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1902.

ORDINARY GENERAL MEETING.*

WALTER AUBREY KIDD, ESQ., M.D., F.Z.S., IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed.

A paper entitled "Locusts and Grasshoppers" (illustrated by specimens from the author's collection), by Rev. F. A. Walker, D.D., F.L.S., was then read by the author.

LOCUSTS AND GRASSHOPPERS, WITH SPECIAL REFERENCE TO BIBLICAL SPECIES. (Illustrated by specimens from the Author's collection.)
By Rev. F. A. WALKER, D.D., F.L.S.

LOCUSTS and grasshoppers may be regarded as constituting two great families of one of the leading orders of insects known as Orthoptera, or straight wings, from the fact of the said wings being of one uniform width in this group, without angles, sinuosities, or scalloped edging.

Insects of this tribe possess four wings, the front pair being smaller than the hinder, and often leathery, whereas the latter are membranous, and the front wings moreover are frequently of a different colour from the hinder, being green, whereas the latter are pink or red, as in the instance of several tropical locusts, or dusky or mottled brown, whereas the latter are red or blue as in the instance of the continental genus of grasshoppers known as *Cedipoda*.

Locusts and grasshoppers themselves are divided into many different genera in their respective families, and several other tribes (as the Achetidæ, to which the crickets belong, the Blattidæ, which comprehend the cockroaches,

* Monday, April 7th, 1902.

the Forficulidæ, which include the earwigs), in addition to locusts and grasshoppers, go to make up what are ordinarily known as Orthoptera, and to the above-mentioned names may be added those of Mantidæ and Phasmidæ, and other subdivisions for which there exists no English equivalent, and which occur either in the regions adjoining the Mediterranean, or are else denizens of entirely tropical climes.

The only two sections of Orthoptera referred to in Holy Writ are the locust and the grasshopper. Some leading orders of insects are not even once mentioned in Scripture, and with regard to other orders that are spoken of, as Hymenoptera and Diptera, and possibly, but more doubtfully, Coleoptera and Hemiptera, the notices of such Orthoptera as locusts and grasshoppers occur as frequently as, and probably far more frequently than, all the passages put together wherein the other orders are alluded to.

Locusts and grasshoppers, it may be remarked, are more exclusively the inhabitants of warm countries than is the case with any other leading order of insects. Every other tribe is numerously represented in Britain, even though the highest beauty of colouring, the greatest variety of species, and the largest number of individuals be found, and found only in the tropics. With us the locust is unknown, except as a very occasional, solitary, and migratory visitor in some very hot summer. Our native grasshoppers are now scarce in the Metropolitan district, are mostly small in size, and, as a rule, inconspicuous in colour. One notable exception to this description, however, is the *Phasgonura viridissima*, a large grasshopper, with its fore-wings of a grass green, as its name imports, widely distributed, but not very common, probably found more often on our South Downs than inland, and certainly far more frequent in Switzerland and in regions bordering the Mediterranean than with ourselves.

One has only to journey to Switzerland to find there a far greater variety of species of grasshopper, and also a much larger number of individuals of each species, than are ever seen here. And then one has only to cross the Alps, and almost before the descent into Italy is completed, the hum of the cicada, and the short and rapid flights of the locusts in the vineyards or among the myrtle and cistus, seemingly so spasmodic and erratic, sufficiently demonstrate that we are among the fauna of the scientific zone known as the Mediterranean littoral.

Wherein, it may be asked, lies the difference between a locust and a grasshopper? Not to dwell on structural divergence and anatomical differences, the great discrepancy in size may be instanced. It is probable, but I do not assert it as a positive fact, that the largest grasshopper only equals in size the smallest locust; it is certain that many locusts, those in particular tenanted Brazil, Australia, and other distant lands, are far larger than any grasshopper, and indeed ranking among the very largest insects, of any order whatever, known to us. Add to this fact the greater swiftness and power of higher and more sustained flight on the part of the locust, its occurrence in far greater numbers, and in well nigh innumerable hordes in the case of some species, and the proportionally destructive results where all vegetation is concerned. Only too true are the words of the prophet in Scripture, "The land is as the garden of Eden before them, and behind them a desolate wilderness." In fact, when the swarm has taken its flight elsewhere, the country appears as it had been burnt with fire; hence the Latin name of this insect, *Locusta* (from *locus ustus*, a burnt place), is peculiarly appropriate, on account of their voracity.

One great difficulty which the translators of our Authorized Version had to encounter, a difficulty, moreover, which they were incapable of removing, and in no way to be regarded as an error to be laid to their charge, was how to render all the different words in the original Hebrew, each certainly signifying a different orthopterous insect, whether locust or grasshopper, probably the former in most instances, as the destructive results recorded as attending its onward march are specially characteristic of the locust hordes—how, I repeat, to render all the different words in the original Hebrew by a separate English equivalent. And the same remark applies to the different Greek words as used in the Greek version of the Septuagint.

