

The animal is reckoned poisonous, and its bite has in certain cases been followed by death, although nothing is yet known of its poison-apparatus.

The species of Turkistan beetles are estimated at 1000. I have before me a list of 500, some of them as yet unpublished. Amongst the most remarkable is the *Copris tumulus*, the largest specimen measuring one inch and three-quarters long.

The hymenopterous fauna of Turkistan is not yet fully worked out, but I may observe that of *Mellifera* there are known 438 species, and of *Sphegidae* upwards of 150. As regards the latter, the valleys of Ferghana and the Zarafshan do not present many specialities. On the other hand, the Kizil Kum desert abounds in new species and even genera, sharply distinguished from known species both in the form of the body and in the beauty and size of the individuals. There is, moreover, a remarkable similarity between the species belonging to the Kizil Kum and the Egyptian sands. Of *Scoliidae* 30 species are known, whilst of *Mutillidae* 18 species have been treated by Gen. Radoszkovsky, who informs me that Gen. Komaroff, now military governor of the Trans-Caspian district, has quite recently made scientific explorations between Askhabad and Merv, and that among the insects collected by him about Askhabad are six species of *Mutillidae*, four of which are marked as new, and one as a new genus. Of 36 species of ants collected in Turkistan, 7 only were new. The Formicidae of the region seem to be very similar to those of South Europe. This is not astonishing, since the mean temperature of a Turkistan summer differs little from the mean summer heat in Southern Europe, and this case only proves once more that, in general, countries with summers alike have greater similarity with regard to fauna and flora than countries lying under identical isotherms with different summers. This peculiarity is evident with regard to Formicidae, because, for example, in Italy and Turkistan they have an identical summer; and though the winter in Turkistan is long and cold, it does not appear to have much influence over the ants, which are protected therefrom. European species which live in trees and woods appear to be in most cases absent from Turkistan. Of the new Turkistan species one *Ischnomyrmex raphidiiceps* is specially interesting, as closely allied to two species inhabiting countries between the tropical and sub-tropical zones of the southern hemisphere. It is remarkable, therefore, to meet with a species of the same genus in the temperate zone of the northern hemisphere, and it may be presumed that these last have existed in Turkistan since the Tertiary period. I have yet to mention *Chrysidiformes*, of which 53 species have been found in Turkistan, and among them 2 new genera and 15 new species.

Before passing from hymenopterous insects I may mention that, though saw-flies are not numerous in the Zarafshan Valley, yet there is one form particularly remarkable, for, with a normal male, related to the group *Selandridae* is a female without traces of wings. Affected by this absence of wings, the thorax undergoes important changes, and appears greatly swollen, and all the females generally have the appearance of little bags. Its relation to this family is said to be astounding, since it is the only example of the wingless form in the whole family of saw-flies. All the other specialities of structure, however, as well as the wings of the male, confirm it.

One of the first lists made of the butterflies and moths of Turkistan enumerated 367 species, of which 122 species were of *Microlepidoptera*. The great majority (284) were caught in the oases and hilly districts between 750 and 4500 feet above the sea; 41 species also were taken on mountains up to 8000 feet high, and 28 species from 8000 to 13,000 feet. Mr. Alpheraky, of Taganrog, has furnished me with a list in manuscript of 377 species of Lepidoptera collected by him in 1879 in the district of Kuldja and the

surrounding mountains; but even these two lists together, I am told, give only an incomplete enumeration of the Lepidoptera of Turkistan, which contains a large number of new forms.

As we travelled from Tashkend to Khojend dragon-flies were so numerous that we caught several specimens by extending a butterfly-net from our carriage. The neuropterological fauna, however, of Turkistan is only partially known. Mr. MacLachlan has treated upwards of 60 species, most of them European in character, and many of them belonging even to Western Europe, whilst there is also an unimportant mixture of the Indian element.

There is a mingling again of the Indian element in the orthopterous fauna of Turkistan, but the Indian species are much fewer than the European. This fauna is particularly like that of South Russia, and it contains a large number of West European species. The non-European species are from South Asia, among which are a few from more distant countries, particularly from Africa. The total number of species known in Turkistan exceeds 70. Among them should be mentioned two locusts, and a third called locally *Prus*. Ravages of the former have been complained of in the neighbourhood of Perovsk and of the "*Prus*" in the Zarafshan Valley.

Of *Hemiptera* I have no list of species, but I saw a fine collection at Tashkend, made by Mr. Oshanin.

