

very good, but they all knew it did not wear like English tanned ox-hide. However, as it could be produced at something like 1s. a lb., while English leather of similar substance, if it could be found at all, would cost nearly 3s., it came in very well as a cheap material for certain purposes. All tanners would be very glad if chemists would turn their attention to some points on the tanning process. For instance, any cheap substance which would prevent or retard oxidation of tannin, and also prevent fermentation, would be very useful. He should be afraid that salicylic acid, if it possessed this property, would be too expensive, unless a very small quantity were sufficient. He should hardly have thought that glucose, which was nothing but potato sugar, would have this effect. As to the statement in the *Tanners' Journal* respecting glucose, he did not much believe it. Glucose appeared to soften leather somewhat similarly to the ordinary dubbing used by curriers. But if leather, stuffed with glucose, were placed in a stove, it would be found that all, or nearly so, of the extra weight, dried out. He, therefore, did not think that it would be used to any considerable extent. Mr. Evans did not speak very highly of gambier as a tanning material, and he also gave it too great a percentage of tannin. He should doubt if any gambier would show more than 30 to 45 per cent. Still, if used in combination with other materials, it produced very good leather, and was certainly very extensively employed in the manufacture of dressing leather. It is an extract evaporated in open vessels made from the *Uncaria gambier*, a shrub of three years growth. The instrument which Mr. Evans had described was a good testing machine, as he had tried it, but it required some care in manipulation. As the difference in density in the liquid to be tested, before it was forced through the piece of skin and afterwards, was very small, a very delicate hydrometer had to be used, and a small error in reading off the densities made a very considerable difference in percentage of tannin. Still it was a valuable instrument when carefully used; it corresponded closely in results with those obtained by the gelatine process. With regard to spent tan, in London we were obliged to burn it, simply for the purpose of getting rid of it. It is generally partially dried, either by being passed between rollers or by hydraulic pressure, and in this state no doubt saves a considerable quantity of coal. The Americans have a way of burning it quite wet from the pits, in a kind of double reverberating furnace, which is said to be perfectly successful. With regard to the time required for tanning leather, he did not suppose that in the case of best heavy sole leather it would ever be materially shortened, but dressing leather, and sole leather could be properly tanned in a much less time than twelve months; still he agreed with Mr. Evans, that very rapidly tanned leather was generally of poor quality. In conclusion he proposed a hearty vote of thanks to Mr. Evans for his paper, which was carried unanimously.

AFRICAN SECTION.

A meeting of this Section was held on Tuesday, February 15th, Mr. FRANCIS GALTON, F.R.S., in the chair.

The paper read was—

ON THE PROGRESS AND PROSPECTS OF OSTRICH FARMING IN THE CAPE COLONY, AND THE TRADE IN OSTRICH FEATHERS.

By P. L. Simmonds, F.R.C.I., &c.

Only those who have looked somewhat closely into the statistics of commerce can form any idea of the demands made upon the animal

kingdom for our wants and our luxuries. Animals, large and small, are sought for by the merchant and trader, from the huge elephant and rhinoceros and the carnivorous and other animals in their wild state, to the smaller insects, which contribute colour-dyes, medicine, or silk. The denizens of the air, the creatures of the deep, and the beasts of the forests and the plains, are all made subservient to the increasing demands of the civilised world. We have already acclimatised, tamed, and domesticated many animals which cater to the wants of man, and any fresh step in domesticating wild ones, whose products are useful, is certainly one in the right direction.

Although I have no practical knowledge of the new industry, which has been quaintly termed "ostrich farming," yet, having for many years paid considerable attention to all animal products, in cataloguing and describing the museum collections belonging to the Department of Science and Art, and being thoroughly conversant with the stages of progress in the domestication of the ostrich, when this was mentioned as a fit subject for discussion before the African Committee, I readily agreed to prepare a paper on it.

So far back as 1856, it was suggested by the French that the ostrich might be domesticated in Algeria, and it was pointed out that while the feathers of a bird shot or hunted down, even if they were all of a good commercial character, would sell only for about £5, the feathers plucked twice a year from a male domesticated ostrich would realise at least £9 to its owner. After the discussions and inquiries thus early set on foot, Dr. Gosse, of Berne, published in the *Bulletin of the Paris Society of Acclimatisation* in 1857 some extended and valuable papers, which helped on the solution of this important question, formerly deemed impossible.

In 1860, the profitable domestication of the ostrich was carried out in Algeria by M. Hardy, who received the offered premium of £80. Prince Demidoff, at Florence, Don Froylan Ayala, at Buen Retiro, in Spain, and M. Noel Suquet, at Marseilles, also followed the same example.

In September, 1864, M. Bouteille, Curator of the Museum of Natural History at Grenoble, submitted to the Society of Acclimatisation at Paris a report of his successful breeding of ostriches in domestication in the Zoological Gardens there.

At the commencement of May, 1864, the female laid two eggs at intervals of six days, these were, however, broken and eaten by her. On the 15th May she again commenced to lay at intervals of two days, up to the 6th June, and produced eleven well-formed eggs. After this the completion of the laying was marked by two small and mal-formed eggs. The male and female birds alternately took their place on the eggs. Of the eleven eggs, two were broken, leaving nine to be hatched, but only two young birds were raised, seven eggs being found either added or with the fœtus dead. This partial failure was attributable to cold and wet weather, and to a want of practical knowledge for guidance.

I shall proceed to give a short account of the ostrich in the northern districts of Africa before passing to the south.

The ostrich is found to the south of Algeria, where it has fled to escape from the chase, of

which it has long been the special object. The Arabs of the Sahara chase the ostrich by coursing, and destroy so great a number that they are becoming rare, and are likely to disappear altogether from their former haunts. This scarcity of the ostrich, which threatens to become general in all the countries where they were formerly found in large numbers, has attracted the attention of scientific and commercial men. The Acclimatisation Society, of Paris, as we have seen, took up the question, and M. Chagot, a feather merchant, of Paris, offered for some years a prize of £80 for encouraging the domestication and breeding of the ostrich in Algeria or Senegal. Six living ostriches, representing a third generation, were to be raised. The solving of this problem presented difficulties of more than one kind; but these were overcome by M. Hardy, the director of the Acclimatisation Gardens at Hamma, Algeria, to whom the prize was awarded, and this garden now possesses several generations of ostriches born in the gardens. The Acclimatisation Garden at Marseilles, and another private establishment in Italy, subsequently obtained equally successful results.

This domestication, and that in the Cape Colony, has enabled many curious facts to be ascertained. One is that the ostrich subsists exclusively on grain and herbs. It swallows occasionally pieces of metal and stones, and it is this habit which has given the bird the reputation of voracity, and of even being carnivorous, which is not true. It is also well known, of course, that the ostrich forms for itself a nest like other birds, in which it lays its eggs, sits on them, and does not leave them to the sun to hatch, as had been supposed by the older naturalists.

The problem of preserving and domesticating the ostrich has now been successfully carried out both in the northern and southern extremities of the African continent; and, instead of mercilessly hunting down the bird to destroy it for the sake of its feathers, it is now raised and preserved in a state to produce periodically its plumage, abundant and intact, for the benefit of the elevator.

This idea, far from being utopian, has been long in practice, although only of late years prosecuted on a systematic scale, and in a commercial point of view.