Let it be granted that as many different kinds of locust or grasshopper were known to the ancients, and were spoken of by the prophets as there are different Hebrew and Greek words in the original, and indeed we cannot arrive at any other conclusion, and that the three words of Joel i, 4, translated respectively palmerworm, cankerworm, and caterpillar signified the creature in its immature condition, the larva and not the imago of three separate species of locust, the translators of the A.V. had not then—we have not now, with the sole exception of two species—any corre-

sponding English equivalent. And, moreover, the Latin names of the different genera and species in common use among scientists did not then exist as we possess them. Besides, what avails it that all the Mediterranean species of Orthoptera or those elsewhere also have each its English and its Latin name assigned, when we have no means of determining, either now or hereafter, the particular species designated by each different Hebrew word? No characteristics, either superficial or structural, are given to serve as an aid whereby to solve the difficulty. All that we are enabled to state with any measure of confidence is that we know what two species were *Acridium peregrinum*, the locust of the plague of Egypt mentioned in Exodus x, verses 4 to 6, and again, verses 12 to 15, and *Truxalis nasuta*, in all probability the bald locust of Leviticus xi, 22. *Nasuta*, of course, means "with snout or proboscis," and the term "bald" may have been bestowed in consequence of its elongated neck, head, and snout being almost of one uniform size and thickness—no lateral enlargement of head or goggle-eyes, as in the case of other species; and in quoting Leviticus xi, 22, it will be *apropos* to remark that the said passage may well be regarded as a *locus classicus* whereon to ground some remarks about the inevitable difficulties that befel the translators of the A.V. Four species, we are therein told, were permissible as an article of food. "Even of these ye may eat; the locust after his kind, and the bald locust after his kind, and the beetle* after his kind, and the grasshopper after his kind."

What was the locust after his kind? Probably the locust of the plague of Egypt, *Acridium peregrinum*, as the species at once by far the most abundant and destructive and the one that the Israelites would be the most likely to encounter of the four species here recorded. What was the bald locust? Probably, from its singular shape, the *Truxalis nasuta* above spoken of, and which I myself have captured in Corsica and elsewhere.

What was the beetle after his kind? Certainly not a beetle at all. Apart from the fact that the large majority of Coleoptera would afford absolutely no nutriment whatever, that the epidermis of the large majority of Coleoptera is entirely horny, it is well nigh a certainty that the beetle

* Cricket, R.V., four kinds of locusts or grasshoppers which are not certainly known.

belonging to Coleoptera would not be introduced between two species of the tribe Orthoptera, namely, the bald locust and the grasshopper. What is doubtless intended is some other kind of locust. In the Hebrew the word is "Chargol," and in the Greek Septuagint ὀφιομάχης—as the beetle has not legs above its feet to leap withal, and the locust both was and is a common article of food in the East. Thus in St. Mark i, 6, we read of St. John the Baptist, "He did eat locusts and wild honey." Such locusts constitute a chief article of diet in the case of the modern Arab, as in the days of old. The head and tail are pulled off as with shrimps, and the creatures are frequently dried and grated to powder.

What is the grasshopper after his kind? It may have been rightly rendered by the translators of the A.V. "grasshopper," but it may also mean another kind of locust which would prove fully as serviceable for diet as any grasshopper, and the same Hebrew word "Arbeh," here translated *grasshopper*, is rendered "locust" in 2 Chronicles vii, 13.

Again, the locust after his kind in Leviticus xi, 22. Though, as I stated, it almost certainly designated *Acridium peregrinum*, "the locust of the plague," it may have included other species also, e.g., *Acridium tataricum*, a smoky brown species probably more widely distributed than *peregrinum* throughout the Mediterranean, but not occurring in such appalling hordes.

The Rabbis assert that there are 800 species of Orthoptera in Palestine. Modern travellers compute with far greater likelihood 40. Possibly some of the larvæ have been regarded as other species instead of the same kinds in an early and undeveloped state.

One other passage occurs in the Pentateuch relating to the locust, Deuteronomy (ἐρυσίβη, lxx) xxviii, 42, "All the trees and fruit of thy land shall the locust consume." The *trees* are likely to be devoured by the locust in its perfect or mature state, when its wings are fully developed. The *fruit of the land* would be liable to the ravages of its larvæ likewise.

