin{matrix} \text{||} \\ \text{||} \end{matrix} \begin{matrix} \circ \\ \triangle \end{matrix} \begin{matrix} | \\ | \\ | \end{matrix}$ as such must be connected with the well known word $\begin{matrix} \triangle \\ \text{~~~~~} \end{matrix} \begin{matrix} \text{O} \\ \text{O} \end{matrix} > \text{ῤῥῖνε : κρω}$ "to be fat".⁵

But whether this word in itself originally had an affinity with a yellowish colour, which was responsible for its being used as the name of orpiment, or whether its well-established use for "yellow" was a secondary development dependent on the colour of this material, is impossible to decide.⁶

¹ LUCAS *op. cit.* p. 400.

² THEOPHRASTUS, *de lap.* LXXI.

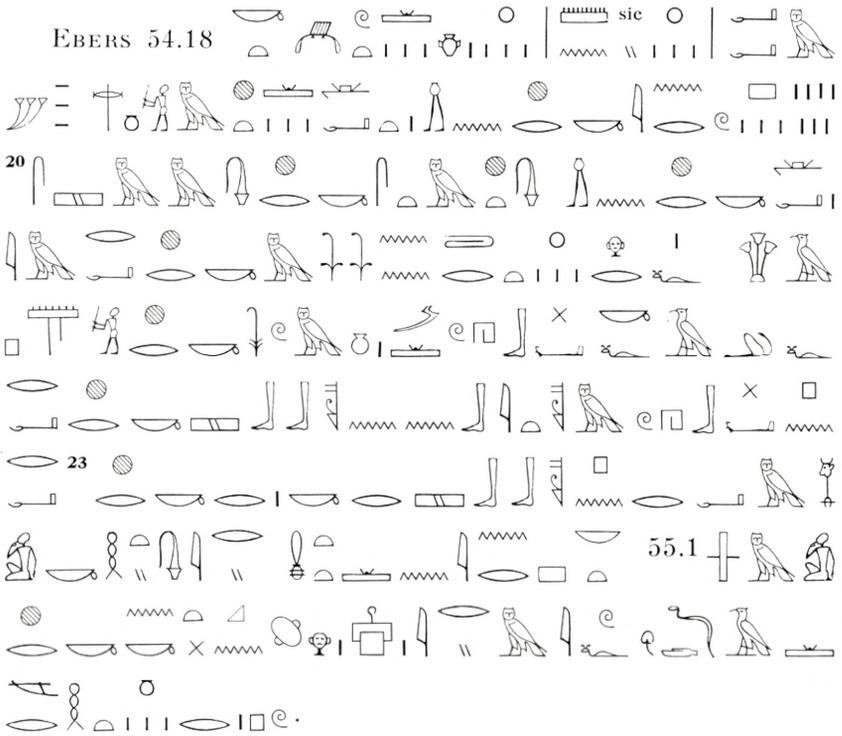
³ I owe this reference to Dr. EBBELL, who several years ago, when he heard that I was collecting materials on Egyptian pigments, was kind enough to send me some slips with notes and references, all of which in all essentials corroborated my own materials.

The references for which I am indebted to Dr. EBBELL, have been acknowledged where they occur.

⁴ Compare the separate article on wt-jb .

⁵ Cf. DEVAUD's remarks on κη , ῤῥῖνε and κρω = πίον , *Rec.* 39, 158.

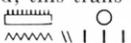
⁶ A curious parallel for the connection between the word for orpiment and a word for fat, is found in CHASSINAT's commentary on the Coptic medical text from Meshaiikh (*Mémoires* 32 (1931) p. 162—63, LV. 109). The usual word for orpiment in this text is the Greek word $\text{αρσενικον : αρσενικον}$, but in the passage quoted above, it has been replaced by the word ψαζω , which CHASSINAT identifies with Arabic شحم "graisse", "être gras", and explains as a "Geheim-name" for sulphide of arsenic, which is orpiment.



Following EBBEL's translation the text runs: "(to dispel cough) another, orpiment?,¹ bitumen?, "m,² are to be ground together. You shall then take 7 stones, you shall heat them in fire, you shall take one of them, you shall place (a little) of these remedies on it. You shall cover it with a new pot whose bottom has been perforated, you shall place a stalk of reed in this hole, you shall put your mouth to this stalk, so that you may inhale its smoke. Likewise with all stones. You shall then eat something fat afterwards, as (e. g.) fat meat or oil."

When the scanty evidence obtained from these rare occurrences of the word is considered by itself, it must be admitted that it hardly permits any definite conclusions as to the meaning or the nature of the word *wt-jb*.

¹ In the vocabulary at the end of the volume he translates *wt-jb* by "Realgar or orpiment" (p. 131).

