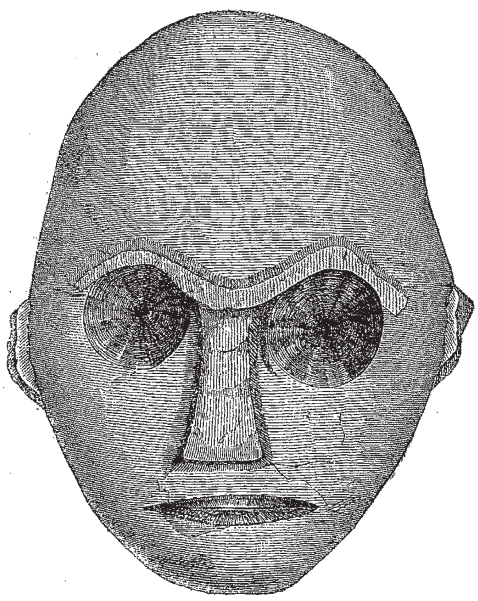
elaborate carvings of the human face have been found in Western New York, figures of which are given in the Thirteenth Annual Report of Regents of New York State University. These may or may not be of identical origin with the western mound specimens. The specimen here figured is, I believe, the only one ever found in New Jersey. It is a hard sandstone pebble, such as are common to the bed of the Delaware River, above tide water. It measures six inches in length by a fraction over four inches in greatest breadth. It is concavo-convex, the concavity being shallow and artificial. The carving of the front or convex side is very rude, but shows distinctly that it has been done with *stone tools* only. The eyes are simply conical counter-sunk holes, rudely ridged, and just such depressions as the stone drills, so common among the surface relics of this neighbourhood, would produce. In the collection of stone implements from Central New Jersey, at the Peabody Academy of Salem, Mass., are several drills sufficiently large to bore as wide and deep depressions as the "eyes" of this mask. The nose is very flat and angular; the mouth merely a shallow groove. The ears are broken, but appear to have been formed with more care than any other of the features. The chin is slightly projecting.



The interest attaching to this specimen is, I think, twofold, and worthy of a moment's consideration. It is interesting from the fact of being found in New Jersey, a point much further east than the mound-builders have been supposed to reach, and there is no reason to suppose that the specimen was ever brought by white men from the west, and lost here. The circumstances connected with its discovery render such a supposition untenable. Its interest, otherwise, is in the fact (as I suppose it) of its being a true relic of the mound-builders. The mystery of this people has certainly yet to be solved, if, indeed, it ever can be, and the relationship they bore to the "Indian" determined. In the prosecution of my investigations into the "stone-age" history of the New Jersey Indians, I was continually struck with the great resemblance of the stone-implements found in New Jersey to those found in the western mounds. The specimens figured by Messrs. Squier and Davis, in the first vol. of Smithsonian Contributions, 1847, were all, or nearly so, duplicated by specimens I gathered in New Jersey; and up to the time of the completion of my second paper on the Stone Age of New Jersey (now in press), I needed but "animal pipes" and stone masks, such as the above, to make the duplication of the mound-relics complete. The occurrence of this specimen brings it to the one form of pipes, and that such have occurred in New Jersey is highly probable; but not having gathered such a specimen, myself, I assume that none have yet been found. It must be borne in mind, however, that as there are no mounds in New Jersey, animal pipes, if found here, must occur as surface relics, or in graves; which latter were, as a rule, very shallow. As New Jersey has been settled for about two centuries, it is probable that such animal pipes would be gathered up, when found, and soon again lost or destroyed, when ordinary "relics" would be overlooked. In this way, such animal pipes would have all disappeared, perhaps a century ago, when their value as archæological specimens was unknown. This, too, might account for the great rarity of such specimens as the mask here described. CHAS. C. ABBOTT

Trenton, New Jersey, U.S.A., April 22

*FERTILISATION OF FLOWERS BY INSECTS**

X.

Lilium Martagon.

C. SPRENGEL was the first to turn his attention to the structure of the beautiful flowers of this plant;† but he did not succeed either in observing insects visiting them or in explaining the contrivances by which they are cross-fertilised when visited by suitable insects. Since Sprengel's time nobody had, as far as I know, studied the manner of fertilisation of *Lilium Martagon*. It was, therefore, with great pleasure that, in Thuringia, I examined the structure of its flowers, and watched them in their natural habitat. The results of my observation were as follows.

