

## The Beginnings and the Early Spread of Agriculture.<sup>1</sup>

By HAROLD J. E. PEAKE.

FOR hundreds of thousands of years, man depended for food and clothing upon the products of the chase. As the last northern ice-cap retreated, Upper Palæolithic man hunted big game on the tundra and cold steppe that lay outside it. Then, as the ice-cap diminished, the zone of open country contracted, and first a coniferous forest, followed by a deciduous forest, occupied the temperate latitudes. Oak forests covered the greater part of these regions in late Magdalenian times, causing big game to become scarce and to retreat to such open lands as were left.

Thus ended the Palæolithic Age. During the Epipalæolithic Age that followed, small isolated communities lived by the shores of the sea, or of lakes and rivers, feeding on birds, fish, and molluscs, supplemented by nuts, berries, and roots. These were hungry times, and it seems likely that some had recourse to collecting wild grass-seeds, as do the natives of Queensland to-day.

Some Epipalæolithic man, or probably one of his woman kind, having collected the seeds of some grass, ancestral to modern grain, must have cast some of these on an open patch of soil and noted that fresh and sturdier plants arose on the spot; a repetition of this process constituted the first advance in agriculture. To ascertain where and when this happened, we must discuss the grains now in use and the places where they occur wild.

The countries in which rice is now grown are known to have received their civilisation from areas long acquainted with the cultivation of wheat and barley. A species of millet, *Panicum colonum*, was used at an early date in Egypt, but it may have been collected from wild plants. *P. miliaceum*, the millet now cultivated, was first grown in south Russia at a much later date. Rye was a common weed in fields of wheat, and in high altitudes supplanted the crop. Oats are a northern crop, and the first evidence of the cultivation of this grain comes from an early Iron Age village in Wiltshire. Barley and wheat have been cultivated from a very early time, though it is not clear which grain was grown first. It is obvious that both must first have been cultivated where they occur wild.

Wild barley is found in south-west Asia; it has been found also in two places in Tripoli. It may once have grown wild along a strip of north Africa from Palestine to the Gulf of Gabes. Wheats are of many species, but may be divided into three groups: einkorns (*T. monococcum*) with 7 chromosomes, emmers (*T. dicoccum*, etc.) with 14, and bread wheats (*T. vulgare*, etc.) with 21. Wild einkorn (*T. ægiloides*) is found throughout Asia Minor and in Syria; it occurs also in parts of Greece, Bulgaria, and southern Yugoslavia. Wild emmer (*T. dicoccoides*) occurs from Mount Hermon

and the Anti-Lebanon to the mountains of Moab, east of the Dead Sea; a claim has been made for its occurrence farther east, on the borders of Persia. The origin of the bread wheats is uncertain; they are thought to be hybrids, but whether of *T. dicoccoides* and an *Ægilops*, an unknown *Triticum* and an *Ægilops* or *T. dicoccoides* and *T. ægiloides* is uncertain. At one place only are both emmer and einkorn found growing wild together; this is on the slopes of Mount Hermon, near Damascus, where Aaronsohn found both growing with wild barley.

There is, however, a school of thought which claims that there was corn in Egypt before it was known elsewhere. This school is championed by Prof. Elliot Smith. Since no form of wheat is known to have grown wild in Africa, the claim is made that barley, which, as we have seen, occurs wild near the north coast of that continent, was first cultivated by the banks of the Nile.

Between 1901 and 1903, Mr. Lythgoe, under Dr. Reisner's directions, explored a predynastic cemetery at Naga-ed-Dêr; this is known as cemetery 7000. No account of the contents of these graves has yet been published, but short references to the cemetery occur in "The Early Dynastic Cemeteries of Naga-ed-Dêr" and in "The Archæological Survey of Nubia." From the latter it would appear that Dr. Reisner has divided the predynastic graves which he has found into three categories—early, middle, and late—and that the graves of cemetery 7000 were early and middle predynastic.

Elliot Smith examined the bodies from these graves, and submitted the contents of the stomachs of a number of them to Dr. Netolitzky, who reported in a letter that several of them contained husks of barley. In two papers that he published shortly afterwards he stated that the glumes were either those of wheat or barley, but later he passed on the material to a pupil, Dr. Hedwig Gherazim, who finally proved that the glumes were those of barley. This proves that these predynastic Egyptians ate barley, and presumably cultivated it, but, as Percival has pointed out in NATURE, since the glumes of wheat do not adhere to the grain, they may have eaten that too.

The predynastic period is a long one, and it is important to know to what part of it these graves belong. Though no dates for this period are available, Sir Flinders Petrie has invented an ingenious device for zoning it. This is the system of sequence dates, which is accepted by nearly all Egyptologists except Dr. Reisner. These sequence dates run from 30 to 78, and the period is usually divided into early s.d. 30-39, middle s.d. 40-59, and late s.d. 60-78. It is not clear that these agree exactly with the corresponding divisions of Dr. Reisner.