In the Middle Ages, according to Marmol, the native tribes of the province of Dara, in Numidia, raised ostriches for their feathers. They were put to graze in troops, so as to secure their feathers in the best condition. Buffon writes on this subject that the feathers of the finest quality were no doubt thus obtained from living birds. Captain Lyons, in his "Travels in Northern Africa," mentions, early in the century, that in some parts of Fezzan they have recourse to the same means. Here are his words:—"At Sockna and its environs they keep ostriches in their yards or enclosures, and collect the feathers three times in two years. From the ostrich skins which I have seen exposed for sale, I fancy that all the best plumes which we see in Europe are obtained from those thus kept enclosed, for those obtained from wild birds have theirs so broken and soiled, that there are often not a dozen good ones found." Various negro tribes in Central Africa also carry on a similar industry; and it is not impossible that the fine

plumes called Aleppo, imported into Egypt by the caravans from Sennaar and Darbour, are the result of this practice. Lapanouse (vol. iv, p. 103) tells us that in Sennaar they breed ostriches in their houses with other birds. In Senegal they are also domesticated.

The late M. J. Verraux, the naturalist, made an excellent profit from the feathers derived from the ostriches he raised in his menagerie at Cape Town, and the feathers could be collected without inconvenience twice a year.

Although it is said that children ride on the ostrich in parts of Northern Africa, we have not yet begun to harness them, as some of the Roman emperors did. Montaigne, in his curious chapter on coaches (Essais, livre iii. chapitre 6), cites one which was received with great applause by the public. "L'Empereur Firmin fait mener son coche à des autruches de merveilleuse grandeur, de manière qu'il semblaît plus voler que rouler." Various travellers record having seen the ostrich ridden by men in Senegal, Gambia, &c.

The ostrich has been celebrated from remote antiquity, its brains being an epicurean dish in old Rome. Like the hog, every part of the bird is utilised. When an ostrich is killed in Africa, the first care is to remove the skin, so as to preserve the feathers uninjured; the next is to melt the fat, and pour it into bags formed out of the thigh and leg, strongly tied at the lower end. The Arabs state the fat yields about 20 litres (upwards of four gallons). The grease of an ostrich in good condition fills both its legs; and as it brings three times the price of common butter, it is considered no despicable part of the game. It is not only eaten with bread and used in the preparation of kooskoosso, and other articles of food, but the Arabs reckon it a valuable remedy in various maladies. It is employed in acute pains by well rubbing in, and then covering the flesh with heated sand. The egg-shells, finely powdered, mixed with various other ingredients, are used to heal alterations in the cornea of the eye, and for sore throat, and the boiling fat applied as a cataplasm is said to afford immediate relief.

The flesh of the ostrich, dressed with pepper and meal, forms the supper of the sportsman. It is said to be delicate eating. Moses, however, prohibited its use as an impure meat.

An ostrich egg weighs on an average about three and a-half pounds, or the equivalent of 30 fowl's eggs, so that an ostrich produces annually in quantity, equal to about 1,100 to 1,300 Spanish fowls' eggs. The flavour of the eggs is somewhat less delicate than those of domestic poultry, but they are, nevertheless, perfectly eatable. A singular fact stated is that the eggs will keep fresh and eatable for two or three months.

The eggs of the ostrich form a considerable item in the Bushman's *cuisine*. Bush girls and Bakahari women, who belong to the wandering Bechuana tribes of the Kalahari district, may be seen coming down to the fountains from their remote habitations, each carrying on her back a kaross, or a net-work containing from twelve to fifteen ostrich egg-shells, which have been emptied by a small aperture at one end; these they fill with water, and cork up the hole with grass. The egg-shells are also frequently ornamentally set and mounted as drinking cups.

In his recently published work on Morocco, Dr. Leared tells us the ostrich is only met with in the south, about Wadnoon and the borders of the Sahara. Birds of the largest size and finest plumage are found in this district. The ostrich is hunted by Arabs mounted on horses. The party advance cautiously against the wind, and with long intervals between each horseman, until marks of the birds' feet are discovered. These are followed up until the birds themselves are seen by the hunters. A dash at full speed is then made after the game, until the ostriches turn and face their pursuers. They do this because their pace, which is accomplished by a combination of flying and running, is interfered with by the action of the wind upon their wings. The gauntlet has then to be run among the armed sportsmen, who either shoot, or maim the birds, by throwing at their legs a short thick stick formed of hard-grained and heavy wood. In the use of this implement the Arabs are extremely dexterous. When secured, the throats of the birds are cut, and the feathers plucked off. These, and the flesh (which although somewhat coarse, is eaten) are then divided among the hunters.

The exports of feathers from Morocco have been as follows:—

Year.	Cwt.	£.
1867	26½	10,500
1868	34	12,200
1869	56½	17,800
1870	62	23,200
1871	59	17,700
1873	55	18,700

In Tripoli the ostrich feathers are brought from the plateau above the first range of mountains, where the ostriches are hunted down during the hot summer months.

In 1865, the value of the feathers exported was £12,000, in 1866, £7,000, and in 1874, those sent to England rose to the value of £62,000, and to France, £37,600.

Passing now to the British possessions in South Africa, we find that ostrich farming is already an important branch of agricultural industry in the Cape Colony, and promises to become still more so; and yet the breeding and rearing of ostriches dates back only about eight years. Before that a farmer here and there had a few birds on his farm, more as a curiosity than anything else; but few thought of hatching ostrich eggs, rearing young birds, and attending to them as you would a flock of sheep.

When it is understood that the value of an ostrich a few weeks old is £10, and that its value increases rapidly as it grows older, it will be at once apparent that the successful pursuit of this industry is a very remunerative investment of capital. With increased production prices may probably rule lower, but there is a very wide margin, and it will be many years before ostrich breeders need fear the effects of overproduction, or that they will be farming at a loss.

About eight years ago Mr. A. Douglass, of Hilton, in the Eastern Province, bought a pair of birds, and subsequently added to them four more, making in all two cocks and four hens. The idea of an incubator then struck him, and after numerous experiments he succeeded in constructing apparatus admirably adapted for the purpose he

required. By this incubator he succeeded in rearing from these six birds 130 young ostriches in one season. The eggs are brought into contact with copper plates, and heated by warm water to a proper temperature.

The following is a description of the incubators generally used for the hatching of ostrich eggs, taken from a handbook of the Cape Colony recently published by Mr. John Noble, Clerk of the Cape House of Assembly:—

"The incubator consists of a wooden box, about three feet square, open from above, and capable of containing twenty-five eggs. It rests upon a copper or zinc pan or cistern, three inches deep, and equal to the size of the box. This is filled with hot water, and has four or five openings through which the vapour ascends into the box. The warm temperature of the water is maintained by a paraffin lamp kept burning underneath the pan; but in some cases this has been found objectionable, as the fumes of the lamp affect the young chicks as they leave the egg, and it is an improvement to have the lamp burning in an adjoining compartment, an extension of the cistern or pan about a foot wide being carried through the partition or wall, and the lamp placed under it. The heat can be regulated as necessary, thermometers being constantly in use. The temperature of the box where the eggs are placed is 102 degs. Fahr. when they are first put in; after two weeks it is gradually reduced to 100 deg., and in two weeks more to 98 deg. The period of incubation is forty-two days. The eggs are turned and aired by opening the box and blanket covering once or twice a day. A fortnight before the expiration of the time, they are held up against the light to examine their condition, and a week after are slightly, but carefully, punctured near the top with a sharp-pointed steel, to enable any of the chicks in weak condition the more readily to break the shell. When hatched, they are turned, kept warm, and fed with cut lucerne, and allowed to run about their inclosures like ordinary fowls."

In natural hatching the average number of birds raised is sixteen out of twenty eggs; in artificial, when properly managed, not more than one out of twelve eggs fail.