I come, lastly, to *Cestodes*, or intestinal worms. Of 47 species known in Turkistan, 2 are found in man, 3 each in the dog and sheep, 2 each in the cat and goat, and 1 each in the horse, ox, and marmot; 30 are found in birds, 2 in reptiles, and 1 in fishes. Of all the *Vermes* the most interesting is what the Bokhariots call the *Rishta* (*Filaria medinensis*). The parasite is found at Bokhara and certain adjacent towns in the water of stagnant pools, which the natives drink, and suffer in consequence from the *rishta* disease. The worm develops under the skin, lengthening at the rate of about an inch in a week, until an abscess is formed, through which the head (as is said) of the parasite appears. The problem, then, is to extract the animal entire. Native specialists insert a needle, and one end is drawn out by the fingers of the right hand, whilst those of the left press the adjacent part. Russian medical men wind off the animal on a reel, so much as comes out daily without force, till the whole, commonly three feet in length, is extracted. If, however, the worm should break, thousands of fresh germs are liberated from the broken part, and the illness continues for several months. I met with an unsuccessful case at Samarkand, and was given by the doctor some pieces of the *rishta*, which I brought in spirits to London.

The appearance of the worm is of a milk-white colour, resembling cooked vermicelli, and it can be stretched like a piece of elastic. The investigations of Prof. Fedchenko brought to light some very interesting facts concerning the *rishta*, the first of which was that the germs of the parasite cannot live in very fresh water, which is in keeping with the fact that the parasite appears only in those places where the people are forced to use standing water. The *rishta* is the last of the Turkistan fauna that I can mention here, but I hope within a few weeks to publish fuller particulars, through Messrs. Sampson Low and Co., in a new work entitled "Russian Central Asia, including Kuldja, Bokhara, Khiva, and Merv, with Appendices on the Fauna, Flora, and Bibliography of Russian Turkistan."

HENRY LANSDALL

#### FIELD EXPERIMENTS AT ROTHAMSTED<sup>1</sup>

THE above Report, forwarded to us, bears the name of no publisher, and is not priced. It therefore may be taken as a private issue, copies of which can only be

<sup>1</sup> "Memoranda of the Field Experiments conducted on the Farm and in the Laboratory of Sir John Bennett Lawes, Bart., at Rothamsted, Herts., June, 1884."

had by application to Sir John Lawes at Rothamsted Park, St. Albans.

The task of reviewing matter of so condensed a character as this is by no means easy. Ever since 1840, Sir John Lawes has carried out field and stall experiments on a scale well worthy of a national enterprise. Elaborate papers by this most enterprising of experimentalists, and his equally well-known coadjutor, Dr. T. H. Gilbert, have poured forth from Rothamsted during the entire memory of the present generation. During the last twenty-five years the scientific staff presided over by Dr. Gilbert has consisted of two, and sometimes three, chemists, and as many competent assistants, a botanical assistant, two to four computers and record-keepers, besides laboratory men. From 1847 to 1884 ninety-six memoirs have been contributed upon subjects bearing upon the soil, the plant, the atmosphere, drainage water, and rainfall, utilisation of sewage, animal nutrition, feeding-materials, manures, the occurrence of fairy rings in pastures, &c., &c. There is, in fact, scarcely a topic of agricultural or pastoral life which has not been investigated at this great English Agricultural station, and that through the enterprise of one man.

The Memoranda commence with a summary of rainfall and drainage extending backwards to 1851. Not only is the local rainfall given for each month over a period of nineteen years, but also the amount percolated through gauges of 20, 40, and 60 inches in depth of soil, the amount evaporated, and the amount retained by capillary attraction in the soil. Thus, as a general summary of the total rainfall, we find 45.3 per cent. percolated through 20 inches depth of soil, 47.4 per cent. through 40 inches of soil, 41.9 per cent. through 60 inches of soil, as indicated by rain- or drain-gauge, while the remainder is accounted for by evaporation or retention in the interstices of the soil. The averages obtained by unremitting observation from 1851 to 1870 are used in comparison with subsequent years, as in the case of the last completed record from September, 1882, to August, 1883. The three last columns of the tables given are devoted to the nitrogen removed in solution by percolation of drainage-water calculated in pounds per acre, by which we see that, at the depths above-mentioned, from 36 to 44 lbs. of nitrogen per acre are annually carried down from the upper layers of the soil to a depth of 5 feet and more.

