Interregional Contacts in the Later Prehistory
of Northeastern Africa
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Experiments in grinding cereals

At the last Dymaczewo symposium in 1988, the author reported the results of observing the wear-use on stone tools for processing cereals from Asia with a metallographic microscope. The author identified wear on stone tools for processing cereals; however, its origin was not clarified. Therefore, some experiments of grinding cereals were carried out.

The stones used in the experiments were made of basalt and the cereal ground was wheat. A grinding-slab, a handstone, a pestle and a shallow mortar were made by flaking and pecking. As my technique of flaking and pecking is very poor, I was not able to make large-sized stone tools. Using these self-made tools, two ways of processing cereals were tried:

grinding - back and forth motion with a grinding-slab and handstone,
husking - up and down motion with a pestle and a mortar.

Pounding with a pestle and a mortar is not efficient, therefore this part of the experiment was not continued, although if the mortar was deeper, more efficient pounding could be carried out.

The results of the grinding was recorded after 200 motions, 500 motions, 1000 motions and 2000 motions. Macro- and micro-photographs were taken by means of a camera for macro-photography and a metallographic microscope. The metallographic microscope used in the experiments was the same instrument which was used in the previous experiment reported in 1988.

Husking with a pestle and a mortar is fairly effective. A handful of wheat ears were put on a depression of a mortar (Fig. 1a). They were completely husked by seven to ten strokes of a pestle without damage (Fig. 1b). Fragments of husks, straws and so on were easily removed by wind (Fig. 2a).

Grinding with a grinding-slab and a handstone is not so effective as husking. Because of the smallness of the tools, only a small amount of seeds can be placed on the grinding-slab and seeds are scattered over its edge without grinding. If a rim of a grinding-slab is higher than a grinding surface like an open-quern of the Levant, or a grinding-slab and a handstone are larger than experimental tools like a saddle quern, grinding cereals with stone tools becomes easier.

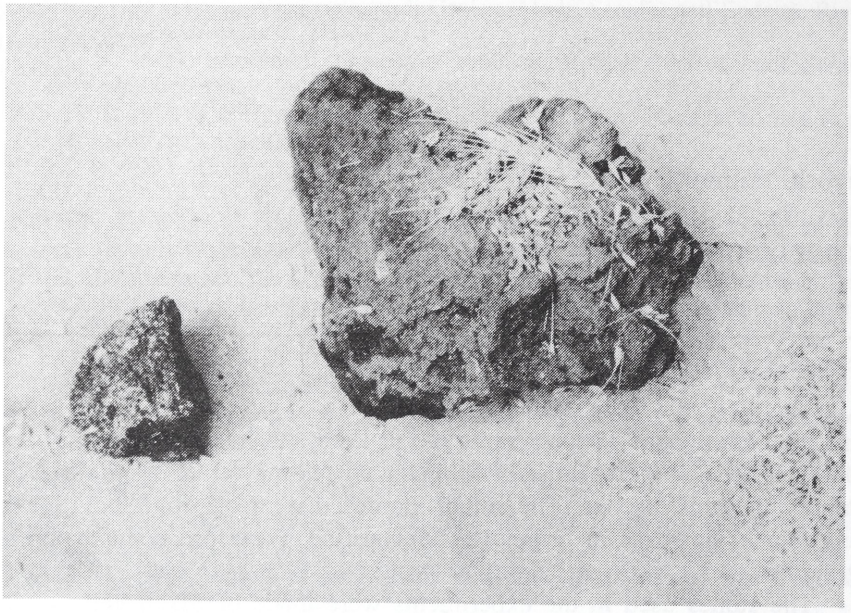

Fig. 1a. An experimental mortar and pestle with wheat ears.

Fig. 1b. Husked wheat by an experimental mortar and pestle.

The resulting experimental flour is not fine but very rough. It includes a lot of tiny fragments of basalt. It is necessary to remove them when processing the flour further.

The surfaces of grinding tools become smoother and smoother. After 500 back and forth motions, it is clearly seen that the surface of a grinding-slab and a handstone became smooth. After 2000 back and forth motions, the surface became much smoother and polished in appearance (Fig. 2b). On the other hand, the surfaces of husking tools remain little changed. After 500 up and down motions, no change is seen on the surfaces of a pestle and a mortar. Even after 2000 up and down motions, little change is observed by the naked eye. Surface changes can be recognized early, by microscopic observation, on grinding tools. On a pecking surface, no signs of use are seen and on a flaking surface, signs of use are also not observed. Even after 200 back and forth motions, weak lustrous gloss and striations parallel to the moving direction can be observed on smoothing surfaces of grinding tools. After 500 back and forth motions, lustrous gloss becomes stronger and abrading striations parallel to the moving direction appear. After 1000 back and forth motions, lustrous gloss becomes more bright and on some parts of the grinding surfaces lustrous gloss becomes dim. After 2000 back and forth motions, all aspects described above are seen clearer and clearer.

The same phenomena are seen on the archaeological specimens from Asia. On the surface of an upper stone of a saddle quern from Ubaid layer of Telul-eth-Thalathat in northern Iraq, lustrous gloss and striations are seen. The lustrous gloss of this specimen is not clear but dim and brightness decreases. The same features are seen on the surfaces of most saddle querns from Telul-eth-Thalathat in northern Iraq and are also seen on the surface of an experimental specimen after 2000 back and forth motions.

