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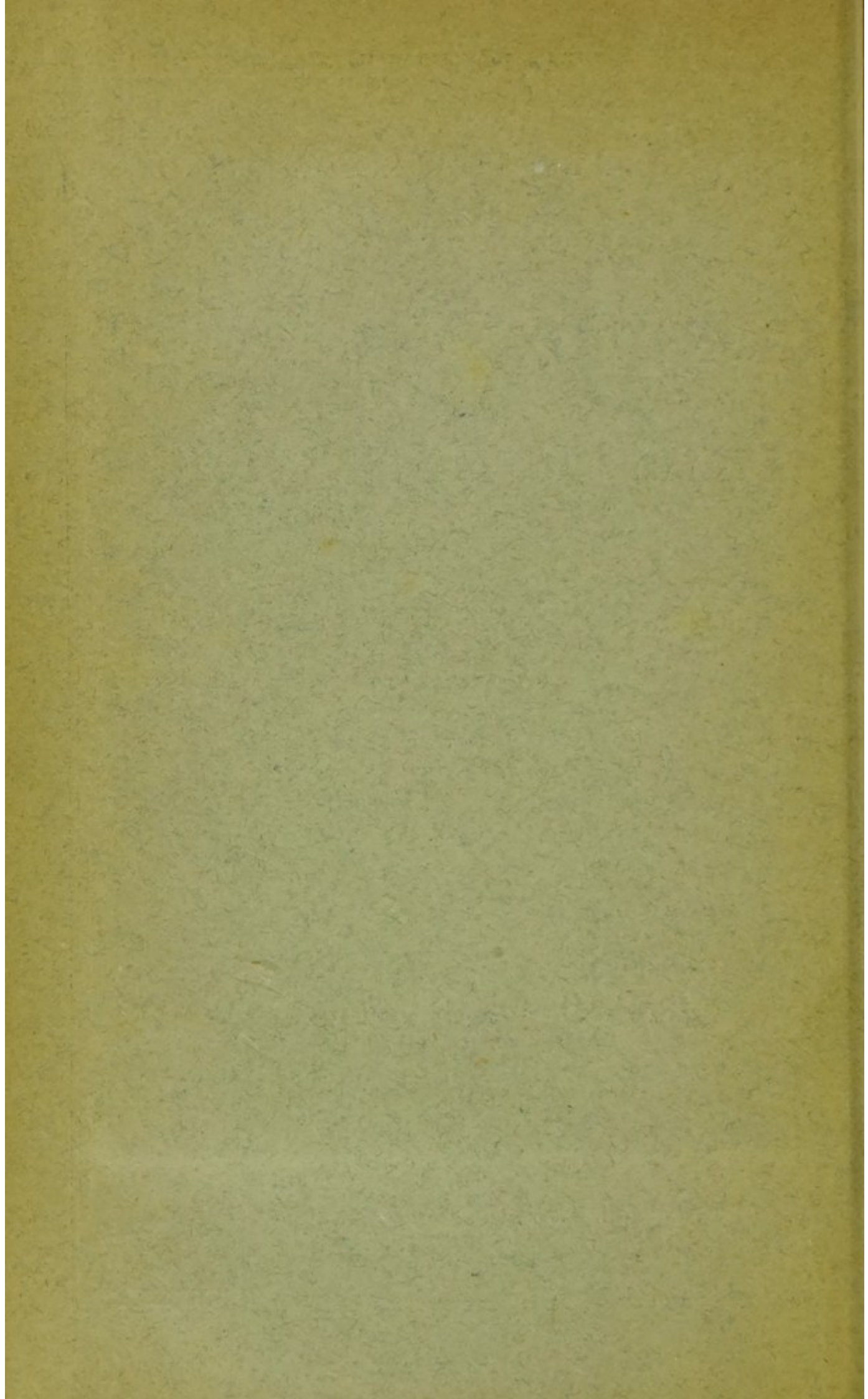
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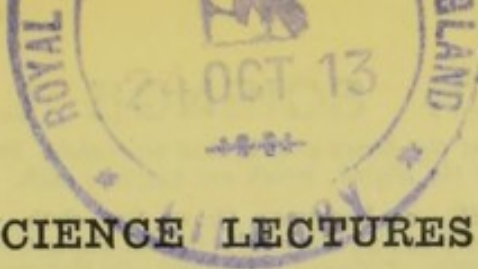
THE
CHANGES PRODUCED BY MAN
IN THE
INDIGENOUS FAUNA AND FLORA
OF GREAT BRITAIN.