Now about s.d. 40 there appears a number of objects not met with in earlier graves; notably

<sup>1</sup> Substance of two lectures delivered at the Royal Institution on Mar. 31 and April 7.

pear-shaped mace-heads and wavy-handled pottery. Both of these occur in Palestine, and the former are found in very early deposits in Mesopotamia. The inference is that invaders from Palestine had brought in these new objects; they might also have brought with them the knowledge of wheat and barley.

Dr. Hrozný, quoting Schäfer, states that Legrain and Lampre found barley and emmer in a tomb with a contracted burial at Silsileh, without a trace of copper. I cannot find an account of this grave, for de Morgan, who mentions the cemetery, says nothing of grain. Schulz, however, says that the grain was barley, and not emmer, as had been thought.

At Abydos, Prof. Peet found kilns for drying grain, and in them some carbonised matter from which Prof. Harvey Gibson extracted grains of wheat. In similar kilns near by, Peet found pottery fragments belonging to the middle predynastic period. At Badari, Miss Caton-Thompson found grain, identified by Percival as emmer, in a ruined hut; above this hut was a layer of late middle predynastic pottery. In a grave at Hemamieh, between Qua and Badari, Brunton found grain, also identified by Percival as emmer; the pottery, he tells me, is rough and not very typical, but he places this between s.d. 37 and 44. He adds: "A slate, a disk-shaped mace-head, and a stone vase would all be round about s.d. 40."

The evidence of these three discoveries tends to show that wheat arrived in Egypt in s.d. 40, and was freely used early in the middle predynastic period. Whether barley was grown earlier depends on whether the graves in cemetery 7000 at Nagad-Dêr and that at Silsileh date from before this time. In the absence of details as to the grave contents this must remain for the present an open question.

Thus it would appear that wheat certainly, and perhaps barley too, were first cultivated in Syria, probably on the slopes of Mount Hermon. In this connexion it is well to remember the statement of Diodorus Siculus, written 2000 years ago, that the Egyptian goddess Isis discovered "wheat ( $\tau\rho\upsilon\phi\acute{o}s$ ) and barley growing promiscuously about the country along with other plants, and unknown to mankind," and that this occurred at "Nysa, a high mountain in Phœnicia, far away."

As we have seen, emmer was taken to Egypt at the beginning of the middle predynastic period; thence this grain appears to have been carried to the lands surrounding the Mediterranean. Grain was also cultivated early in Mesopotamia, though which grain was known there first is uncertain.

Before 2000 B.C. the Sumerians compiled lists of kings and dynasties, beginning with eight or ten antediluvian monarchs, who ruled at various cities in Mesopotamia. One of these kings reigned at Eridu, while another, who ruled at Suruppak, escaped in a boat from the flood. After the flood there ruled in succession dynasties at Kish, Erech, and Ur. A tablet found near Ur mentions A-annipadda, son of Mesannipadda, the founder of the

first dynasty of that city, and quite lately a lapis lazuli cylinder seal of Nin-Kur-Nin, Mesannipadda's queen, was found in a grave at Ur. No search has yet been made for relics of the first dynasty of Erech, but at Kish, Prof. Langdon has found a layer which he believes dates from the first dynasty of that city, the first after the flood. Here have been found tablets covered with pictographic inscriptions and also some pots of a polychrome ware.

Similar polychrome pottery was found last year at Simdet Nasr, about 16 miles from Kish, and in one of these pots some grain, which is clearly a kind of wheat. Unfortunately, experts differ as to the species. An American botanist has identified it as *T. vulgare*, Dr. Stapf believes it to be *T. compactum*, a more developed type of *T. vulgare*, while Percival states that it is *T. turgidum*, a more developed type of *T. dicoccum* or emmer. Whatever may be the ultimate verdict, it is clear that wheat of some kind had long been cultivated in Mesopotamia at the time of the first dynasty of Kish.

At Tell el Obeid, however, graves have been found which are believed to antedate the first dynasty of that city by a long time; they contained fine painted pottery. Similar pottery, sickles, hoes, and querns, and pear-shaped mace-heads, have been found at Abu-Shahreïn, the site of Eridu, the seat of one of the antediluvian monarchs. It is clear that grain was grown in Mesopotamia before there took place the disaster which gave rise to the story of the Great Flood.

At a very early date people making highly burnished pottery had been living at Knossos in Crete; their figurines suggest that they came from Asia Minor. No evidence of agriculture has been found among their remains, but if they cultivated grain it is likely to have been einkorn, which is native to Asia Minor. About 3400 B.C. fresh people arrived on the Mesara Plain; these Sir Arthur Evans believes came from the north-western corner of the Delta. Though there is again no evidence of agriculture among the remains found of these people, they can scarcely have been ignorant of the practice, and probably cultivated emmer. It seems likely that it was the Cretans who disseminated this grain throughout the Mediterranean area.