A writer in a local paper gives an account of a visit to Mr. Douglass's farm. Hilton is distant about twelve miles from Graham's Town, on the Cradock-road, and appears to be well adapted to ostrich breeding. The greater portion of it is surrounded by a fence, and the enclosed area is subdivided into a number of fields or paddocks, in which the birds are kept. It does not require a very high or very substantial fence to secure the birds. One field contained a brood of chickens a month old, and in the same place a fine large hen which had recently been attacked by a leopard, and severely bitten in the neck. The patient was, however, recovering. Round about the homestead, another brood of fifteen or more, about three months old, were feeding, and flocked round the visitors like chickens when being fed. In one enclosure were twenty fine birds about 18 months old, which trotted up from the farthest end of the field the moment the visitors entered, capered about, and ran after each other in the most playful yet grotesque manner. In one paddock were a savage old cock and two hens. No one dare venture within this until the male bird was secured in a small kraal or wooden stall, into which he was enticed by food. These were the most valuable birds on the farm. The two hens laid eggs all last season; and although he did not pretend it was their market value, Mr. Douglass said it would not pay him to take a thousand pounds sterling for these three birds. The extent to which the occupation is carried on may be judged from the fact that there were then

on the farm upwards of 280 ostriches, and that Mr. Douglass had sold 85 birds. The Acclimatisation Society of Paris in 1874 awarded to Mr. Douglass its first-class silver medal.

Another breeder, near Middlesberg, in addition to birds kept in enclosures, has a flock roaming at large, taken care of daily by two men on horse-back. The food which he supplies is, for birds old enough to take care of themselves, Indian corn; the chicks are fed with a mixture of green barley and chicory chopped up fine, and kept regularly supplied by a little boy, whose business it is to be constantly with his charge. This breeder considers his feathers when in season have as fine a gloss as those which are obtained from the bird in its wild state. He attributes this not so much to the character of the pasturage, although this is very favourable, as to the comparatively free range which his adult birds enjoy.

The domestication of the ostrich in the Cape Colony has assumed every year greater importance, and this industry promises to become considerable. It has been attended with such success that many large establishments have been created.

Mr. J. M. Beyers, of Noolbyeducht, near Stellenbosch, appears to be a very successful breeder by artificial incubators.

Mr. Kinnear, of West Beaufort, has given much attention to the subject. His farm is a model of simplicity, and surprises many who were disposed to consider that large tracts of territory were necessary to breed the ostrich with success. On eight acres of land attached to his dwelling, and enclosed with fences, he has thirty ostriches, nearly all raised by him. This enclosure is sown with lucerne, and according to Mr. Kinnear would suffice for the elevation of nearly one hundred ostriches, if his system of irrigation were more extended. A lodge and sheds are constructed for the protection of the young birds during the winter months, and it is here the process of obtaining the feathers is carried on. For this operation two processes are resorted to; some advise the plucking out of the feathers, others consider it best to cut them a little above the roots, and to remove the roots two months afterwards. Mr. Kinnear prefers the latter mode, as he thinks the former is often injurious to the bird. The first plucking of feathers takes place when the bird is about eight months old, but the feathers are then small, and not of much value. The operation is renewed every eight months. Three pluckings of ostriches, when in full plumage, realised to Mr. Kinnear £240, or £120 per annum—that is £8 sterling per bird. In 1874, instead of selling the feathers on the spot, he sent them to England, and by this means each ostrich realised £10, or £2 more. One portion of the enclosure is divided into compartments, in each of which the ostriches are paired. At liberty, in the wild state, five females are often attached to one male, and they all lay their eggs in one nest, and set on them in turn. Mr. Kinnear, however, only assigns one female to each male. They are coupled in July, and commence laying in August, and continue laying for about six weeks, after which they set till October. A month or six weeks later, about December, they recommence to lay for about five weeks, provided the young brood are removed. In the first season the hen will lay fifteen or twenty eggs, but the second is much less. The male sits on the eggs more

assiduously than the female, often sixteen hours successively, from four in the afternoon to eight in the morning, the female, on the contrary, takes the greatest care of the young ones. Mr. Kinnear removes the young when they are sufficiently strong to be taken from the nest, that is one or two days after they are hatched. They require a warm temperature, and hence are placed in a deep box lined with sheepskins, taking care to let the air penetrate by the cover. During the severe colds of winter the lodge is heated and kept closed. Their usual food is chopped lucerne, but they do not like the stem. Grain is also given to them, and, when they are strong, maize. Trefoil and vetches agree with them as well as lucerne. They neither have iron nails, metal buttons, nor other delicacies of that class, to which many travellers assert they are partial; but they require sand, earth, pulverised quartz, small bones, and plenty of water.

Mr. Kinnear states that, for their usual food, nothing equals lucerne or trefoil, but they also like cabbage leaves, fruit, and grain. Each ostrich will eat about twenty pounds of lucerne a day.

In the district of Colesberg some farmers have enclosed with walls large spaces of ground, leaving the ostriches as it were in a state of liberty. Competent persons think they obtain by this means feathers of a superior quality to those from birds kept in a domestic state; but the rearing of the young ostriches does not succeed so well. On the farm of Mr. Murray, in that district, many ostriches died in 1870 without any apparent cause, their death being attributed to a worm found in their intestines.\*

In the districts of Worcester and Graaf-Reinet, the rearing of the birds has succeeded well. The advance which has taken place in ten years, both in the price of the birds and of the feathers, will give an idea of the importance which this industry has already attained in the Cape Colony. In 1860, a pair of ostriches six months old could be bought for 10s.; now, for one bird alone, a few days after hatching, £5 will be given, and for those of three or four months old, £8 or £10. In 1860, the quantity of ostrich plumes exported was 2,297 lbs., valued at £19,201; in 1873 the export was 31,581 lb., valued at £159,677. In 1874, the quantity shipped was even larger. And it may be stated that an ostrich which has obtained its full development will only yield every eight months a quarter of a pound of feathers.

Dr. Mann has favoured me with the following interesting private letter, from Mr. A. Burger, giving his experience in ostrich farming, and it appears very desirable to compare the notes of the various breeders. Mr. Burger's farm, Vleyplaats, near Murraysburg, in the division of Graaf Reinet, and adjoining farm, is known by every man in South Africa, and by many a gentleman now in Europe.

"I am sure nothing is more profitable than ostrich farming, the outlay or investment of capital being much less, the expense in farming very much smaller, the extent of property more limited, the risk considerably smaller, and trouble and care not to be compared with any other mode of farming. As is necessary with cattle, the nature of the soil and the seasons must also be studied with reference to ostriches. They may to a certain extent live, thrive and increase on

\* Report of Mr. Arthur Lanen, French Consul at Cape Town.

grass or "Zair veldt," but karoo and "brak" are undoubtedly the best. There they have the natural alkalies, as also the various kinds of bush, herbs and shrubs, besides many kinds of sweet grasses and other things which naturally spring up after rain. There they thrive to the fullest extent, the feathers are so much finer, heavier and more natural, the birds larger and handsomer, increase so much better, and the chickens healthier, and grow up so much quicker; thus the farmer may expect his labour richly rewarded. I hold that from 300 to 400 per cent. can be safely calculated on the outlay, both on birds and other expenses, such as the enclosures, plucking stalls, "kraals," and other requirements, land rent, &c., &c. £15 is considered a fair average for the feathers of a full-grown bird, those of one nine month's old fetch £1, and from eighteen months to two years £5, and from thence they give from £10 to £15 very soon. From twenty-five to thirty chickens is a fair average from one hen in a year; I have seen many more. I hold that two hens for one cock is better than three hens, others say three are not too many. The value of young ostriches varies from £20 to £50 a piece, according to size and age."