Respecting *Acridium peregrinum*, "the locust of the plague," once more, I captured male and female of this species at Tangiers in a vineyard on June 1st, 1891, and dead ones in worn and dilapidated condition in the hedgerows, doubtless benumbed and killed by a recent change in the weather. Cf. Nahum iii, 15 to 17, "As the great grasshoppers, which camp in the hedges in the cold day." That there had been three incursions of the locust hordes already that year at Tangiers, and that a fourth was expected,

speaks most highly of the extraordinary fertility of the country, as in spite of all these serious drawbacks, the condition of the maize fields and vineyards which I beheld was most flourishing. I have also been sent specimens of *Acridium peregrinum* from Jerusalem. Both male and female have the upper wings numerously spotted with brown. The upper wings of the male are of a daffodil yellow; those of the female are browner. Of two other species also previously mentioned, *Acridium tataricum* and *Truxalis nasuta*, I possess specimens of the former from Lido, Solfatara, and Beyrout, and of the latter from Lido, Bellagio, Florence, Ajaccio, Jaffa.

The historical books of the Old Testament and the Psalms contain five passages relative to the locust, to wit, Judges vi, 5, "For they came up with their cattle and their tents, and they came as grasshoppers* (*ἀκρίς*, lxx) for multitude; for both they and their camels were without number: and they entered into the land to destroy it"; 1 Kings viii, 37, "If there be in the land famine, if there be pestilence, blasting, mildew, locust, or if there be caterpillar"†; 2 Chronicles vii, 13, "If I command the locusts to devour the land"; Psalm lxxviii, 46, "He gave also their increase unto the caterpillar,‡ and their labour unto the locust"; Psalm cv, 34, "Locusts came, and caterpillars,§ and that without number, and did eat up all the herbs in their land, and devoured the fruit of their ground." *Apropos* of Judges vi, 5, the migratory habits of Orthoptera would seem to be indicated, and in reference to 1 Kings viii, Psalm lxxviii, Psalm cv, and also to other passages in the Prophets, the *larvæ* of locusts would seem to be signified by *caterpillars*, caterpillars being mentioned in the same clause, or at all events the same verse, as locusts.

There are five passages in which the locust and caterpillar are so mentioned together. What the larvæ had spared, the matured and perfect insects destroyed, and then again the larvæ. To translate the young of the locust by the word caterpillar is apt to give rise to a misconception, as caterpillar is only properly used when it designates the rudimentary condition of the butterfly or moth. Larvæ, on the other hand, refer to the first stages of all orders of insects.

* Locusts in R.V.

† ἐρυσίβη, lxx, red blight in corn.

‡ ἐρυσίβη in lxx, red blight in corn.

§ Cankerworm in R.V., βροῦχος in lxx, but this is really a locust without wings.

The word "grub" is used more appropriately in treating of the undeveloped state of Diptera, Hymenoptera, Coleoptera. *Palmerworm* and *cankerworm* are also understood as implying larvæ of locusts in Joel i, 4, though *cankerworm* is by some understood to signify *centipede*. *Palmerworm* and *cankerworm* cannot assuredly be regarded as conveying the meaning of the original, and yet it is hard to see what other English renderings the translators could have devised to denote the young of two different species of locusts. The term worm, indeed, is employed in a very loose and indefinite way to denote several orders of organic creatures that have no connection whatever with one another, but is then properly made use of when it is applied to the earthworm of our gardens, *Lumbricus terrestris*, and is of course etymologically associated with such Latin words as *vermes*, *vermicularis*.

In Jonah iv, 7, we read God prepared a worm.* The meaning doubtless is either a centipede or the larva of a locust. Both these creatures attack fruit. An earthworm can hardly be intended, as that would only attack the root or fallen fruit. Indeed, it may fairly be questioned whether earthworm is designated in any of the numerous passages of Holy Writ where "worm" is mentioned, save and except in Micah vii, 17—"They shall move out of their holes like worms of the earth."† (But ὄφεις lxx.)

But to resume. In the writings of the Hebrew prophets the following passages seem descriptive of the habits of the locusts:—Isaiah xxxiii, 4—"Your spoil shall be gathered like the gathering of the caterpillar: as the running to and fro of locusts shall he run upon them." Jeremiah xlvi, 23—"They are more than the grasshoppers, and are innumerable." Jeremiah li, 14—"Surely I will fill thee with men, as with caterpillars." Jeremiah li, 27—"Cause the horses to come up as the rough caterpillars" (four passages in major prophets). N.B.—The vast numbers, the movements, and the gathering together of Orthoptera are here referred

* σκώληξ the word in lxx means earthworm, *Lumbricus*.