BY

PROF. G. ROLLESTON, M.D., F.R.S.

JOHN HEYWOOD, EXCELSIOR BUILDINGS, RIDGEFIELD, MANCHESTER;
AND 18, PATERNOSTER SQUARE, LONDON, E.C.





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PRICE ONE PENNY.

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A LECTURE delivered in the City Hall, Glasgow, January 9th, 1879,

BY PROF. G. ROLLESTON, M.D., F.R.S.



LADIES AND GENTLEMEN,—The subject of this lecture forms a part—not a very large part—of a much larger question, which may be put in these few words: What changes would our ancestors note if they were good observers, and were to come back into this country now? It is a part of that question, and only a small part, for there lies under this question all these other matters, which I will just mention, without dealing with them in full. I have not, whilst I keep to my undertaking to the best of my ability, to deal with such questions as these. I have not to say what are the changes that have been brought about by man in his contrivances for meeting the inclemencies of the weather. Nor have I to deal, save here and there, with the changes entailed by man's contrivances for meeting the necessities of hunger and thirst. Nor have I to say anything about the way in which we now furnish ourselves with protection, say, against the inconveniences of darkness, though there are living men who knew others who denied that such a thing as lighting a town with gas was a possibility. I shall not do more than glance at the changes which have converted this valley from being merely an estuary into a large city, distributing its wares all over the world. Nor have I to speak of such changes in the way of protection against medical disease as vaccination has produced, nor of those effected in comparatively recent times in the way of protection against surgical disease by the employment of carbolic acid, of which you in Glasgow must know something, for I believe Professor Lister did once officiate in this very city. Nor have I to say anything at all about the

means by which man has, through chloroform, changed his relations to pain, though perhaps that is not an unimportant change. None of these great changes, which man has worked out by faith and patient diligence, favoured sometimes by what we call *chance*, have I to deal with. I propose to myself a much humbler task, that, namely, of enumerating some of the more obvious alterations which have been produced in our vegetable and animal surroundings by man's interference.

First, let us ask what are the great changes that have been brought about in the flora—in the vegetation, trees, and plants, around us. Trees and plants make up very much more of the landscape than do animals. In animals I take considerably more interest. So, I presume, do most of us, as we belong to that kingdom, and not to the other. Nevertheless, the more obvious of the two sets of changes is that brought about in the vegetable world. And, first, what is the most striking change which has been effected by man's agency in this kingdom of Scotland here, and in comparatively recent times? Let me just say that the prominent changes as regards trees are, as I think, throughout the whole of the United Kingdom, those affecting, first, firs; secondly, elms. In Scotland you have Scotch firs still prominent in many or most of your landscapes. It is a very common tree here at this moment. But let me add that no single one of all the other sorts of firs now prominent in your country are indigenous to it.

I was waiting, to-day, in the station of the North British Railway, in Edinburgh. I there saw a fir, drawn in an advertising picture of Strathspey, which was entirely unknown in Scotland 300 years ago. This was the Spruce Fir, which is a northward ranger, and found in countries stretching in longitude all the way from Behring Strait to Cape Clear, covering the entire length of that part of the world called the Palæ-arctic, and, finally, a tree represented in the pre-glacial period.

I say the spruce fir was unknown in Scotland in these later geological times till three centuries ago.