² The word which in other instances seems to be identical with 'm' may mean "resin", "Harz". Until the material has been properly examined, this translation is only a tentative suggestion, however. EBBEL's translation of  as "bitumen" seems very doubtful.

We are left with the meagre information that its place in the lists makes it probable that it belongs to the pigments, that it has a close relationship to the word ḳnj.t , which is orpiment, and that it is found in the medical texts in the description of a remedy against cough, where it is used as an inhalant. By a rare and unexpected stroke of luck, however, the therapeutic evidence seems for once important and conclusive.

It has already been pointed out elsewhere in the present study that owing to the widespread, and according to our conceptions, unsystematic use of the different drugs in Egyptian therapy, it is methodically dangerous to let their therapeutic use play too great a part in their identification.

This is naturally the more so when we have only one example of the connection between a certain drug and a specific disease, as in the present case.

Nevertheless, we shall see that for once the therapeutical evidence seems conclusive enough to permit an identification all by itself owing to the special information regarding the use and application of the substance.

We have seen in the article about ḳnj.t , that another closely related compound of arsenic, the red sandarac ($\sigma\alpha\nu\delta\alpha\rho\acute{\alpha}\chi\eta$) or realgar, had a widespread use in antiquity.¹

If, however, we consider the therapeutic use of this substance as related in the *materia medica* of DIOSCURIDES (V. 120. p. 531 in BERENDES' ed.) we find a striking parallel to the passage from *Papyrus Ebers*, because we are explicitly told that sandarac is used "mit Harz als Räucherung gegen alten Husten, indem der Dampf durch ein Rohr in den Mund eingeatmet wird."

It will be admitted that this in itself would be sufficient to establish a deciding proof of the connection between ḳwt-jb and sandarac, but it is further supported by the already established

¹ It must be realised that the word sandarac was used in antiquity to designate quite a variety of substances, all of which have been enumerated by CHASSINAT in his edition of the Coptic medical papyrus (p. 82). There is no doubt, however, that the original meaning of the word was to designate the substance which we should call the red sulphide of arsenic.

This is evident from CAMPBELL-THOMPSON'S remarks (*Chemistry* p. 43) where he explains the origin of the word as a "merchant's garbling" of Akkadian ṣindu-arqu , "yellow paint", which originally was the name of orpiment. Owing to their close relationship—their main external distinctive was their colour—the two substances were never kept strictly apart, and the name of one was often used for the other. See the quotations from PLINY and CELSUS under ḳnj.t note 16.

connection with ḳnj.t , which becomes natural on the background of the natural relationship between the two materials orpiment and sandarac.

That ʔwt-jb should be explained directly as ḳnj.t is also intelligible owing to the fact that the two materials were never kept strictly apart in antiquity, where the name used for the material in each case would depend on the colour nuance of the sample in question.¹

As in ancient Egypt orpiment seems to have been the commoner of the two varieties, it is only natural that the rarer sandarac should be explained by its name.

It must be mentioned, however, that, as far as I know, we have no direct evidence for the use of sandarac as a pigment in Ancient Egypt.

LUCAS does not mention it,² and nobody else seems to have found it anywhere as an ingredient in the red paints of Egypt.

We have seen that the ordinary red pigment was red ochre, and LUCAS quotes BERTHAUD for having found the red colour on certain Egyptian palettes to be minium, which is red lead. This substance, however, was probably never used in Egypt until a very late date—probably not before Roman times—(LUCAS, *op. cit.*) and therefore it cannot have anything to do with the word ʔwt-jb occurring in the texts as early as about the eighteenth dynasty, significantly enough about the same time as ḳnj.t .

In spite of this deplorable lack of practical, chemical evidence, it will be seen, however, that we have conclusive material to corroborate EBBEL's original proposal from the vocabulary of his translation of papyrus *Ebers*,³ and to assert that sandarac is the only natural translation of ʔwt-jb , the literal translation of which would probably be "delight", referring undoubtedly to the bright and cheerful colour of the material.

¹ Compare Arabic *zarnīḥ aṣṣar* = ἄρσενικόν, and *zarnīḥ aḥmar* σανδαράκη. BOISSAC, *Dictionnaire étymologique de la langue grecque* p. 851, considers the word σανδαράκη as "un emprunt asiatique" and refers to Sanskrit *candra-rāga*, "ayant l'éclat de la lune". Compare, however, CAMPBELL-THOMPSON's etymology quoted above. CHASSINAT (*op. cit.* p. 83) quotes BERTHELOT (*Hist.* II 129) for the fact that the word *sandarac* may occasionally be used for red as well as for yellow arsenic.

² According to modern terminology he uses the word *sandarac* only to denote a resin obtained from *Tetraclinis articulata*, which was probably unknown to the Egyptians (*Materials* p. 371).

³ In the text he translates 'orpiment?'

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