† Canon Girdlestone reminds me of the same word in Deut. xxxii, 24, "Poison of serpents of the dust," A.V.; "poison of crawling things of the earth," R.V. But why is the same word in original translated serpents of the dust in Deut., and "worms of the earth" in Micah? in A.V. "Crawling things of the earth" in R.V. is a nice little non-committing rendering. He that sits in the room of the unlearned will doubtless regard "worms of the earth" as earth worms.

to. Only in one passage, namely, Jeremiah li, 27, the rough caterpillars possibly indicate the larvæ of *Arctia caja*, the common tiger moth, popularly known as "the woolly bear," and not the larvæ of the locusts, from the term *rough*, *hairy*, employed. The hairs of said larva have urticating and irritating properties, and the moth is common over all Europe. On the other hand, if destructive numbers are indicated, the larvæ of the locust far exceed those of any species of moths.

On turning to the writings of the minor prophets, we find therein three passages descriptive of the locust, or to speak with greater accuracy, of the locust and the grasshopper alike, and moreover of the locust and of its larva too, and also of different species of locust, both in the perfect and in the larval condition, *e.g.*, Joel i, 4—"That which the palmerworm (*κάμπη*) hath left hath the locust (*ἄκρις*) eaten; and that which the locust hath left hath the cankerworm (*βροῦχος*) eaten; and that which the cankerworm hath left hath the caterpillar (*ἐρυσίβη*) eaten." Amos vii, 1, 2—"Thus hath the Lord God shewed unto me; and, behold, He formed grasshoppers (locusts R.V.) in the beginning of the shooting up of the latter growth; and, lo, it was the latter growth after the king's mowings. And it came to pass, that when they had made an end of eating the grass of the land, then I said, O Lord God, forgive, I beseech Thee: by whom shall Jacob arise? for he is small." Nahum iii, 15-17—"Then shall the fire devour thee; the sword shall cut thee off, it shall eat thee up like the cankerworm: make thyself many as the cankerworm, make thyself many as the locusts.* Thou hast multiplied thy merchants above the stars of heaven: the cankerworm† spoileth, and fleeth away. Thy crowned are as the locusts, and thy captains as the great grasshoppers, which camp in the hedges in the cold day, but when the sun ariseth they flee away, and their place is not known where they are."

N.B.—The *forming* of grasshoppers recorded in Amos vii, 1, 2, is an interesting scientific fact revealing a state and degree of knowledge one might hardly have expected at that early period. Amos, it is true, owing to his vocation

* lxx βροῦχος; both locust and cankerworm rendered βροῦχος, wingless locust, ἄκρις rendered grasshoppers both in A.V. and R.V.

† lxx βροῦχος ἀτέλατος, a locust without wings in classical Greek.

as a herdsman and a gatherer of sycamore fruit, enjoyed exceptional facilities for observation of external nature.

Orthoptera, as it happens, of all the leading tribes of insects are the only one that increase in size and development of wings in the mature state, and this development in Italy and the warm lowlands of Switzerland is not completed till early September. Now, be it carefully noted that Amos does not only record the development of Orthoptera in the imago condition, but he also particularizes very carefully the exact period of the year when that development took place. The seer twice reiterates the same truth, that it was when the season was well advanced. The beginning of the shooting up of the latter growth—the latter growth, after the king's mowings, *i.e.*, the second hay crop, termed rowing in Hertfordshire, and aftermath in the north of England.

The Faroe Isles, so far as I am aware, constitute the northern limit of Orthoptera, and only one orthopterous insect, *Forficula auricularia*, the common earwig (itself one of the most rudimentary forms of the extensive family to which it belongs), is found in that archipelago. I took occasion to assure myself by testing the development of the earwig in the Faroes by collecting the *Forficula* from the blossoms of *Caltha eu-palustris*, which it had gnawed nearly down to the calyx, when my steamer anchored off the Faroes on her voyage to Iceland, and by capturing other specimens in the same place on my return thither five weeks later, and marking the increase of size in the interval. The locusts that according to Revelations ix, 3, came out of the smoke upon the earth may be only metaphorically so, with hair of women, teeth as of lions, crowns of gold, and stings of scorpions—at all events unlike any species now known to science.

There are seventeen passages in all in Holy Writ referring to Orthoptera.* And as far as we can infer nine species of locust are intended, though even as regards this assertion some uncertainty prevails because the same Hebrew word *gob* is rendered locust by our translators in Isaiah xxxiii, 4, and is rendered by them grasshopper in Amos vii, 1.

* More than this number, probably between twenty and thirty, but some of the remaining passages are not so graphic and descriptive as those here quoted.—F. A. W.

Then, again, *yelek*, the Hebrew word denoting licker of the grass, obviously denotes thereby the larva of a winged species of locust, and its mention occurs in five passages of the O.T., to wit, Joel i, 4; Nahum iii, 15; Psalm cv, 34; Jeremiah li, 14, and again in verse 27. In two of said passages it is translated cankerworm, and in the remaining three caterpillar—both renderings being erroneous.