Let me give you its history in a few words. You all know the tree, commonly known as the spruce fir, technically known as the *Abies excelsa*, poetically known as the "dark Norway pine." Though it holds its own in Norway and Switzerland, it nevertheless was, till recently, unknown in this country, though it is freer from the extremes of temperature than either of those parts of the world. The Gulf Stream does so temper your climate that even fuchsias can form a hedge to your gardens and survive during

the winter. But the spruce fir, on account of some uprisings and downsinkings—especially downsinkings—of the United Kingdom in the glacial period, had got extinguished here, where it had flourished in times immediately preceding. So that that tree is of recent introduction into Scotland, so recent that it can be measured even by centuries of history, having been introduced only 300 years ago. It has, however, now the same geographical distribution over the Old World as the Scotch fir. You can get it in the far North, in the levels of the Samoiedes, and in Switzerland. It has like the other inhabitants of Scotland, a great power of becoming semi-cosmopolitan. You can find it in all parts of Scotland. You can observe it in Switzerland, close upon the edge of the glaciers, and if you look for it you can find it in Norway also, so that mere cold has not kept it out of this country. It sometimes take the shape of a bush, but when well treated it is very long-lived and becomes one of the tallest trees that you see in Europe. It is not so tall as the Wellingtonia, or Washingtonia, or Sequoia, whichever you call it, but still a tall tree, attaining a height of some 150 to 200 feet. It is a very common tree, and though introduced or reintroduced so recently you see it now figuring in advertisements of pleasant places in Scotland as a characteristic of your country.

Now about the Scotch Fir itself. You all know it differs from the other tree we have been dealing with, being a *Pinus*, whilst the spruce is a true *Abies*. If any one should chance not to know the difference it would be easy to show him the difference at once in any drawing, such as those before you, giving the general *habit* of the trees.* The Scotch fir differs from all other large coniferæ familiar to us here—to wit, the spruce, the larch, and the silver fir—inasmuch as when it is left to grow to a head it forms a large, expanding, more or less umbrella-like, head. It does not, like the spruce and larch, end in a conical point. It is distributed over all that part of the world which is called Palæ-arctic, which means the whole of the Old World as compared with the New World, with the exception of India and Africa south of the Sahara Desert. Man has greatly altered the landscape of Scotland by greatly diminishing the number of Scotch firs.

There is another fir tree to be spoken of—the Silver Fir (*Abies pectinata*). Now, I take it, here in Glasgow, you have heard of

* In the course of his address the lecturer frequently directed attention to these drawings.

some such place as Roseneath, on the Clyde, belonging to the Duke of Argyll. On his Grace's estate there are, or were, according to the *Edinburgh Review*, October, 1864, two silver firs 165 years old, and 140 feet high. This silver fir is even a more recent importation by some twenty years than the spruce, having come from Germany in the year 1603. There is no tree more striking in the landscape than the silver fir, when left to grow by itself. It is one of the tallest of European trees, and the tallest, I think, of British. The spruce fir is ordinarily used up, cut down, and converted into various things for which a tree of that sort is employed; but, every now and then, you see the silver fir left, and a very prominent object it makes in the landscape, with its horizontal, bird-perched, airily-interspaced boughs. When you go into Switzerland you will observe, sometimes, fir trees like that depicted in this picture (a pile dwelling). That is a spruce fir, as its cones show you, but in general habit it is very like the silver fir, with its boughs lying more horizontal than is usual in our spruces. You may be puzzled at first, as I was, to note that on a tree with the horizontal branches, and also with much the same colour of bark as the silver fir, there were hanging cones of the spruce fir. The difference between the spruce and silver fir is very much the same difference that there is between the cedar of Lebanon and the deodara of India, this consisting in the latter tree's long retention of a more distinctly conical contour, whilst the branches of the cedar of Lebanon more early take on a horizontal direction and tabulate contour. The horizontal direction of the branches of the spruce fir, as seen in Switzerland, is due partly, at least, to the fact that they there grow to be old, and are not cut down and employed for chemical and other manufacturing and useful purposes, as they are here. I take it, also, that the heavy weight of the snow incumbent on the branches induces this horizontal direction, for it does certainly press them out and flatten them down. And whilst all this makes the spruce tree assume the horizontality of the silver fir, growing old, like some other organisms, it grows whiter, and thus comes to resemble the silver fir still more closely. Man's interference in the way of using up the spruce whilst young has thus altered the landscape in Great Britain.