On one of the "farms" near Grahamstown, where about 170 birds are kept, two males and four females are kept for breeding purposes; the rest are young birds—from chicks to ostriches of two years old—which are destined to produce the feathers that may some day bedeck the royalty and fashion of Europe.

One of the most striking circumstances in connection with the farm is that the old birds are seldom allowed to incubate their own eggs, but "artificial incubators" are used with great success; by this means a larger number of eggs are hatched than is the case if they are left to the natural functions of the parents. Birds hatched by this means are quite as healthy as those reared by the parents.

Informing the nest—which is a huge hole scraped in the sand—the male bird is most assiduous; and when all the arrangements are complete, the laying of the eggs commences. This takes place about June, though the time varies in different parts of Africa. In Algeria it is generally about February. From 15 to 23 eggs are laid, and carefully arranged in the nest, their position being frequently changed by the apparently fastidious parents; and when the number is complete the regular incubation is continued without intermission. The male bird is generally observed to sit at night, the female morning and evening; in a wild state the birds frequently leave the nest untended during the heat of the day. If more than one female is associated with the male they sit alternately, or sometimes both together. The birds are in the habit of ejecting a certain number of eggs from the nest, and allowing them to remain uncovered, and they also throw aside any eggs which, in course of incubation, they find become "addled" and useless. The former are left as food for the ostrich chicks, which, on their first appearance in the world, eat the yolk of the rejected eggs—a wise provision of nature to prevent them dying from starvation, which they probably would do under natural conditions, if, as frequently happens, the nest were situated miles away from a blade of grass, too far for the young birds to travel in search of it.

When the eggs are hatched by means of artificial incubators, the ejected eggs are preserved, and the proportion of spoiled eggs is much smaller. The period of incubation is about 43 days, and the chick on its entry into the world is about the size of a pullet. In the farm of which we are speaking, the old birds are seldom allowed to sit, and

the healthy condition of the "chicks" hatched by artificial heat shows that they suffer nothing from this mode of treatment. The first day of their life they are seldom fed, but on the second day—sometimes not until the third—some very tender grass is given to them; even at this early life they swallow pebbles and other hard substances, which serve to digest the food in the gizzard. The young birds are kept at night in a warm place, the weakest ones being placed in an "artificial mother"—a contrivance specially prepared for keeping them warm and out of danger. The others are covered over with coops for shelter. When the birds are a few months old, they are placed in an enclosure, where they are fed at regular times.

All the younger birds are driven under shelter at night, as a precautionary measure; in every enclosure there is a tent or shed, under which they can take refuge from a storm in the day time, and in which, when they are fully grown, they are left to rest at night, but in their early days they are taken in-doors.

Ostriches are comparatively inexpensive to keep, as during three-fourths of the year they require only a little artificial food, the grass produced on the farm being nearly sufficient for their keep; during the remaining fourth they only need some supplemental supplies of green food with a little Indian corn, which can also be grown upon the estate.

The food is generally fine grass and beans, in fields of which they are occasionally "pastured." At other times the food is distributed for them in the yards allotted to them.

Captain Crépu, who has kept ostriches in Algeria, feeds his birds on barley and different kinds of fresh herbs, grass, and the leaves of the cactus or Barbary fig, cabbage, &c., chopped fine. About 3 lbs. avoirdupois of barley a day to each bird, and grass, &c., according to circumstances, is the quantity he recommends. This might be reduced to 2 lbs. a day, except during the winter and breeding seasons, when the supply of food should be plentiful.

The following estimate of possible receipts, which has been carefully prepared by Major Erskine, will give some idea of the enormous profits that are looked for in ostrich farming by sanguine authorities:—

		First Year.			
		£	s. d.	£	s. d.
Feathers of 20 old birds, at £15 each	.....	300	0 0		
Feathers of 225 birds, of eight months old and under, at £1 each	.....	225	0 0		
				525	0 0
		Second Year.			
Feathers of 20 old birds, at £15 each	.....	300	0 0		
Feathers of 375 young birds, of different ages, at £5 each	.....	1,875	0 0		
				2,175	0 0
		Third Year.			
Feathers of 20 old birds, at £15 each	.....	300	0 0		
Feathers of 375 birds, at £10 each	.....	3,750	0 0		
Feathers of 375 young birds of 2nd year, at £5 each bird	.....	1,875	0 0		
				5,925	0 0

<i>Fourth Year.</i>	
Feathers of 20 old birds, at £15 each .....	300 0 0
Feathers of 375 young birds, of 2nd year, at £10 each ..	3,750 0 0
Feathers of 375 young birds, of 3rd year, at £5 each ..	1,875 0 0
Sale of 225 birds of about 3 years and under at £50 (several pairs would be worth £200) .....	11,250 0 0
	17,175 0 0
Total .....	£25,800 0 0

The fifth year, 375 young birds would be sold, and so in future, except the renewal of stock, which would be small, as the birds live fifty years. The stock on hand at the end of the fourth year would be 20 old birds and 750 young birds, in addition to the above sum realised, besides plant, horses, &c., and lease, goodwill, fencing and improvements; this is without reckoning the purchase of eggs to be hatched by an incubator, which would be done.

This calculation is based upon the assumption that only 25 birds would be reared out of 70 to 80 eggs laid annually by each hen.

In Northern Africa opinions differ as to the longevity of the ostrich; some limit it to from 8 to 15 years, others attribute 70 to 100 years to this bird. The mean average, however, is probably from 25 to 35 years. (*Bull. Soc. Accl.* 4, p. 334.)

For some time before domestication was attempted, the ostrich had become a rare bird in the colony, and the chief sources of the feather supply were hidden away in the far interior, to the north and north-west of the Free State and the Transvaal. Many farmers in the northern and western divisions of the colony now preserve these birds on their farms, and their domestication and annual plucking has proved profitable, since the best feathers range from 30 to 40 guineas a pound in the European market, although those from the domesticated bird are not considered quite equal to those from the wild one.

A curious mode of hatching the eggs was tried by Mr. Thomas Barn, of Wolf's Sprint, Hodder River, Orange Free State. He took eggs from the nest and placed them in the sun in the day-time, covered with sheep-skins. In the night he placed them in his bed with him, so as to maintain the necessary artificial heat, and succeeded in hatching many. At eighteen months he obtained his first crop of feathers, amounting to about  $\frac{1}{2}$  lb. for each bird. Later on he succeeded in obtaining annually from some of his male birds about 1 lb. of feathers, worth £30. His young birds of two years old he readily sold for £10, after having obtained two crops of feathers. He has since sold twenty birds for £400.

Who was the first in South Africa seriously to attempt the domestication of the ostrich, will probably remain a matter of uncertainty. About thirteen or fourteen years ago, Mr. Kinnear, of Beaufort West, had a small flock of ostriches well in hand. The idea was probably taken from the French efforts, set on foot by the Paris Acclimatization Society. The industry has, however, received greater development in southern Africa than in the north, for the farmers of the British colony

have taken to the novelty with great spirit. If it is difficult to say who was the first to begin ostrich farming at the Cape, it is more difficult to enumerate all who are continuing it. The occupation is now widespread.

There are but few districts of the colony where there are no ostriches. From the near neighbourhood of Cape Town to the eastern frontier, and from Albany to the Orange River, flocks of these valuable birds are to be found at intervals of no formidable distance. Some breeders have a reputation for their successes. Mr. Meiring, Mr. Raubenheimer, and Mr. Guest, as well as Mr. Kinnear in the west; Mr. Douglass, Mr. Atherton, and Mr. White, in Upper Albany; Mr. Distin, Mr. Sluiter, Mr. Booysen, and Mr. Murray, of the Midlands; and Mr. Loxton, on the eastern border, are well-known names in connection with ostrich farming. It must not, however, be supposed that the colony, or any part of it, is stocked with the bird.\*

The climate of all parts of the Cape Colony, we are told, is alike favourable to the growth and production of the ostrich; when once past their infancy they are the healthiest and easiest cared for stock a farmer can possess; they thrive equally well on the barrenest karroo as in the most fertile region.