To add to the confusion the Hebrew *yelek* is rendered *βροῦχος* in the Greek Septuagint, but the Hebrew *arbeh* is also rendered *βροῦχος* in the Greek Septuagint when in Exodus x the locust of the plague is mentioned, whereas two different Hebrew words, *yelek* and *arbeh*, are probably used on purpose to denote two different species of winged locust; and to add still further to the confusion *βροῦχος* is the very word used by Greek classical writers to signify the wingless locust, *Callimenus oniscus*, a species with which I am personally familiar, having captured it on the aromatic undergrowth of myrtle or cistus along the road to Marathon. It is a very handsome kind when alive, having broad bands of velvety black across a ground colour of apple-green, but as a cabinet specimen unfortunately rapidly fades to a uniform dusky brown, and is indebted for its Greek specific name *ὄνισκος*, a little ass, to the long curved shape of the dorsum, resembling that of a beast of burden.

Then, again, the word *arbeh*, rendered locust in Exodus x, and locust again in 2 Chronicles vii, is translated grasshopper in Leviticus xi, and grasshopper again in Judges vi. The Hebrew word *chasil* of Psalm lxxviii, 46, means a “consumer.” As it is included with the locust in that verse, it probably means the larva of the locust; in the A.V. it is translated caterpillar. The Hebrew word *gazam* of Joel i, 4, is translated palmerworm in the A.V. and appears as *κάμπη* in the Greek Septuagint.

Now *κάμπη* is a larva, and the word signifies not the larva of a locust, which is doubtless what the prophet intended, but the larva of the tribe of moths known as Geometridæ, which bends up its back to move, and hence its name of *κάμπη* (from *κάμπτεω*). *Chagob*, the Hebrew word in Leviticus xi, is generally rendered grasshopper and once locust. In the Greek Septuagint it is translated *ἄκρις*, which probably means grasshopper, but *ἄκριδες*, the plural of *ἄκρις*, signify locusts in Greek classical writers.

Additional matter might be adduced on this head, but what has already been stated will probably be regarded as

sufficient to demonstrate the difficulties arising from the same word being used indifferently to denote two or three species, or the same word being used indifferently to signify both the larva and the perfect insect, or the same word being employed for one kind in the Greek Septuagint, and another species in classical Greek. English is not so rich as Greek in the possession of many words only separated in signification from one another by delicate shades of meaning, and there is also another reason why the Greek Septuagint and the Hebrew originals should alike have many words at command to designate the Orthoptera of Scripture. It is almost certain that all the kinds recorded occur in Greece as well as in Palestine.

Nearly all the countries bordering the Mediterranean bear a remarkable resemblance to one another in many particulars of geology, botany, and insect fauna. But hardly a single species of the said Orthoptera occurs in England, and therefore could not have been familiar to the translators of the A.V. or be recognized on their part by a distinctive appellation in consequence.

I may instance in conclusion the locust of Deuteronomy xxviii, 42, for which the Hebrew word is *tzelatzal*, "the tinkler;" a word applied to the locust from the noise of its wings, and evidently formed to signify the sound that the creature makes. The late Professor Westwood regarded it as evidently from the name identical with the *Tsalsalya* or zimb of Bruce, the well-known traveller in Abyssinia. Most words coined to express the hum of insects commence with *Ts*, *Tz*, or *Z*.

To revert once more to the passage concerning grasshoppers in Amos vii, in verse 2 we are told, "And it came to pass, that when they had made an end of eating the grass of the land," what then? Are we to infer that they arose on swift wing, and betook themselves on high, afar, to pastures new? Aquatic Coleoptera are supposed to be provided with wings, that if their pond be dried up in time of summer heat, they are thus enabled to fly off to other waters. So we discern the import of the prophet's question, "By whom shall Jacob arise? for he is small"—he has no wings, he is as yet undeveloped, in other words he cannot raise himself.

On referring to the Rev. J. G. Wood's account in *Bible Animals* of the locust, pp. 596 to 604, and which I did not consult until I had drawn up my own observations already recorded, I conclude that his facts agree with mine in all

essential particulars. He rightly states that the Hebrew word *arbeh* (p. 597 of his book) occurs many times in the Scriptures, and aptly describes the locust as regards its vast multitudes, its sudden arrival, and its destructive power, and that even if there were any doubt about its signification, the context would be sufficient to denote its proper rendering. We are also at one as regards the statement that "*chagab*" is rendered both grasshopper and locust and mostly translated as the former. The inference that the author draws is doubtless correct when he says it seems to have been less in size than the *arbeh*, inasmuch as it is used as a metaphor to express smallness. See, for example, Numbers xiii, 31-33, where is recorded the false report of the spies whom Moses sent to inspect the land. The men who went up said, "We be not able to go up against the people; for they are stronger than we. And there we saw giants, the sons of Anak, which come of the giants: and we were in our own sight as grasshoppers (*chagabim*), and so we were in their sight." A similar metaphor is employed by the prophet Isaiah, "It is He that sitteth upon the circle of the earth, and the inhabitants thereof are as grasshoppers" (xl, 22) and in Ecclesiastes xii, 5, extreme weakness is forcibly indicated by the words, "The grasshopper (*chagab*) shall be a burden."