Now, with regard to the Larch, the botanists have a spite against it, and so have the landscape painters. One of the German botanists, Dr. Karl Koch, professor of botany in Berlin, calls it the most hateful tree he knows, because it differs from these other firs in the fact that it is a deciduous tree, shedding its leaves, and being

consequently ragged, shivering, and cold-looking through the winter, instead of presenting the beautiful contrast produced in snowy times and places by the Scotch pine and the Norwegian and other firs. Hence it is by no means an ornamental tree. But it is a tree which I believe is a favourite with arboriculturists, or persons who deal with trees as articles of profit, because it is one of the most rapidly growing of fir trees. It was a tree respecting which, as planted at Grasmere, the poet Wordsworth said he wished the vegetable manufactory could be removed to some other less picturesque district. It grows, as I have said, with great rapidity, and now covers a large area of this country, and indeed of many other countries where wooden sleepers for railways and similar articles are wanted and employed. In fact it is the best *paying* fir tree.

Now what is the history of the larch? Upon it depends one of the changes, the introduction of which man has brought about. It is of more recent introduction than either spruce or silver fir, and you can fix the date of its being introduced in any quantity to about 1745, an exceeding familiar epoch in the time of George II., being the year of the battle of Culloden, not to mention the battle of Prestonpans, which engagement had a very different result. The tree was introduced in great abundance by James, Duke of Athole, having been but scantily represented for the foregoing 150 years in gardens. Two larches which were quite lately in existence at Dunkeld—magnificent trees they were—date only from twenty years before the eventful period of 1745.

I must now get on to what is my proper subject. It is a striking fact that into this country of ours, which is now so rich in forest trees, so many of them should come by importation. If any one here, who has paid attention to the subject, or will do what I shall do to-morrow, when travelling from this city to Edinburgh—take note of the trees which are the most numerous, if not always the most prominent—they would find these were the Elms. Now the elms (*Ulmus campestris*) which do abound here, are, according to many botanists, not English nor Scotch trees. They are analogous therefore in our landscape to words of Latin derivation in our English language. They have been imported into it, and they exist in nearly every part of it, but they do not form a part of the indigenous flora any more than the Latin words form a part of the genius and spirit of our tongue. We cannot utter a sentence hardly, however pure the Saxon we speak, without bringing in some Latin vocables, but the structure of our language is still distinctively Teutonic. So the so-called common elm, which

spreads itself by suckers, overruns our land and yet does not really belong to it. It is supposed that it was the Romans who imported it into this country; and that, though thus imported, it forms a quantitatively more important part of most of our landscapes than any tree, except, perhaps, one or two, is a patent fact.

There is just one other thing to which I have to call your attention. There is a sunken forest at Cromer, in Norfolk. You there find stems of trees standing upright. You also find the leaves and seeds of plants and trees, so that the trees can be identified as well as proved to have grown there. What are these trees? They are the Scotch and the spruce firs, the yew, oak, alder, birch, and blackthorn. But though in this period, just verging on the glacial period, you find these trees, you find very few, if any, others, and notably not the elm. Let me impress this upon your mind by a quotation, which will come home to you all, of the words of one of your own poets, or rather one of the world's poets, Robert Burns. Like a real poet, and not like a false poet, Robert Burns really laid his mind broadside along Nature, and you see the real truth he put out coincides with what the geologist takes out of the fossil formations. What a person finds who goes into a part of Great Britain in which civilisation has not yet carried the "new foreign shrubs" is very much the same thing that is found in the forest-bed of Cromer, and what is found in these lines of Burns', from "The Humble Petition of Bruar Water to the Duke of Athole":—

"Let lofty firs, and ashes cool,
My lowly banks o'erspread,
And view, deep bending in the pool,
Their shadows' wat'ry bed!
Let fragrant birks, in woodbines drest,
My craggy cliffs adorn;
And for the little songster's nest,
The close embow'ring thorn."

Here you have just got England's own proper non-imported indigenous trees. But amongst them there is no elm—not even the wych-elm. If you had had a bad observer, who makes ordinarily but a poor poet, you would have heard something of the "Norway pine," the "verdant larch," or the "stately cedar," but when you come to the real poet he introduces nothing but what is to be seen in Nature.