The plans adopted by farmers in meeting the first requirement of domestication—that of limitation—have been various. Mr. Kinnear made his compound, not more than eight acres in extent, suffice for thirty birds. It would, however, be misleading to allow this fact to be looked upon as anything but an exception to the rule that the ostrich needs considerable room. Mr. Kinnear was obliged to sow his eight acres with lucerne, in order to provide food for his birds. Even with that provision, and with every allowance made for an unusual aptitude for domestication on the part of Mr. Kinnear, it cannot but be considered that this gentleman was very much indebted to fortune for his success. Other breeders have given their birds the run of their lands, trusting to careful herds, and the attraction of a daily feed of mealies at the homestead. Mr. George White, of Upper Albany, at one time gave an inclosure of 500 acres to 23 young ostriches. Mr. Murray, of Colesberg, had about 90 within 1,000 acres, walled round with stone, and he has now an inclosure of nearly 5,000 acres for his larger flocks. Mr. Douglass, of Albany, has his farm divided into about seven or eight large well fenced paddocks. It may be considered a settled law of ostrich farming, that free space and good fences are essential to success. Sheds, kraals, and houses are also necessary, not only for safe keeping, artificial hatching, and feather gathering, but also for shelter from the cold and wet. Exposure is very hurtful to the birds, if weak or out of condition.

To show the rapid increase of ostriches in the Cape Colony, and the commercial importance attached to breeding them, I may quote from some of the recent Cape papers. Thus, in the *Eastern Province Herald*—“Ostriches for sale, cheap. H. David and Co., offer for sale 52 ostriches, 12 months old; 44 ostriches, 8 to 9 months old; 25 ostriches, 4 to 7 months old. Any number will be

\* Handbook of South Africa.

sold to suit purchasers.—Somerset East, September, 1875.”

And, later in the following month, the same firm advertised for sale 74 ostriches from 7 to 13 months old. Then, in another paper, we are told, the ostriches of Mr. Bland, sold by Mr. S.H. Roberts, in October last, brought capital prices. They were all young, a year and under. Farmers appear to be turning their attention seriously to ostrich farming. The following are the prices realised, viz., two birds, £38 each; four do., £35 15s. each; eight do., £35 2s. 6d. each; four do., £34 10s. each; two do., £30 2s. 6d.; two do., £30 1s. each; twelve, £25 each; fourteen do., £23 12s. each; four do., £15 each; one do., (injured) £10.

In South Africa, since the recent vast increase in the value of these feathers, and the extension of ostrich farming, ostriches are strictly protected, and a heavy fine is imposed on the destruction of a wild one.

Having now given attention to the breeding and practical part of the subject, let me turn for a few moments to the resulting product, and furnish some description of the general trade in ostrich feathers.

We paid for ornamental feathers, chiefly those of the ostrich, in 1874, nearly £603,000; and the value of imports of the past year (not yet published) was probably more. Of this amount about one-fourth in value is re-exported, but close upon half a million of money is a large sum to pay annually for a trivial article like feathers, to minister to the pretty vanities and dainty whims of the ladies.

The trade in ostrich feathers is an important branch of commerce, which constituted in the 13th century a veritable source of riches for the Pisans and the Genoese, who used to buy them in the ports of Algiers, Bone, Bougie, and Tunis.

The elegance of the feathers of the ostrich, arising from their slender stems and the disunited barbs, has occasioned them to be prized in all ages, and they still constitute a valuable article of commerce. There is a singular feature which distinguishes them. The large wing feathers of other birds have always one side unequally plumed, whilst in those of the ostrich the quill is in the middle of the feather plume. This equal balance was probably the origin of the hieroglyphic of the Egyptians, which represented Justice by an ostrich feather.

The feathers of the male are most prized, being better shaped, larger, whiter, and finer than those of the female bird. White feathers are the most esteemed, but they take dyes readily.

In France, the white feathers are sold by number, in England by weight. The black are also sold by weight in France. France receives in the rough, and prepares, a large quantity of ostrich feathers, which are greatly enhanced in value; for instance, in the seven years ending 1871, she bought about 517,000 lbs. of all sorts, of the approximate value of £112,000, and during the same period exported to different countries 170,000 lbs. of prepared plumes, of the value of £820,000. This commercial industry is therefore of considerable importance, considering the high prices the feathers have reached. Feathers which were worth only about £1, twenty or

thirty years ago, can now not be had for £20 or £30. This advanced price is due to the extended use of ostrich feathers for parures and trimmings, hats, &c., and to the scarcity arising from the persevering chase of the wild bird, which has driven it far into the desert regions.

M. Chagot, one of the leading feather merchants of Paris, writing in the Bulletin of the Paris Society, and complaining of the advancing price of ostrich feathers, stated that a good white long feather cost them 11s., one of the second quality 5s. 6d., one of the third quality 3s., and a small tail feather, 1s. 3d. About half a pound of fine black feathers, £5; 600 lbs. ordinary quality, £8 10s.; so that if we estimate 40 wing feathers per bird, and 100 tail feathers, we find each bird yields in value feathers selling for £26 11s., without reckoning the flesh and the fat, which can be also utilised. What other bird can be found which yields anything like this return.

The head and neck of the ostrich are nearly naked, the general plumage very lax; but the quill feathers of the wings—remarkable for the length of the barbs, which, though furnished with barbules, are completely separated from each other—form the well-known ostrich plumes of commerce.

As the trade in ostrich feathers belongs to an industry of luxury—a question of fashion—its importance in the present state of affairs cannot be overrated, when we reflect that the fashion which has made of these plumes an ornament of high price has lasted more than 4,000 years. The forehead of the Pharaohs, among the most ancient dynasties of Egypt, were, in fact, ornamented with these plumes; and in our day they are held in the same favour and estimation among the higher classes of society. The graceful and elegant plumes of the ostrich have thus for centuries been sought after throughout the civilised world, to adorn the head coverings of both sexes. In the middle ages, the beautiful feathers of the ostrich decorated alike the hat of page and cavalier; and in the reign of the second Charles ostrich plumes were universally worn by those of patrician birth, from the king downwards. For the last couple of centuries it has been the rigid law of fashion that ladies going to Court must appear with ostrich feathers in their heads, artificially curled and arranged. As we all know, the crests of the Princes of Wales consist of three ostrich plumes, surmounting the motto, “*Ich Dien*.”

But ostrich feathers are not only required for Court plumes; they are much used, as I have already stated, for ladies' hats, dress trimmings, plumules, &c.

Ostrich feathers dyed black are also required for making funeral plumes for horses' heads, in sets of eleven for the hearse, and sets of six for the lid or coffin board, which is borne on the head of one of the undertakers. These plumes are made of a number of pieces of feathers, fastened on to supports of stout brass wire, which are bent downwards when used, so as to give the graceful fall to the plume. When not in use they are closed up on the centre stem. A full set of these plumes for a funeral is worth £200 to £300, and they are let out by the makers to undertakers. Plumes of white ostrich feathers are sometimes used at the funeral of young females, but such plumes, from their great value, are rarely seen.