I am not so certain that I can concur with the author in his observation which immediately follows:—"Now the two principal species of locust which travel in bands and devastate the country are the common migratory locust (*Edipoda migratoria*) and the *Acridium peregrina*. If, therefore, the word *arbeh* expresses one of these insects, it is probable that the word *chagab* signifies the other." But by his showing *arbeh* is probably a larger species than *chagab*; the one a locust, the other a grasshopper. And as far as my own very imperfect knowledge goes, the two kinds, the migratory locust and the locust of the plague of Egypt, are of about the same size. Then, too, he has bestowed on the migratory locust the generic name of *Edipoda*, which may possibly be correct, but which title I had thought was confined to a genus of grasshoppers. That the genus of grasshoppers known by that name occurs in Palestine as elsewhere along the Mediterranean I am well aware, and it has received that appellation from a certain thickening in the joints of its legs, and the mythical hero *Edipus* is commonly reported to have sustained a swelling of the knee joints owing to his

having been exposed in infancy on the slopes of Mount Cithæron.

The following description of the appearance and habits of the locust, p. 599, by the same author is so graphic and true that I feel constrained to give it *in extenso* :—

“The appearance of a locust when at rest and when flying is so different that the creature is at first sight scarcely recognizable as the same creature. When at rest, it is a compact and tolerably stout insect, with a dull though delicately coloured body; but when it takes flight it appears to attain twice its previous dimensions. The front pair of wings, which alone were seen before they were expanded, became comparatively insignificant, while the hinder pair which were before invisible, became the most prominent part of the insect, their translucent folds being coloured with the most brilliant hues, according to the species. The body seems to have shrunk as the wings have increased, and to have diminished to half its previous size, while the long legs that previously were so conspicuous are stretched out like the legs of a flying heron.

“All the locusts are vegetable feeders, and do great harm wherever they happen to be plentiful, their powerful jaws severing even the thick grass stems as if cut by scissors. But it is only when they invade a country that their real power is felt. They come flying with the wind in such multitudes that the sky is darkened as if by thunder clouds, and when they settle, every vestige of green disappears from off the face of the earth. Mr. Gordon Cumming once saw a flight of these locusts. They often wheel three hundred feet from the ground, and come on in thick solid masses, forming one unbroken cloud.

“On all sides nothing was to be seen but locusts. The air was full of them, and the plain was covered with them, and for more than an hour the insect army flew past him. When the locusts settle, they eat with such voracity that the sound caused by their jaws cutting the leaves and grass can be heard at a great distance; and then the young locusts, which have no wings and are graphically termed by the Dutch colonists of Southern Africa ‘voet-gangers,’ or foot-goers, are little inferior in point of jaw to the fully developed insect.”

As long as they have a favourable wind, nothing stops the progress of the locusts. They press forward just like the vast herds of antelopes that cover the plains of Africa, or the

bisons that blackened the prairies of America, and the progress of even the wingless young is as irresistible as that of the adult insects. Regiments of soldiers have in vain attempted to stop them. Trenches have been dug across their path, only to be filled up in a few minutes with the advancing hosts, over whose bodies the millions of survivors continued their march. When the trenches were filled with water, the result was the same; and even when fire was substituted for water the flames were quenched by the masses of locusts that fell into them. When they come to a tree, they climb up it in swarms, and devour every particle of foliage, not even sparing the bark of the smaller branches. They ascend the walls of houses that come in the line of their march, swarming in at the windows, and gnawing in their hunger the very woodwork of the furniture.

Nothing can be more vividly accurate than the splendid description of the locust armies (Joel ii, 2-11). First we have the darkness caused by them as they fly like black clouds between the sun and the earth. Then comes the contrast between the blooming and fertile aspect of the land before they settle on it, and its utter desolation when they leave it. Then the poet-prophet alludes to the rushing noise of their flight, which he compares to the sound of chariots upon the mountains, and to the compact masses in which they pass over the ground like soldiers on the march. The impossibility of checking them is shown in verse 8, and their climbing the walls of houses and entering the chambers in verse 9.

Modern travellers have given accounts of these locust armies which exactly correspond with the sacred narrative. One traveller mentions that after a severe storm the locusts were destroyed in such multitudes that they were heaped in a sort of wall, varying from three to four feet in height, fifty miles in length, and almost unapproachable on account of the odour of their decomposing bodies.