There is one other remark I would make about trees before I speak of animals, and this is as to how man must have modified

the flora of this country owing to certain of man's inventions. I suppose you have heard of the English archers. I believe more battles were won by the English archers than knights were or are willing to allow. Everybody knows that the bow was made from the Yew-tree, and the staple of our fighting power was the bow, just as the musket is the staple of it now. But to furnish those bows what an enormous number of yew-trees must have been required, even when we make all reasonable allowances for importation of yew-staves from abroad. The yew is now a scarce tree. If you turn over old books or poems you see the former importance of the yew-tree. One of the consequences which followed the invention of gunpowder, which could not have been contemplated by the inventor, is that the landscape of the country must have been considerably modified, because it rendered yew plantations no longer necessary to the national life. They were cut down, and the ground planted with other trees which grew more quickly, and paid better commercially.

Let me now proceed to what I said was the other half of my lecture, namely, "The Changes Produced in the Indigenous Fauna of this Country." I had better confine myself to the animals of most practical use; and I will now ask you to look at these drawings, because I wish to explain what they are intended to illustrate. Let me begin with the type form of a very useful animal—the pristine form of a pig; and here on the other side is what man has been able to effect in the way of modifying it. Here again is a picture of one of the still existing races of sheep of Scotland, my knowledge and the possession of which I owe mainly to the kindness of Wm. Alex. Stables, Esq., of Nairn. It has horns very like those of the goat, and it is like a goat also as to its tail. It is sometimes called the "flounder-tailed sheep," and it certainly is a very old form of a sheep. It is a connecting link with the wild sheep of Siberia. Here again is the picture of a ewe which was living some few weeks ago at Dunrobin, having been imported thither from St. Kilda, and has been drawn under my direction from a sketch by the Rev. Dr. Joass, which I have been allowed to use. There is running after it one of its lambs. Here again we have the picture of a horse as it was seen in the so-called "Reindeer Period," and was drawn by one of the animal draughtsmen of those early days. You may see the account of this "find" in Mr. Lee's translation of Mr. Merk's "Excavations at the Kesserloch." It is very like the Sibero-Russian horse of the present day, as copied on the same sheet from Middendorff's

"Sibirische Reise" (p. 1313). Next, please observe these houses, built upon piles, a drawing taken from Keller's "Lake Dwellings," and slightly altered. At one of the doors is standing the small domestic cow of the period in company with other domestic animals of the pile-dwelling people. This picture shows what the domestic animals of our forefathers were like, and the cattle and other shows of to-day enable us to judge of the changes which man has produced by his action upon them. If you will examine the river-gravels, such as are in the valley of the Thames, you will find they contain the remains of wild animals, such as the red-deer and the wild ox, distinguishable obviously enough in the matter of size from the stags of your Highlands, and from the ordinary Kyles cows such as I saw this morning feeding upon the barren heaths as I came through from Edinburgh. You will also find, if not in these gravels, still in peat and drift-clay, only a little more recent, the remains of the wild boar. You never find the sheep, although you have this animal in such great and even picturesque abundance on your hills. You have also the remains of the horse in those gravels which the rivers of the South of England have deposited at various levels on their sides. But these gravels, possibly from having been over-violently rolled by the large rivers of those times, have not left you the remains of man himself, though they have left what is more enduring than himself, namely, the works of his hands, his implements, and weapons. It is perhaps possible that the animals just enumerated, viz., the ox and the horse, may have been domesticated at the period of the deposition of these gravels, but I do not know nor think that there is any evidence for this in existence. Indeed, I have not found any decisive proof that the men of a much later period—that, viz., represented by the *long barrows* and the *horned cairns* of Scotland and England—had domesticated the horse, though the remains of domesticated oxen and goats abound in such burial-mounds. Nor do I believe there is any evidence, to use a hard word, of *hippophagy* having been practised within the United Kingdom, though no doubt it was not an unusual practice to eat horseflesh on the Continent in the days of the cave men. My point is that man, by extirpating the wild ox and the wild horse, has greatly modified even the landscape by removing from it what must have been a prominent object in it, viz., those wild herds and wild troops which were so abundant, when the rivers were eating out what are now the valleys at the bottom of which they run. The ox and horse are animals which are both