Other people from south-west Asia Minor were working the mineral resources in the Cyclades about the same time, and a few centuries later settled in Argolis and near Corinth. It is thought that these people grew grain, and if so it is likely to have been einkorn. Other people, also from Asia Minor, settled still earlier in Thessaly. These are known to have grown grain, though of what type is uncertain; again it seems likely that it was einkorn. A third set of people, probably from Asia Minor, came apparently by boat to the Middle Danube basin, and settled near the gold and copper deposits of Hungary and Transylvania. It seems likely that they had arrived there some centuries before 3000 B.C. Einkorn has been found in some of their settlements.

Lastly, we have the Black Earth lands of south Russia, in which we have evidence of a civilisation, the first stage of which is thought by most people to be coeval with those mentioned in Thessaly and the Danube basin. This civilisation is distinguished by a profusion of painted pottery, and evidence that the people who made it were grain growers. According to Prof. Childe, this civilisation was destroyed about 2600 B.C., when some of the people fled to Thessaly, inaugurating there the second Thessalian civilisation. The destroyers seem to have been nomads from the steppes east of the Dnieper; these seem to have invaded the Danube basin, founding there the second Danubian civilisation. Now at Sesklo, a second Thessalian site, and at Lengyel, a second Danubian site, grain has been found; in both cases the sample contains both einkorn and *T. vulgare*. The inference is that both regions grew einkorn during the first phase, and that *T. vulgare* was introduced into both from the

Black Earth lands. Quite recently a paper has been published in Kiev, citing the existence of *T. vulgare* from a site near that city, belonging to this culture, though whether this belongs to the first or second phase is uncertain.

At Anau, a village site in Turkestan, painted pottery has been found, bearing some resemblance to that of the Black Earth lands. In the earliest layer on this site were found potsherds containing impressions of grain; this grain has been identified as *T. vulgare*. From this it is suspected that the art of painting pottery and the cultivation of bread wheats both arose somewhere in Transcaucasia.

From Crete and the Danube basin the practice of agriculture spread, by sea and by land, to all parts of Europe, while from Turkestan it was carried, with painted pottery, certainly to north China and most probably also to north-west India.

### Television.

By Prof. E. TAYLOR JONES, University of Glasgow.

ON May 24 and 26 I proceeded, at the invitation of Mr. John L. Baird, to the Central Station Hotel, Glasgow, to witness demonstrations of television between London and this city. I was received by Mr. Baird's colleague, Capt. Hutchinson, who explained that the transmission was to take place over the telephone line, Mr. Baird, in his laboratory in London, being in charge of the transmitting apparatus.

The earlier apparatus devised and used by Mr. Baird has been described by him in the *Journal of Scientific Instruments* for Feb. 1927. A model of the original transmitting apparatus is in the possession of the University of Glasgow, of which Mr. Baird is a former student. The following additional information as to the method has been supplied by him:

"The method used in the London-to-Glasgow demonstration consisted in passing an image of the object being transmitted over a light-sensitive cell in a series of strips. The modulated current from the cell was transmitted over the ordinary trunk telephone line, and at the receiving station in Glasgow was used, after amplification, to control the light of a glow discharge lamp, a modified form of neon tube, giving a light of intense brilliance, being employed. By means of a revolving slotted shutter a point of light from this lamp was caused to travel over the field of vision in exact synchronism with the traversal of the image over the cell at the transmitting station, complete traversal taking place in about one-eighth of a second."

The receiving apparatus was set up in a semi-darkened room, the lamp and shutter being enclosed in a case provided with an aperture. The observer looking into the aperture saw at first a vertical band of light in which the luminosity

appeared to travel rapidly sideways, disappearing at one side and then reappearing at the other. When any object having 'contrast' was placed in the light at the sending end, the band broke up into light and dark portions forming a number of 'images' of the object. The impression of sideways movement of the light was then almost entirely lost, and the whole of the image appeared to be formed simultaneously. The image was perfectly steady in position, was remarkably free from distortion, and showed no sign of the 'streakiness' which was, I believe, in evidence in the earlier experiments.

The size of the image was small, not more than about two inches across when the 'object' was a person's face, and it could be seen by only a few people at a time. The image was sufficiently bright to be seen vividly even when the electric light in the room was switched on, and I understand that there is no difficulty in enlarging the image to full size. I was told also that arrangements will soon be made for transmitting larger 'objects,' and for increasing the number of appearances of the image per second.

The amount of light and shade shown in the image was amply sufficient to secure recognisability of the person being 'televised,' and movements of the face or features were clearly seen. At the second demonstration some of those present had the experience of seeing the image of Mr. Baird transmitted from London while conversing with him (over a separate line) by telephone.

My impression after witnessing these demonstrations is that the chief difficulties connected with television have been overcome by Mr. Baird, and that the improvements still to be effected are mainly matters of detail. We shall doubtless all join in wishing Mr. Baird every success in his future experiments.