The remainder of the chapter on locusts in *Bible Animals* (the whole of which well deserves perusal by all present on account of its fidelity and its numerous quotations from various authors, sacred and profane, ancient and modern, in reference to the locust) relates to the use of locusts as food. Notice has already been made of the Israelites, whose dieting was so scrupulously limited, having been permitted the use of the locust.

Herodotus, when describing the various tribes of Libyans,

mentions the use of the locusts as an article of diet and the way in which the said creatures are prepared for food by the Nasamcnes.

Palgrave, in his *Central and Eastern Arabia*, gives a description of the custom of eating locusts.

Mansfield Parkyns, in his *Life in Abyssinia*, mentions that the true Abyssinian will not eat the locust, but that the negroes and Arabs do so.

Signor Pierotti, in his *Customs and Traditions of Palestine*, states that locusts are really excellent food, and that he was accustomed to eat them, not from necessity, but from choice, and compares their flavour to that of shrimps; and Dr. Livingstone makes a similar comparison.

The article in the *Encyclopædia Britannica* on locusts may also be read with profit (vol. xiv, pp. 765-767), and which contains well executed figures of some of the most destructive species, to wit, *Pachytyles migratorius*, *Acridium peregrinum*, and *Calopterus italicus*, and the paragraphs on Orthoptera in Kirby's *Text Book of Entomology* should similarly be consulted.

DISCUSSION.

The CHAIRMAN.—I think we are all indebted to Dr. Walker for his interesting and learned paper, and particularly so as many of the insects referred to are illustrated before us by his own specimens.

I hope there are some present who will be able to further pursue the subject. May I ask Mr. Kirby if he will give us any remarks on the subject that may occur to him, as he has authority on the matter?

Mr. KIRBY, F.L.S.—I may say that I have listened with much interest to Dr. Walker's paper. There are a few points upon which I may be able to throw a little more light.

In respect to "grasshopper" and "locust" the terms are popular and almost synonymous. Popularly the smaller insects are called "grasshoppers" and the larger ones "locusts." There is really no very definite distinction between them—the former having long antennæ, or feelers, and the other, short ones.

I am not sure whether any list is published of the Orthoptera of the Faroe islands; but certainly there are a good many found in Lapland.

Locusts do not appear to be destructive in proportion to their size. The very large South American locusts, of which there are specimens before us, as far as I know are not noted for being specially destructive. Those large red specimens are about the largest, but they grow larger than that, and some of them are still more beautifully coloured; but I have not heard that they are specially destructive. Those which Dr. Walker refers to as most destructive in Southern Europe and Africa are of medium size, but there are two smallest species which are specially destructive. One is a locust which is common in the Mediterranean, but is especially destructive in Cyprus, and the other is the Rocky Mountain locust of North America. As far as I remember neither of these measure more than about two inches across the wings.

The SECRETARY (PROFESSOR EDWARD HULL, M.A., LL.D.).—I think, Mr. Chairman, that the special interest of Dr. Walker's paper lies in its endeavour to interpret the terms "locust" and "grasshopper" as they are used in Holy Scripture. One can well understand the extreme difficulty that the authors of the Revised Version must have had in dealing with these Hebrew and Greek terms for insects. It is something like the difficulty that the authors of the Authorized Version must have had in dealing with the names of precious stones. I once, at the request of some publishers, wrote an essay on the precious stones of the Bible, and I must say when I came to endeavour to discriminate between one kind of precious stone and another I was non-plussed in many cases, and a similar difficulty must have been present with the authors of the two versions.

It is a great misfortune, I think, that although the authors of the Revised Version were men of great eminence in classical knowledge, yet I do not know that they were advised when dealing with the names of special animal or vegetable forms. We do not know whether they were or not; but it occurs to me that probably they were not, and that they rested a great deal upon what might be called the ordinary sense, or at any rate on the meaning of the particular word, as inferred from the context.

I feel sure that in several cases Dr. Walker has thrown

considerable light on some of these names. The "palmerworm," and the "cankerworm" no doubt, as he says, mean the grub or larvæ of certain kinds of locusts; and I hope that this paper will prove of advantage to those who study these critical points of the natural history of Holy Scripture.

I am much obliged to Dr. Walker for having brought the subject before us. I never knew the origin of the word "locust" before, but it is very clear now that it has been explained by the learned author.

Professor LOGAN LOBLEY.—I am glad that Professor Hull has called attention to the difficulty arising from certain words that are used in the modern versions of the Bible, whether the Authorized or the Revised Version. We find such a word as "jasper," for instance, which is used very often in the Bible, and that evidently, from the context, means something transparent and brilliant. Now we know that jasper is neither transparent nor brilliant. It is really a most opaque form of quartz, and until you put upon it a high polish it has no shine or lustre whatever; and yet the term "jasper" is used in the Bible to signify something which is resplendent. That is an illustration of the want of scientific knowledge on the part of the translators of the Bible. That cannot be charged to them as a fault of course, for they had not that scientific knowledge when the Bible was translated which is common now, but still it is a warning to us not to take everything we find in the present version of the Bible just as we see it according to ordinary language now used. We must remember that the ancients used language that was appropriate to their knowledge, and that the language of the Bible now is only appropriate to their knowledge so far as the translators understood it.