Lustrous gloss is thought to originate from plant silica in Gramineae, as sickle-gloss is sometimes found on the surfaces of sickle-blades. Striations are thought to come from abrasions between an upper stone and a lower stone. Abrasions between an upper stone and a lower stone are assumed to be the main reason why lustrous gloss becomes dim. The aspects of wear on archaeological specimens are the same as those on the experimental specimens. Therefore, saddle querns are thought to have been used for grinding cereals.

Surface change on husking tools can hardly be noted with metallographic observation. After 200 up and down motions, no change can be observed. After 500 up and down motions, very weak sporadic lustrous gloss can be detected only near the summit of the microtopography of the surfaces. After 1000 up and down motions, lustrous gloss becomes fairly strong, but sporadic. After 2000 up and down motions, sporadic lustrous gloss is clearly seen only near the summit by microtopography of the surface. In the valley of the microtopography of the surface, no trace of wear are seen. Lustrous gloss appears only at the contact point of the surface with the husking materials. This lustrous gloss is thought to originate from plant silica in Gramineae.

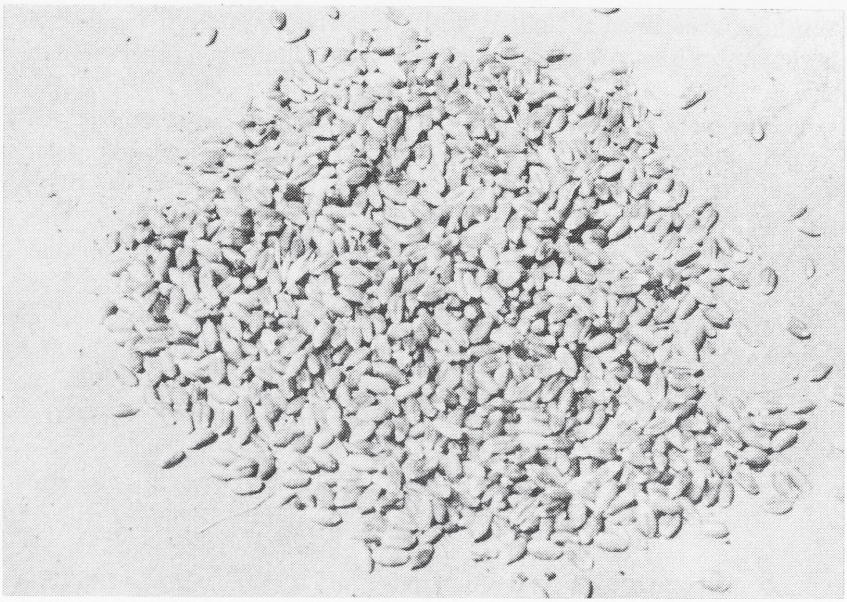

Fig. 2a. Wheat seeds after wind blowing.

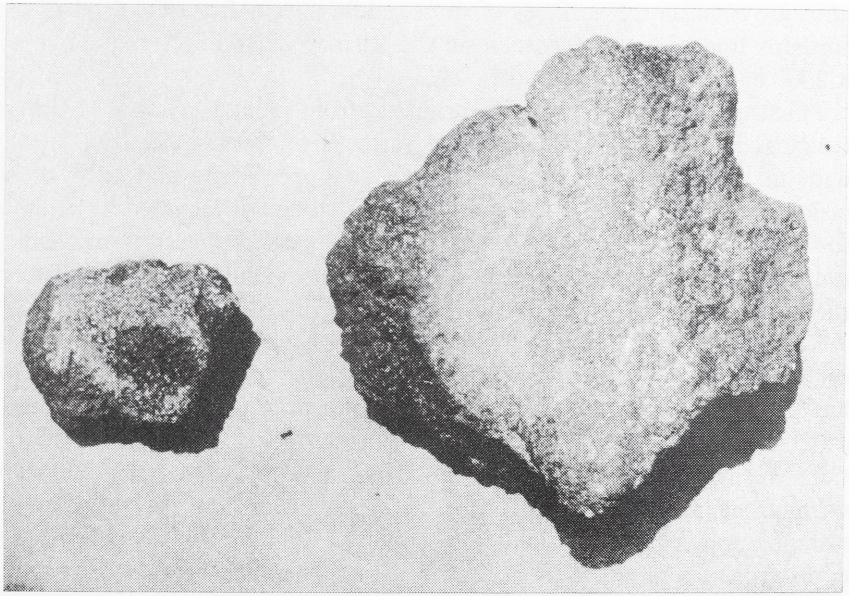

Fig. 2b. Experimental flour by a grinding-slab and a handstone.

On the surface of a handstone from the Neolithic layer of Tall-i-Mushuki in southern Iran, sporadic lustrous gloss is also seen. It is only found on the summit of microtopography of the surface. In the valley or the foothill of the microtopography of the surface, no traces of wear are detected.

The use-wear on this archaeological specimen resembles that on an experimental pestles: the features of wear and gloss, the position where traces of wear are seen and so on. These stone tools are thought to have been used for processing cereals. As stated before, these small experiments show that saddle querns were used for grinding cereals and that handstones, pestles and mortars, at least a part of them, were used for processing cereals.

From the prehistoric sites of Africa, many stone tools which are thought to be used for processing cereals have been found. Microscopic studies of them may clarify their way of use. On the basis of this study, the subsistence systems of the prehistoric societies in Africa can be assumed with firm evidence.