alike reduced almost, if not altogether, to domestication. They are both alike widely or universally spread over the world, and both alike, therefore, have been completely bowed to man's will, so far as being tamed and gifted with cosmopolitanism for his ends. As regards cosmopolitanism the horse has outdone the ox, for it flourishes within the arctic circle. With that picture of a horse before us we can say that it does really *flourish* there. As Middendorff remarks, it is certainly not like an Arab horse. But any naturalist who was not acquainted with the history of the domestic dog would, if he found, say, a bulldog in some oceanic island, and compared it with the greyhound, undoubtedly put the two animals into different species. No naturalist, however, would have any hesitation in saying that the best developed horse and the horse whose picture you see before you showed any specific difference. The fact is the horse has been, in spite of externals, comparatively little modified as compared with other domestic animals. To take another example. Your blue-rock pigeon which has much the same extent of range—that is, all the way from the Shetland to the Timor Islands—is of the same species, obviously and unmistakably. But any naturalist who was ignorant of the history of pigeon-breeding, if such an one could be found, should compare such pigeons as the pouter or tumbler and the blue-rock with each other, he would all but certainly say that they ought to be put into three different species—yet we know historically and from experiment they ought not. So you see of two animals, the one is more subject in certain directions to man's modifying power than the other. The horse has been very stubborn as regards not his liberty but his bodily form, whereas the pigeon has been very plastic as regards the latter, while still retaining the former in much greater measure. The dog's history, in relation to us as domesticators, has been very much the same as that of the pigeon.

Let us turn now to another domestic animal. If you look at the pig whose picture you see before you, you observe at the angles of its lower jaw certain wattles. If you go into your museum here, which has the privilege of being managed by Dr. Young, you will see a stuffed goat, also with a couple of wattles hanging at the corners of its jaw. These two animals resemble each other. What is the history of that goat and that pig? This head of a pig was sent to me from Illinois, in the United States. It is an old Irish greyhound pig, with exactly the very same wattles hanging at the corners of its jaws as

the pig figured in Mr. Darwin's work on "Domestication," after Richardson. A friend of mine, whose business is by no means that of studying natural history, but who showed some amount of endurance and tolerance in hearing some lectures of mine upon this matter of domestication, heard me say something or another about goats and pigs with wattles. On hearing this he said, "When I was in the United States of America on the last occasion I saw something in the State of Illinois that resembled the sort of pig of which you are speaking." I said to him, "I wish you could get me a specimen, and I shall be glad to pay all expenses;" for I had done all I could with my Irish friends to procure this interesting pig, and was almost in despair of getting it. He said, "I will write to my American friend, and I will see what I can do for you." I got a letter last September telling me that the head of such a pig was coming to me. It came, and I got a drawing of it made, and you are the first audience which has seen it. These pigs did live, till lately, in Ireland. They are not unheard of there, even now, and I think it is possible, after due research, that you will be able to discover this kind of pig in some out-of-the-way part of that country so much nearer to us than Illinois. Probably some of the settlers in former times took that particular variety over with them from Ireland to the United States, and in that way the old stock came up in America, where you would not expect such an old-fashioned article to appear. In this history of domestication you get a fair gauge of the progress, or at least of the length of time which has been allowed for the progress, of a civilisation in a new country. The late Mr. Crawford has said that in America you get a fair and valuable means of taking stock of the progressiveness of various colonising nations in the uses they make of the horse and the ox respectively. In some of the Spanish colonies the ox is still used as a beast of burden and draught, as well as for ploughing, whereas the horse has long ago displaced the ox from the former position in England and in the United States. Specialisation forming a part, whether for good or evil, of modern civilisation, the horse is told off to do portage, whilst the cow is told off to produce food, whether in the form of milk or in the form of meat. The Americans are too good economists to employ the animal for both uses, for they know by so doing they are likely to spoil it for both. After having succeeded in getting this head of the pig, I happened to go through Bristol, and, when there, found my way to the docks.