Mr. MARTIN ROUSE.—I should like to say that having looked up many of the Greek names of various stones, although I have not the technical knowledge that Professor Hull possesses, I find that jasper, or *jaspis*, is compared to grass by at least three authors in the Greek classics, and so we find in the dictionaries; and therefore *jaspis* did convey to the mind something most restful, as well as beautiful; and the appearance the stones forming the foundation of the Holy City, and the light of it, are said to be like jasper, that is to say a beautiful clear green, like sunlight shining through the leaves of a spring day. That is the meaning of

the Greek word *jaspis*; but we, in course of time, have changed the application of the English word jasper and have applied to it the name of opaque quartz.

Mr. D. HOWARD, D.L.—I think we find that there was a curious tendency on the part of the early settlers in America to apply convenient names to the birds and plants they found there, and the chief thing of which we may be perfectly certain as to the popular names of plants or birds which they bear is their singular inaccuracy, and one must not be surprised if a Greek coming into a country where they speak Hebrew proceeds to apply a handy Greek word which might mean something totally different. It is one of the most difficult things to be quite sure what a very familiar word means. I sometimes think the more familiar a word is the more likely it is to be misleading.

Mr. KIRBY.—I meant to mention that the word locust is frequently applied popularly and, of course, entirely inaccurately to the *Cicadidæ*. They of course belong to a totally different order of insects, and have nothing to do with grasshopper or locust; but they are called locusts in the United States popularly and also in Australia, I believe.

Mr. HOWARD.—It is a handy word for a new insect.

Mr. MARTIN ROUSE.—When you said, Mr. Kirby, that you did not know of that large South American locust being destructive did you mean that there were no locusts that were destructive in South America, or that that was not one simply? Because I was thinking, from the description I read of the *Voyage of the "Sunbeam,"* of an enormous flight of locusts, probably bent on mischief, passing over the country and described by Lady Brassey, which were seen from a comparatively low height, with the sun shining above them making them look as if they were burnished gold.

Mr. KIRBY.—They are very destructive sometimes in Buenos Ayres and some parts of South America, but I never heard that those very large locusts which are found more in the northern parts of the country were specially destructive or that they migrated.

Mr. MARTIN ROUSE.—It would be a smaller sort then?

Mr. KIRBY.—Yes; I think so.

Rev. F. A. WALKER.—I think those large ones come from Brazil, but they may be in Buenos Ayres as well.

The CHAIRMAN.—I will now ask Dr. Walker to reply.

Rev. F. A. WALKER.—I am much obliged, in the first place, to

my friend, Mr. Kirby, for the very kind notice he has taken of my paper, and for the very indulgent way in which he treated any possible error in it.

I know there is a tribe of Orthoptera with long antennæ and another with short. One of the specimens with long antennæ I have here (*Phasgonura viridissima*), the largest grasshopper we have in our country; and here are Swiss specimens of the red and blue. The red and blue variety is one species called *Edipoda fasciata*, from a black band round the hinder wings, and it has a thickening of the knee joint. Some say they are of different tints in different positions, the red in the vicinity of autumn leaves and the blue occurring on blue clay or marl for self-protection.

Mr. MARTIN ROUSE.—How far can locusts fly without alighting?

Rev. F. A. WALKER.—Further than the length of this room. You should ask Mr. Kirby that question.

Mr. KIRBY.—I am afraid I cannot say positively. I do not know that there is any positive record on the subject.

Mr. MARTIN ROUSE.—You would make a distinction between locusts and grasshoppers—that locusts fly much further. I did not know whether their flight was caused voluntarily or whether sometimes by a strong wind; as it says in the Bible, “God caused a strong east wind to blow and locusts were brought by it.”

Rev. F. A. WALKER.—They can certainly fly across a wide road and as high as this room and up into trees.

Mr. MARTIN ROUSE.—We think of them coming in clouds from a great distance and blocking out the light. We read of it.

Rev. F. A. WALKER.—Their ordinary flight, when not frightened, is about the height of 15 feet for about 20 or 40 yards, and then they come down. I daresay if the wind set their way, or they were frightened, they could go much quicker and further. That is the flight I have seen them take. About the height of this room for 20 to 40 yards when they start from under your feet.

The CHAIRMAN.—I am sure we offer our cordial thanks to Dr. Walker for his paper. [Applause.]

The Meeting then adjourned.