But it is not only civilised nations who value ostrich feathers; most travellers tell us that they are the favourite ornament of the savage people of the interior of Africa. They not only adorn their head-dresses with them, but make of the larger white plumes parasols of a remarkable elegance, and with the black feathers a species of plumed baton, which serves the hunter to frighten away furious animals.

In Congo, ostrich feathers mixed with those of the peacock, are employed as ensigns of war. Dr. Schweinfurth tells us that the Donita, the Nueir, and other Negro tribes of the shores of the Upper Nile territory, wear helmets made of cane and grass, garnished all over with ostrich feathers, which are worn as broad hats for protection from the sun.

Subjoined is an account of the total quantity of ostrich feathers imported into the United Kingdom, in the last quarter of a century:

	lbs.	£
1850 .....	3,988 ..	—
1851 .....	11,128 ..	—
1852 .....	8,986 ..	—
1853 .....	7,666 ..	—
1854 .....	10,282 ..	46,285
1855 .....	10,681 ..	13,821
1856 .....	10,797 ..	19,441
1857 .....	14,922 ..	102,132
1858 .....	18,843 ..	56,722
1859 .....	29,672 ..	78,871
1860 .....	25,277 ..	81,425
1861 .....	17,871 ..	42,550
1862 .....	33,642 ..	76,256
1863 .....	28,500 ..	153,059
1864 .....	42,835 ..	194,063
1865 .....	37,811 ..	191,222
1866 .....	42,506 ..	152,447
1867 .....	51,419 ..	136,164
1868 .....	60,712 ..	111,840
1869 .....	64,159 ..	145,257
1870 .....	66,063 ..	176,797
1871 .....	83,977 ..	288,433
1872 .....	73,607 ..	289,518
1873 .....	85,149 ..	347,390
1874 .....	106,919 ..	323,669

In the Board of Trade returns, for the last five years, ostrich feathers are not specifically mentioned, but included under the head of "ornamental feathers." By looking up the sources of supply, I have, however, been able to separate them, although we probably get back some dressed and prepared feathers from France.

Ostrich feathers are now just as much the product of regulated human labour, applied to the art of domestication, as wool, mohair, or silk. The plumes which play so distinguished a part in the pomp of ceremony and fashion, are no longer to be reckoned among the barbaric spoils of the chase. They are the tame products of the farmyard, and are the ultimate results of such commonplace processes as breeding, rearing, herding, feeding, clipping, and sorting. Cape farmers buy and sell ostriches as they do sheep, and they fence their flocks in, stable them, grow crops for them, study their habits, and cut their feathers, as matters of business.

The feathers received from Southern Africa are from a race of ostriches whose stature is the largest of any. They are the largest and longest feathers of commerce, but are at the same time less flexible.

M. Jules Verraux, of Paris, informed me that he had seen one which measured over 2 ft. in length by 7 ins. wide; it was at the same time soft, elastic, and its extremity bent like a weeping willow. They rank in value after those of Barbary and Aleppo. M. Verraux states he has seen an ostrich feather sold for £4, and the finest quality of Cape feathers fetch £2. This is somewhat different to the price paid in 1809 to the hunters of them, of 3s. to 4s. for a fine feather, and in 1822 even less than half this price was paid, according to Pringle.

Mr. Layard considers the South African ostrich as distinct from the North African bird, to which probably the name of *Struthio camelus* was originally given. Anderson recognised two distinct species of ostriches in Namaqualand.

Less than half a century since flocks of ostriches were to be seen in almost all parts of the Cape Colony. Preferring the karroo flats and the sweet grass lands of the upper country, where they found the alkalis necessary to their health, they were nevertheless to be found towards the coast, grazing on the sour *veldt*, and making the best of the salt, lime, and such bones as they could find. To obtain its beautiful and much-coveted plumage the bird was hunted down and killed. This practice was not only cruel but also uneconomical. It was, in effect, killing the goose for the sake of the golden eggs. The system of slaughtering the bird for its feathers was fast removing the ostrich from its old haunts, and was surely accomplishing its destruction.

In the time of Kolber, ostriches were so numerous in the neighbourhood of Cape Town, that a man could hardly walk for a quarter of an hour without seeing one or more of these birds.

It is found in the present day thinly scattered over many parts of the Cape Colony, in the Piqetberg, Malmesbury, and Caledon divisions, in Namaqualand, and Clanwilliam, the northern parts of Uitenhage, Beaufort, Colesberg, and Graaf-Reinet, and a few in the dams in the vicinity of Port Elizabeth. In October, 1858, a flock of twenty or thirty were seen in the Koeberg, a few miles from Cape Town. Early in 1857 Count Castelnau, the French Consul, writing to the Paris Society, stated that in a land journey he had made of 125 leagues from Cape Town to Algoa Bay, he had only seen one wild ostrich, although a few were kept by the Boers on their farms, but they did not then breed in captivity.

In 1826, ostrich feathers from the Cape paid a duty in England of 20s. per lb. weight. In 1832 this was reduced to 10s., and in 1845 the tax was wholly removed. In 1846 only 1,327 lbs. of feathers, valued at about £8,000, were exported from the Cape. The amazing increase in this small article of luxury is shown in the following table I have compiled, of the exports from both the Cape Colony and Natal since 1858.

There is a certain fluctuation in the average value per lb. of the feathers, which it is difficult to explain without details of the quality, of the state of the markets, of the season, and other points. That increased production has been followed by diminished prices does not appear to be the case absolutely, though to a certain extent this natural sequence of events may have occurred. A reduced price, occurring contemporaneously with largely increased yield, is most apparent in the



Return of the quantity and value of Ostrich Feathers exported from South Africa in the last 17 years.

DATE.	FROM THE CAPE COLONY.		FROM NATAL.	
	Quantity.	Value.	Quantity.	Value.
	lbs.	£	lbs.	£
1858....	1,852	12,688	84	510
1859....	2,972	19,018	70	391
1860....	2,297	19,261	64	465
1861....	3,475	24,142	110	564
1862....	7,462	42,488	600	2,510
1863....	10,275	72,834	1,746	7,255
1864....	17,873	81,755	1,665	6,572
1865....	17,811	66,426	2,025	11,299
1866....	15,144	75,661	2,605	10,921
1867....	18,921	75,221	4,426	11,200
1868....	16,163	63,193	4,191	8,830
1869....	13,920	70,750	2,133	4,757
1870....	29,805	91,229	2,063	6,364
1871....	25,508	150,769	1,706	6,910
1872....	26,993	158,904	1,856	9,745
1873....	31,581	159,677	1,535	5,940
1874....	36,829	205,640	387	3,139

returns for 1870, as compared with those for 1862, the value per lb. being £2.99 in 1870 against £5.7 in 1862.

This may be accounted for by the fact of the increased yield of feathers, under the artificial system of producing them, having so suddenly followed upon a period of scarcity, as to have alarmed the merchants, who feared a general depreciation of the prices. The subsequent rally in prices is sufficient to prove the healthy tone of the market, and the prosperity of the trade, for we find that, after the large crop in 1870, which succeeded a comparatively poor period of production, and which has been followed by an annually increasing yield, prices, instead of falling, rose to an average of 50 per cent. higher per lb. than had been maintained in the years immediately preceding. The average value per lb. previous to 1870, was £3.8. Since then it has been £5.5, as the following table shows:—

	Average price per lb.	
	Cape Colony.	Natal.
	£	£
1868 .....	3.9	2.1
1869 .....	3.7	2.2
1870 .....	2.99	3.08
1871 .....	5.08	4.05
1872 .....	5.9	5.2
1873 .....	5.05	3.8
1874 .....	5.6	8.0

I have thus endeavoured to trace the commencement and progress of this new and important industrial occupation, hoping that it may lead to further inquiry and discussion, and I cannot but think it will profitably be carried on in some parts of Australia where the Victoria Acclimatisation Society has introduced a troop of ostriches at Wimmera, but they are to be transported to the Murray Downs, Swan Hill, as a more suitable locality, and incubators are to be obtained from the Cape. I have heard it alleged that this industry, like the search for diamonds, is likely to prove detrimental to the permanent agricultural progress and prosperity of

the Cape Colony, by withdrawing land from culture, seeing that wheat, butter, and other produce that might be locally produced, have to be imported. But there are many questions which have to be taken into consideration, such as continuous labour, seasons, &c. Moreover, the same complaint was urged against gold seeking in Australia and New Zealand, but this has attracted labour and capital, and gradually settled down, so as to have rather benefited than injured the colonies.