There I saw certain animals in various open crates, or cages, upon which was written as an address the name of a place in the United States. These animals, I found, were pigs of the best Berkshire breed. And you may be sure that these pigs, breeding well, and laying on fat rapidly, which the greyhound pig does not do at all at the same rate, will supplant all such competitors, and in a few more years there will be no more wattled pigs to be had from the United States, and what you have seen here will be extinguished as much as the Dodo. It is right to add that even this specimen may have been due to that reversion to an older form which is so often the result of crossing. Here is a drawing of an animal, in a dress or *livrée* entirely unknown to us now in these islands. If you have seen a young domestic pig born in this country with stripes, I should be exceedingly glad if you will favour me with the information. The loss of their striped clothing is another result of the constant selection of the more useful varieties of the species as they came to hand in one way or another—by importation or otherwise. In many parts of Norway and Germany young pigs are still found to be born with a different livery, a different coloration of skin, from that of their adult life, resembling in this and some other points the wild boar, from which, no doubt, they have descended, inheriting its outward and some of its other peculiarities. And though a striped pigling is a variety unknown here, in India most young tame pigs are born striped like the wild ones. Here is again a change that has been brought about in the fauna of our country by man's interference.

As to the dog, it has been the domesticated or semi-domesticated companion of man, probably enough, before any other animal, and even now it is often the only one he possesses. The lowest savages have, at least, their dogs, even if they tame no other animal, and usually they seem to have domesticated some variety indigenous to the locality they occupy. For instance, the Indians of the far west of America domesticated the prairie wolf (*Canis latrans*), the wild stock still remaining *in situ*, and claiming, and, in a many ways unnecessary to specify, asserting and exercising, the rights of relationship. The dingo is the only domestic animal the Australian savage ever has had. The want of any other has made it impossible for them to attain to anything like real civilisation. They had no beast of burden like horses, llamas, or camels, not to mention the ox and the sheep, so powerfully does the presence in a country of domesticable animals bear upon political and social progress. Without these animals we could not

have worked ourselves up to any real civilisation, and without them there would have been around us an impenetrable barrier, circumscribing us within a circle or cycle of menial drudgeries and field sports.

I will now say a word or two about the cow. There is one long Latin word that expresses the names of the three great animals which are certainly—if we put the dog out of account—the three animals we could least spare. One or other of the four was, undoubtedly, the first animal that was domesticated. Some persons may say that the dog was the first animal to be domesticated, others have advocated the claims of the sheep, whilst others again have advocated those of the cow. Now the names of three out of the four animals are bound up in one Latin word, *suovetaurilia*. Their relations to man, and their importance, were commemorated, unconsciously perhaps, in this one word, which was the name of the sacrifice offered up by the Romans, as also by the Greeks, on great occasions and lustrations. What changes has man made in the destiny and the development of the cow in this country of Scotland—or let me say rather, in this country of Northumbria, which embraces the district, I apprehend, between the Firth of Forth and the Humber. You have still some remnants of the wild ox under the guardianship of the Duke of Hamilton and Lord Tankerville. It is more reasonable to expect that the native savages of early times would be able to domesticate the ox than, on comparing their feebleness with its strength and size, appears at first sight likely. For however awkward it may be to deal with a wild bull or cow, it is easy to catch the calf, when its natural protectors have been removed, whether by arrows, or by the more usual way of conquering the wild ox by pitfalls. If the wild cow is driven into a pitfall, and its calf left helpless, it is easy to see how the latter would be domesticated, and with ease. The wild bull of those days was a very large animal. Julius Cæsar, in his works, describes the wild ox as being of a size little less than that of the elephant. They were, indeed, very large animals in those days, as their bones show, and it is somewhat of a scandal, and an offence—a thing, that is, very hard to believe—that savages, armed simply with bows and slings, and employing pitfalls, were able to conquer animals which Julius Cæsar described in such terms, and the brutal strength of which is alluded to in the name “Front de Bœuf,” given by Sir Walter Scott to one of the least amiable of his heroes. How, out of these prodigies of size and strength, does come to be manufactured by