Along the middle of each sepal and petal, beginning at its base and continuing throughout a length of 10-15 mm.,

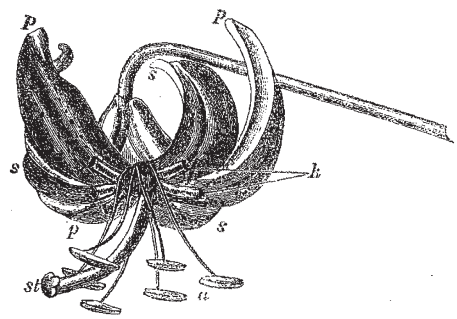


FIG. 63.—Flower of *Lilium Martagon* in its natural position and natural size.

is a furrow, which secretes honey, and whose margins converge and are bordered with reddish knobbed hairs, so close as to cover the open side of the furrow, and to convert it into a channel (*h*, Figs. 63, 64). The basal opening of this channel (*b*, Fig. 64) being closed by the base of a filament, the only way by which the honey is attainable is the small opening at the end of the channel (*e*, Fig. 64). This opening, as well as the channel itself, is very narrow, its diameter only a little exceeding 1 mm. No other insects except Lepidoptera are provided with sucking instruments sufficiently long and slender to be able to reach the honey concealed in these long and narrow channels; and from the flowers being turned downwards and the stamens projecting and slightly bending upwards, it is evident that Lepidoptera, when sucking this honey, cannot avoid dusting their under-side with pollen, and effecting cross-fertilisation as often as they fly to another

* Continued from vol. xi. p. 171.

† C. Sprengel, "Das entdeckte Geheimniss," &c., pp. 187-189

flower and bring their pollen-covered under-side first in contact with the stigma, which slightly overtops the anthers. The flowers of *Lilium Martagon* must consequently be considered as adapted to cross-fertilisation by Lepidoptera.

The colour of these flowers, dark reddish brown, with dark purple dots on the inside, is not very striking, and in the daytime they are but slightly scented, whereas during the evening they emit a very attractive sweet odour. Hence we may safely conclude that they are far more attractive to crepuscular and nocturnal than to diurnal Lepidoptera.

Thus far, in Thuringia, in July 1873, I had succeeded in explaining the separate peculiarities of the flowers; but in vain had I watched them repeatedly during the evening in order to surprise the fertilisers in the very act of fertilisation. But the hope I had failed in when making every effort to realise it, happened to be fulfilled a year later, quite unexpectedly. In the Vosges, returning from the Hoheneck, and passing the village Metzerall, July 5, 1874, towards the evening, I was struck with the sight of flowering plants of *Lilium Martagon* growing in a garden hard by, and a specimen of *Macroglossa stellatarum* flying round them and fertilising them.

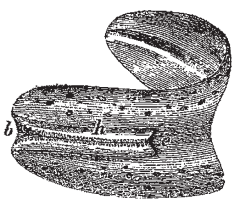


FIG. 64.—A single sepal or petal of this flower, magnified.

Freely fixed in the air by the rapid movement of his wings, this busy Sphinx inserted his long slender proboscis into the honey-channels of the sepals and petals, now of a single one, now of others of the same flower, and having done so immediately flew away to another flower. Yet, the flowers never being turned directly downwards, but somewhat inclined, all the honey-channels of any flower were never sucked by the Sphinx, but in every case only those of the uppermost sepals and petals. When sucking he always touched the stigmas and the anthers with his legs and under-side, and the latter ones were to be seen rocking and swinging. Thus, undoubtedly, the under-side of the Sphinx was dusted with pollen, and the stigma of the flower next visited, when first touched by the pollen-covered under-side, was cross-fertilised. A single Sphinx, with his vehement movements during a quarter of an hour, may easily visit and cross-fertilise plenty of flowers of *Lilium Martagon*. Nevertheless, self-fertilisation in many of these flowers will occur, where visits of Sphingidæ are wanting. For the stigma, by being bent upwards more decidedly than the anthers, comes frequently into contact with one or two of them; and C. Sprengel, who enclosed the yet unopened flowers of *L. Martagon* in a net, thus excluding all insects except some ants (and perhaps Thrips), was surprised to find that every capsule developed and matured its seeds.