DISCUSSION.

Dr. Mann remarked that one reason why the feathers of birds artificially hatched had an advantage over those of wild birds which had been killed, was that the greatest injury done to the feathers of the wild bird was during the period of incubation, in which process they roughened their tail feathers, and also damaged those of their wings. To Mr. Douglass, he believed, belonged the chief credit for having so admirably developed the practice of artificial incubation, and so great was his reputation in the colony that it was said that he knew a great deal more about the hatching of eggs than the mother bird herself. One point of the greatest interest in connection with ostrich farming was that feathers were removed at stated periods, so that successive crops could be gleaned year after year, and the way in which they were removed was also very interesting. At first the practice was to pluck them, but as this was found to be a source of irritation, it had been superseded by another. The birds were driven up into a small enclosure or shed, where they were so tightly wedged together that they could not move; two skilled men then squeezed in amongst them, who knew the habits of the birds, so that if any one of them should turn vicious they knew how to seize it by the throat, and by partially strangling it, make it perfectly safe. They used a small, delicately made, and very sharp knife, turned to a hook at the point, which was laid flat on the finger of the operator, who passed his hand over the back of the bird and selected the feather he wished to remove, when by a slight turn and backward movement of the knife, he severed it at a short distance from the body, and handed it to his companion. Very commonly the stumps were left to fall out, but sometimes they were removed when they became loose. At first it appeared that certain kinds of pasture only were suitable to these birds, and this still obtained to some extent, and therefore, some local and practical knowledge was still requisite for the selection of an ostrich farm. Above all it was necessary that the birds should have a supply of lime, and the first notion was that lime in any form would do, the object being of course to form the shell of the egg, and also to supply bone earth for the young animals. Common lime, however, did not succeed, and it then became apparent that it was phosphate of lime, not ordinary carbonate of lime, which was required, and it was now usual to grind up a quantity of old bones and add a little sulphur and salt, and this made a compound which the birds readily accepted, and ate greedily. Major Erskine's figures were very interesting, and he knew that when he was in England he had been at great pains to get information, in order to make an honest estimate, but at the same time he feared it was rather an enthusiastic one. He had now gone out to the Cape to test the value of his figures, and was, no doubt, making arrangements to start an ostrich farm, so that in a few years they might hope to hear how his practice tallied with his anticipations. He feared he had rather overlooked the difficulty of managing animals of this class in large numbers. A large part of Cape Colony was now occupied by small farms of these birds, but the two great centres where most had been done were the farm of Mr.

Douglass, immediately to the north of Graham's Town, and Mr. Murray's farm immediately to the south of the bend of the Orange River. Throughout the whole of this district there was a bird very abundant known as the black crow, and since the ostrich had been brought into the country these birds had acquired a very curious habit of taking up stones and dropping them upon the open nests of the ostrich, so as to break the eggs, which they then proceeded to eat. It was said that as many as one-third of the eggs allowed to be hatched in open nests were destroyed in this way, but until within the last twenty years nothing of the kind was known, though it was possible that the crows in the wild lands had practised it unobserved. The scientific name of the ostrich, *Struthio camelus*, was interesting, meaning the camel bird, and it was very remarkable how grotesquely the foot of the ostrich mimicked that of the camel. The ostrich had two toes of unequal size, which were almost a fac-simile of the camel's foot, as may readily be noticed. It is also a somewhat remarkable and interesting fact that so large and coarse-looking a bird should possess such beautifully fine and delicate feathers. Another fact to be remembered was that the finest feathers belonged to the male and not to the female bird, and therefore it seemed rather curious that men should have allowed these feathers to go almost entirely to the adornment of the ladies, instead of keeping them to themselves, because it was evident that nature intended them for the male sex. In conclusion, he drew attention to a large map of Africa on the wall, which had been prepared for the Section under the superintendence of the late Mr. Davenport, and executed entirely by one of his sons.

Mr. Wm. G. Soper said that having himself visited one or two of the ostrich farms in South Africa, and being a regular importer of ostrich feathers, the subject was not altogether new to him. One important fact mentioned by Mr. Simmonds was that there had been a serious depreciation in the value of ostrich feathers within the last four months in the London market; and another was that some people at the Cape considered that the permanent development of the colony would be more secure were corn, wool, or any other agricultural product made the subject of their care, attention, and investment. Whether owing to these facts or not he could not say, but certain it was that the ostrich farmers of the Cape were now most anxious to get rid of their ostriches and their farms, as he could say, from most trustworthy information, which had reached this country within the last month or two. Another remark made was that the value of the feathers from tame birds was not to be compared with that of those from the wild, and any manufacturer would tell you that the tame feather would not remain in curl so long as the wild one. Consequently, as the development of the tame ostrich feather trade had been partly a question of an increased return for invested capital, immediately that return diminished so would the amount of capital invested. He hoped, therefore, that if there were any gentlemen present anxious to go to the Cape and engage in this branch of industry, they would think twice before investing in the feather farms which would, no doubt, be offered to them. A remark had been made about cutting the feathers instead of plucking them, and this was said to be a more humane process; and no doubt it was so if the feather was immature; but why did they cut the feathers? simply because they could do so twice a year, and so double the returns. The consequence was that the tame feathers were sent to market before they were matured, and thus they did not command anything like the price of the wild feathers. If they would only wait until the feather could be either cut or plucked without inhumanity, and would see the birds had plenty of space in which to roam about and clean their feathers against the bushes, he did not see why the tame feathers should not be as good as the wild. As a rule, however,

the birds were kept on a comparatively narrow area, and there was a great desire on the part of the farmer to cut the feathers before they were ripe.

Mr. Hyde Clarke said it was rather curious that artificial incubation, which had been carried out for so many centuries in the northern part of Africa, in the case of the common fowl, should be now practised in the south with these large birds. As a rule, a dead feather did not take a curl so well as one from a living bird, and he should therefore like to ask Mr. Soper, or any other practical man, whether there was any advantage as to the general crispness of the tame feathers as compared with the wild ones, which in many cases were obtained from dead birds. The objection seemed to apply principally to the same feathers cut in an immature state; and if, when allowed to grow their full time, they took the curl as well as the wild ones, it would have an important bearing on the future of the trade. Another question worth consideration would be whether there was any distinct market for the tame feathers, because it sometimes happened that an inferior article would make a market for itself apart from the superior one.

Mr. Samuel Figgis (Messrs. Lewis and Peat), said he could not claim to have been to the Cape, yet as a great proportion of the feathers which came to this country passed through the hands of his firm, and they had a sale to-morrow, when about £25,000 to £30,000 worth would be put up to auction, he might answer the question put by the last speaker. It seemed to him that the main objection to the tame feather was the weight and thickness of the quill; the quill of the tame feather was much heavier and more inflexible and difficult to manage than that of the wild. He could not help thinking, on hearing the admirable paper of Mr. Simmonds, that he had rather taken some of his figures for granted with respect to the extent of the trade and its increase. For instance, he remarked that in one year France imported £112,000 worth, and exported £170,000 worth, which would leave, it appeared to him, nothing for their own consumption.