man such an animal as the Kyloe—the small, stunted, unaggressive, placid breed of cattle so familiar to us all here? Those cattle were large because, if a small bull encountered a pack, however small, of wolves, it was pulled down, and there was an end of its existence, and of the chance which it had of propagating small animals like itself. Let me here mention what strikes a Southerner—it is that your Cheviot breed of sheep should be able to live out upon the hills. I have seen in the middle part of Northumbria this hornless breed of sheep standing even this weather, and having no protection but sheds and shanties. But the sight of such a flock in such a locality shows also another result of man's action, viz., that there can be no wolves there; otherwise such a breed of sheep could not exist, and form an object in the landscape, as we see them doing. Such a sight shows that you are living in a country more entirely reduced under man's dominion than is continental Europe. A mere picture of a flock of hornless sheep, upon the top of a hill, in a wild country, with woodlands, would tell a naturalist that you had extirpated from that region all the wild and dangerous animals. Modern civilisation, by extirpating beasts of prey, has rendered it possible for us to leave herds and flocks of small oxen and sheep out in the open. In times of ancient savagery, in which packs of wolves held their own, none but big animals would be so left. In those times also, the country was not mapped out by "formal props of restless ownership," and these wild animals had a much wider range, and having better pasturage grew larger accordingly. It is clear that both causes—the presence of wild carnivora, and the absence of enclosures—must have co-operated in increasing the size of the graminivorous beasts. But when the early man had caught a young calf it was necessarily separated from its mother, which would not readily acquiesce in the loss of liberty, and, as a consequence of the separation, it would have to go without its regular and proper and naturally supplied ration of milk. It is well known that if a child is starved it rarely recovers the loss, but usually remains stunted throughout life. An analogous or identical process we can see going on in India now, where the buffalo calves of the tame buffalo are deprived of the regular supplies of milk which their mothers would have furnished, and become stunted, the Hindoo naturally preferring to reserve what milk he can obtain for himself and his family. The domestic buffalo is thus a smaller animal than the wild stock to which it belongs, this wild stock having necessarily to be large and powerful

enough to hold its own against the jungle carnivora. But when we come to civilised times and our modern domestication, the stunting process of the early tamer is precisely reversed, and the difference which we see between *Bos longifrons* of the old ox tamers and the Smithfield Cattle Show ox is immense. The young calves not only get their rations of milk but they get much more, and the outcome is the large prize animals to be met with occasionally. The invention of hay is comparatively modern. Savage races were and are ordinarily unacquainted with it. Consequently, when the long winters set in, the domesticated animals were put upon short rations of dry food. In like manner the introduction of turnips, a more recent invention still, has co-operated in enabling us to manufacture out of the small oxen the very large ones we have now, and I will profess this as an article of my faith, that the old small domesticated ox was nothing more than the ill-fed representative of the large well-fed wild ox of the period when hay and turnips were not available for making it into a larger animal.

I have talked long enough for your patience, but I will mention one other change that has taken place in the lifetime of the youngest lady present. It is a change which strikes me very forcibly when I wander through the Lake district. I miss what I used to hear but a few years ago, namely, the wild eery whistle of the buzzard. It is a bird that is fast verging on extinction there. There is another note equally pleasing to my ear—what has been called the “iron croak” of the raven; it, too, is yearly becoming less common in England, though it is no doubt still heard in the North of Scotland. But though the larger birds may be verging upon extinction in this part of the world, we may specify one that has increased and multiplied greatly of late. It is a comparatively insignificant bird, although it is domesticated in certain parts of Europe, and furnishes what the French call *volaille*—I mean the common starling. How are we to account for the great increase in the numbers of these birds in recent years? It has been explained in this way, viz., by reference to the improved means of shooting with the smooth-bore percussion-capped gun, which has almost extirpated the hawks which preyed upon the starling. But on certain parts of your coasts the cliffs harbour and protect these birds of prey, and at the same time and in the same place large flocks of the smaller birds in question. The problem, therefore, cannot be considered to be entirely solved, and I leave it to you for consideration.