Lippstadt HERMANN MÜLLER

NOTE ON THE HYRCANIAN SEA

THE resolution of the problems which are involved in the physical aspects of Western Turkestan, and which have offered so ample a scope for speculation, will probably be one of the earliest and most important consequences of the occupation of the banks of the Amú Darya by Russia. But, whatever may be the light which will thus be afforded to geographers, ethnologists, or historians, it is to be expected that the field of inquiry will widen and recede, in proportion as each step forward is made, along paths which have hitherto been shrouded in obscurity.

Among the observations which will demand, and which will most certainly fully repay, the greatest attention, are those which shall accurately determine the true rate of evaporation from the surface of Lake Aral. A meteorological observatory was established in June 1874 on the lower courses of the Amú, and its working will contribute much to a knowledge of the rate of local evaporation. It may be doubted, however, whether such observations as are recorded at Núkús will be of practical value for determining the desiccation going on in Lake Aral itself. In the absence of precise information we shall for some years be dependent upon data of doubtful trustworthiness, in regard to the aspect the lake may have presented at different epochs in past history.

Among such data there is an isolated observation which seems worthy of more attention than has hitherto been given to it. Between the years 1848 and 1858 Boutakoff found that the depth of water at the entrance of Abougir (the gulf at the south-west corner of Lake Aral, which is now entirely dry) had decreased by eighteen inches, or, in other words, at the rate of 0·05 yards per annum. This rate of decrease may possibly be not very exact; but it is approximately so, and may therefore serve, until better data are available, to draw some conclusions regarding the Aralo-Caspian Sea.

The chart of Lake Aral, compiled from the surveys of 1848-49, shows the waterspread to be about 24,500 square miles. The contour line drawn at a depth of twenty-four feet on this chart includes an area of about 18,300 square miles, *i.e.* the loss of surface is 6,200 square miles. For every yard of fall below its surface of 1848, Lake Aral, down to a depth of eight yards, loses a waterspread of 775 square miles. And since during the past twenty-seven years the surface has fallen $27 \times 0{\cdot}05 = 1{\cdot}35$ yards, the waterspread of 1875 will be $24500 - 775 \times 1{\cdot}35 = 24500 - 1046{\cdot}25 = 23453{\cdot}75 = 23454$ square miles, say. The mean of the two waterspreads of 1848 and 1875 will be $\frac{24500 + 23454}{2} = \frac{47954}{2} = 23977$ square miles, or 74,271,155,200 square yards; and this quantity multiplied by 0·05 gives 3,713,557,760 cubic yards as the volume of water lost by Lake Aral yearly since 1848, or a loss of 120 cubic yards per second.

The supply poured into Lake Aral by the Amú and by the Syr can only be guessed at, since it has probably fluctuated during the past twenty-seven years. At the present time the combined volume afforded by those two rivers may be taken at about 2,000 cubic yards per second; and this estimate is probably not ten per cent. removed from the actual truth. The evaporation, then, from the lake must be assumed to have been, since 1848, $2000 + 120 = 2120$ cubic yards per second, from a waterspread of 23,977 square miles, or 74,271,155,200 square yards, which is equal to an evaporation of 0·0026 yards per diem = 0·0936 inches per diem, or thirty-four inches per annum.

The physical aspects of the shores of Lake Aral suffice to show that in very recent times its level has been at least fifty feet higher than that of to-day. With this increased depth the waterspread would be about 36,500 square miles, or 113,062,400,000 square yards. The daily evaporation from this surface at 0·0026 yards will be 293,962,240 cubic yards, or 3,400 cubic yards per second. There was therefore a time (and that a recent one) when Lake Aral received a supply of 3,400 cubic yards per second; and, indeed, of more than that quantity. The Russian knowledge of the country, handed down by the great map of the sixteenth century, informs us that a river flowed from the Aral to the Caspian. The geographical MS. of (according to M. Vámbéry) Ibn Said el Belkhi, notices in the early part of the tenth century, the opinion that the two seas communicated; and this com-