Mr. Simmonds said that the latter figure represented the increased value from the feathers being manufactured.

Mr. Figgis said he was aware of that, but being acquainted with the trade in France, he did not think that was sufficient to allow for the enormous consumption of feathers in that country itself. Then again he thought there was a slight inaccuracy with regard to the extent of the trade in 1874, which was represented as being something like £110,000 worth from Tripoli, £20,000 from the West Coast, and £150,000 from the Cape, making altogether about £300,000, but the total was given as £620,000, thus leaving £300,000 odd to be accounted for from Egypt and the Soudan. No doubt the quantity from there was very large, but it was patent to all acquainted with the trade that the estimate of the value of feathers from the Cape must be considerably under-estimated of late years. Major Erskine some time ago visited several people in the city with a view, he believed, of inducing those interested in the trade to help him to get up a company, but he feared he had hardly made himself sufficiently acquainted with the subject in a practical point of view, for no man of business would suppose that such results as he had shown could be obtained. If it were so, and so many thousands, as he represented, could be obtained for the expenditure of a few hundreds, there would be plenty of people glad to take part in it. In his short experience, the trade had grown in such a marvellous way that he

\* According to the explanations elicited from practical members of the trade, it appears that the tame feathers have too much stem or stalk, and are, consequently, too strong and stiff for taking a good curl. This is deserving of investigation, as it may arise from want of food or want of exercise, as compared with wild birds. So likewise with regard to the lustre of tame feathers, which is inferior to wild feathers.—H. C.

feared its future expansion had been over-estimated, and particularly that some of the gentlemen at the Cape were over-estimating the capability of this market to take off the feathers at the prices they put upon them. If there were, as he had heard, 350,000 young ostriches alive in Cape Colony, it appeared to him incontrovertible that lower prices must rule. Ladies would have feathers, and they were also used in large quantities for children, including boys, and with the increase of luxury and greater circulation of money, no doubt the trade would increase during the next five or ten years, but still they must look to a very different result commercially to what there had been of late. He thought the increase of the Cape trade had been much greater than Mr. Simmonds had led them to suppose, and he also thought the produce from the Soudan and from Cairo was largely on the increase. During the last two years there had been an extraordinary weight of feathers from those parts, but the value during the last four months had declined from 20 to 30 per cent., which was only natural considering the enormous supply. As to the difference in the value between the tame and wild feathers, that was found to be in the market of from 15 to 22 per cent., which he attributed mainly to there being a less number to the lb., and to their not having the same brilliancy of plumage, and not retaining the curl as well on the whole as the wild feathers, which were often sought after at high prices when the market was overstocked with tame feathers.

The Chairman said the fact mentioned by Dr. Mann with regard to the black crows was very remarkable, as being one of the few cases in which they heard of animals using weapons. Remarks had been made bearing on the inferiority of tame birds; but it must be borne in mind that attention to the breed of animals was sure to create an improvement in the points which it was desired to develop; and by attention to the breeding of ostriches, no doubt very superior animals would be produced. Another point was the interest which attached to the effective domestication of any new animal. All domestic animals known to the present time had been domesticated from prehistoric times, and the reason, he believed, was this. All travellers had observed that savages reared wild animals as pets, and it was common for chiefs of tribes to receive gifts of animals as presents, and preserve them. For instance, the king on the shores of Lake Nyanza, as mentioned by Captain Speke, had quite a menagerie; those animals which thrive in captivity multiplied, which was not the case with all animals, and thus those which were useful ultimately became preserved and domesticated. The ostrich, it appeared, did admit of domestication, and had been reared, to some degree, in various parts of Africa; but, until very lately, no great pains had been taken with it. There was another bird also half domesticated in Africa, the gallina, which was never wholly domesticated because, although these birds were hardy and thrive in captivity, they were rather wild, laying their eggs away from the haunts of man. The same difficulty was found with these birds in England; and it was an interesting case of an animal nearly fit for domestication, but not entirely so, which was almost domesticated in savage countries as well as in England. The only point on which he disagreed with Mr. Simmonds was that in which he spoke of the flesh of the ostrich as being delicate eating, for having eaten most kinds of game in Africa, he could only say that the flesh of the ostrich was the hardest, driest, and most sinewy of foods which existed. One point which might be interesting, was the manner in which the hunters carried the feathers after the bird had been shot. One would naturally suppose the hunter would be somewhat puzzled with a handful of delicate feathers, which would be easily injured by the accidents of transport. He got over the difficulty by cutting the gullet of the bird, tying a sinew or thong to the feathers, and pulling them through it; and in this way the feathers were taken to Cape Town, or

wherever he wished to bring them. He concluded by proposing a hearty vote of thanks to Mr. Simmonds for his paper.

Mr. Simmonds, in reply, said his object had been served by eliciting practical information from the practical men present. He did not come there as an advocate of this industry, or with the view of inducing parties to embark their capital in it. He had merely put together certain facts, which, he thought, were reliable, even in those cases in which they had been doubted. His figures had been taken from the Board of Trade returns, the Consular reports, and others, and the only difficulty he had found was, that in the last returns, ostrich feathers had not been separated from ornamental feathers generally. Still the ostrich feather formed by far the largest item in the whole. He had hoped that other gentlemen would have been present from the Cape, who would have given more information upon the subject, especially as some of the authorities he had quoted might be rather over sanguine, and he did not altogether pin his faith to what had been put forward.

On the motion of Lord Alfred Churchill, a vote of thanks was passed to the Chairman, and the proceedings terminated.

#### ELEVENTH ORDINARY MEETING.

Wednesday, February 16th, 1876; Sir FRANCIS C. KNOWLES, Bart., F.R.S., in the chair.

The following candidates were proposed for election as members of the Society:—

Anderson, George, 25A, Great George-street, S.W.  
 Campion, Frank, The Mount, Duffield-road, Derby.  
 Clark, John, Imperial Gas Works, King's-cross, N.  
 Green, Thomas Bowden, M.A., F.R.S.L., F.R.Hist. Soc., 14, Argyll-street, Regent-street, W.  
 Tyson, Edmund John, Hartford, near Huntingdon.

The following candidates were balloted for and duly elected members of the Society:—

Buckle, Captain Charles M., R.N., 3, St. James's-place, S.W., and United Service Club.  
 Rosing, F., 11, Billiter-square, E.C.  
 Sampson, Thomas, 252, Marylebone-road, N.W.  
 Smithers, Alfred Waldron, 24, Brandram-road, Lee, S.E.  
 Tooth, Robert, 10, St. Mary-at-Hill, E.C.

The paper read was—

#### THE COMBUSTION OF COAL GAS TO PRODUCE HEAT, AND THE THEORY OF THE STRUCTURE OF FLAMES.

By John Wallace.

Wherever heat is required it is wanted in a certain definable quantity. This quantity is constant for any given purpose; that is to say, whether the object is heating a building, heating or melting metals, cooking, or any of the numberless operations to which we apply it, the same operation, however often repeated under the same conditions, requires the same amount of heat.

The quantity of heat produced in order to perform any operation is always in excess of that actually required, because the whole of it cannot be utilised. Radiation, convection, and absorption are all at work to carry off as much as possible, and the amount thus lost depends in a great measure on the method we adopt in applying it. This is well exemplified in the weight of coal required to evaporate 10 lbs. of water in a steam-