One of the most attractive series of experiments, extending now over a period of thirty years, is that carried out upon permanent grass-land in the Park at Rothamsted. Space forbids more than a most cursory sketch of these experiments. Like all the Rothamsted investigations, the first aim is practical and comparative. The questions asked are as follows:—What is the effect of various applications to grass land? Which gives the largest return? What is the effect upon the herbage of continuous and of varied treatment? What is the effect upon the soil of long-continued privation and of long-continued *feeding* with simple and combined dressings? The investigation is at once chemical, physical, and botanical, and the change wrought in the character of the herbage of various contiguous plots of natural pasture, as well as upon the soil to a great depth, is most remarkable.

Perhaps the chief interest in the experiments upon crop cultivation will still centre around wheat. Broad-balk field, on the Rothamsted estate, is unique, so far as treatment and cropping goes. In 1839 this field carried a crop of turnips, manured with farm-yard dung; in 1840 it was barley; in 1841, peas; in 1842, wheat; in 1843, oats; all the four last crops being unmanured. The field was, therefore, according to all farming rules, in an exhausted state when the first experimental crop of wheat occupied it in 1844. Every year since 1843 has this field carried wheat, and, with some exceptions, nearly the same description of manure has been applied to each plot. In this field the visitor, during the present summer, will see

the forty-second wheat-crop growing without manure of any description upon the unmanured portion of the field, still keeping up a wonderfully uniform yield of about thirteen bushels per acre—or about the average yield of wheat-lands in the United States of America. This is a striking fact for those who fear the eventual exhaustion of our soils. Equally startling is the result from the continued use of nitrate of soda year after year. This fertiliser is looked upon by many landlords and agents with suspicion as a stimulator and exhauster of the soil; and yet after forty-one years application of nitrate of soda, and nothing else, we have the astounding result of an average of 23½ bushels per acre, or double the yield of the unmanured plot. And, although it is true that the yield of the unmanured and nitrate of soda plots is less upon an average from 1868 to 1883 than it was from 1852 to 1867, yet it is equally true of the plot manured with 14 tons of farmyard manure annually; and this falling off is therefore probably due to a succession of bad seasons, more than to any actual exhaustion of the soil. Another striking fact brought out in these experiments is the excellent results achieved by applications of artificial fertilisers as contrasted with those obtained from farm-yard manure. In the latter case, where 14 tons of dung have been annually applied to the wheat-plot for forty years in succession, the very satisfactory yield of 33½ bushels per acre has been obtained over the entire period. When, however, a well-compounded mixture of artificial fertilisers has been applied, a larger yield has been obtained. For example, 200 lbs. of sulphate of potash, 100 lbs. of sulphate of soda, 100 lbs. of sulphate of magnesia, 3½ cwts. of superphosphate, and 600 lbs. of ammonia salts, have given upon an average over the same long period 36 bushels per acre year by year. We must not draw these remarks to a conclusion without at least noting the interesting experiments upon barley, the leguminous crops, clover sickness, root crops, and potatoes. The memoranda close with a synopsis of a series of experiments upon rotations of crops commenced in 1848 in order to test the effect of growing crops in rotation, instead of continuously, and so to arrive at precise results when a system of mixed farming is pursued with and without manures, and in conjunction with sheep farming.

JOHN WRIGHTSON

#### RECENT EXPLORATIONS OF THE PAMIR

THE third fasciculus of the *Izvestia* of the Russian Geographical Society contains three very interesting papers, by D. L. Ivanoff, on the Pamir, being the results of the expedition of MM. Ivanoff, Puyata, and Bendersky, already mentioned in NATURE. The first of these papers deals with the journeys of the members of the expedition; the second contains the author's views on the orography of the Pamir; and the third gives a description of the flora, fauna, and inhabitants of this "Roof of the World." Leaving aside the purely geographical part (M. Ivanoff's papers should be translated into English), I shall sum up the most important orographical results arrived at by the author, as also his observations on the natural history of the Pamir.

As to its limits, so variously determined by geographers, M. Ivanoff places them—rightly in my opinion—as follows:—The Alay Mountains in the north, the Hindu-kush in the south, and the Kashgar Mountains in the east. As to its western limits, the following remarks ought to be made:—The whole of the highlands on the upper Amu-daria must be divided into two parts—the Eastern Pamir and the Western. The Eastern Pamir is a very high plateau, intersected by numerous valleys, rivers, and lakes, with an average height above the sea-level of 12,000 feet (from 10,000 to 14,000). These valleys are either separated by chains of mountains