

of species. He says:—"Every true species presents in its individuals certain features, specific characters, which distinguish it from every other species: as if the Creator had set an exclusive mark or seal on each type." He likewise believed in specific centres of distribution. He held that all the individuals composing a species had descended from a single progenitor, or from two, according as the sexes might be united or distinct, and that, consequently, the idea of a species involved the idea of the relationship in all the individuals of common descent; and the converse, that there could by no possibility be community of descent except in living beings which possessed the same specific characters. He supposed that the original individual or pair was created at a particular spot where the conditions were suitable for its existence and propagation, and that the species extended and migrated from that spot on all sides, over an area of greater or less extent, until it met with some natural barrier in the shape of unsuitable conditions. No specific form could have more than a single centre of distribution. If its area appeared to be broken up, a patch not in connection with the original centre of distribution occurring in some distant locality, it was accounted for by the formation, through some geological change, after the first spread of the species, of a barrier which cut off part of its area, or by some accidental transport to a place where the conditions were sufficiently similar to those of its original habitat to enable it to become naturalised. No species once exterminated was ever re-created, so that in those few cases in which we find a species abundant at one period over an area, absent over the same area for a time, and recurring at a later period, it must be accounted for by a change in the conditions of the area which forced the emigration of the species, and a subsequent further change which permitted its return. Forbes defined and advocated what he called the law of "representation." He found that in all parts of the world, however far removed, and however completely separated by natural barriers, where the conditions of life are similar, species, and groups of species, occur, which, although not identical, resemble one another very closely; and he found that this similarity existed likewise between groups of fossil remains and between groups of fossils and groups of recent forms. Admitting the constancy of specific characters, these resemblances could not be accounted for by community of descent, and he thus arrived at the generalisation that in localities placed under similar circumstances, similar, though specifically distinct, specific forms were created. These he regarded as mutually representative species. Our acceptance of the doctrines of "specific centres" and of "representation," or at all events the form in which we may be inclined to accept them, depends greatly upon the acceptance or rejection of the fundamental dogma of the immutability of species, and on this point there has been a very great change of opinion within the last ten or twelve years—a change certainly due to the remarkable ability and candour with which the question has been discussed by Mr. Darwin and Mr. Wallace. I do not think that I am speaking too strongly when I say that there is now scarcely a single competent general naturalist who is not prepared to accept some form of the doctrine of evolution. There are no doubt very great difficulties in the minds of many of us in conceiving that, commencing from the simplest living being, the present state of things in the organic world has been produced solely by the combined action of "aravism," the tendency of offspring to resemble their parents closely, and "variation," the tendency of offspring to differ individually from their parents within very narrow limits; and many are inclined to believe that some law, as yet undiscovered, other than the "survival of the fittest" must regulate the existing marvellous system of extreme and yet harmonious modification. Still, it must be admitted that variation is a *vera causa*, probably capable, within a limited period, under favourable circumstances, of converting one species into what, according to our present ideas, we should be forced to recognise as a different species; and such being the case, it is perhaps conceivable that during the lapse of a period of time—still infinitely shorter than eternity—variation may have produced the entire result. The individuals composing a species have a definite range of variation strictly limited by the circumstances under which the group of individuals is placed. Except in man and in domesticated animals, in which it is artificially increased, this individual variation is usually so slight as to be inappreciable except to a practised eye; and any extreme variation which passes the natural limit in any direction clashes in some way with surrounding circumstances, and is dangerous to the life of the individual. The normal or graphic line, or "line of safety,"

of the species, lies midway between the extremes of variation. If at any period in the history of a species, the conditions of life of a group of individuals of the species are gradually altered; with the gradual change of circumstances the limit of variation is contracted in one direction and relaxed in another, it becomes more dangerous to diverge towards one side, and more desirable to diverge towards the other, and the position of the lines limiting variation is altered. The normal line, the line along which the specific characters are most strongly marked, is consequently slightly deflected, some characters being more strongly expressed at the expense of others. This deflection, carried on for ages in the same direction, must eventually carry the divergence of the varying race far beyond any limits within which we are in the habit of admitting identity of species. But the process must be, so to speak, infinitely slow. It is difficult to form any idea of ten, fifty, or a hundred millions of years; or of the relation which such periods bear to changes taking place in the organic world. We must remember, however, that the rocks of the Silurian system, overlaid by ten miles thickness of sediment, entombing a hundred successive faunae, each as rich and varied as that of the present day, are themselves teeming with fossils fully representing all the existing classes of animals except the very highest. It is possible to imagine that this marvellous manifestation of eternal power and wisdom involved in living nature can have been worked out through the law of "descent with modification" alone, we shall certainly require from the physicists the very longest row of cyphers which they can afford. Now, although the admission of a doctrine of evolution must affect greatly our conception of the origin and *rationalis* of so-called specific centres, it does not practically affect the question of their existence, or of the laws regulating the distribution of species from these centres by migration, by transport, by ocean currents, by elevations or depressions of the land, or by any other causes at work under existing circumstances. So far as practical naturalists are concerned, species are permanent within their narrow limits of variation, and it would introduce an element of infinite confusion and error if we were to regard them in any other light. The origin of species by "descent with modification" is as yet only a hypothesis. During the whole period of recorded human observation, not one single instance of the change of one species into another has been detected, and, singular to say, in successive geological formations, although new species are constantly appearing, and there is abundant evidence of progressive change, no single case has as yet been observed of one species passing through a series of inappreciable modifications into another.

ON THE OBJECTS AND MANAGEMENT OF PROVINCIAL MUSEUMS *

ALTHOUGH every intelligent person knows more or less what these institutions are, and what they ought to be, there is probably no subject, connected with the modern means of education in natural science, concerning which so much misconception or ignorance is manifested and tolerated as in the Management and Objects of our Provincial Museums. The majority of them throughout England present such examples of helpless misdirection and incapacity as could not be paralleled elsewhere in Europe. Some noteworthy exceptions there are. But generally the managers or guardians of local museums are precisely of this unfit class, and seem to have no more notion of their charge than as mere curiosity-shops, and even display less intelligence than is shown in such shops, where the cupidity or shrewdness of the dealer induces him at least to take due care of, and give a local habitation and a name to, his wares. But in the provincial museums even this care and title of information is pertinaciously withheld, and the visitors are left to do the best they can amid the surrounding bewilderment. This is commonly made up of a most puzzling jumble of heterogeneous miscellanies, arranged, or rather scattered, with an equally sovereign contempt for the convenience or instruction of the public, and indeed all in such admired disorder as may most plainly show how Chaos is come again and Confusion can make his masterpiece, and how every specimen added to the heap only tends to increase or perpetuate the miserable derangement. It looks as

* Abstract of an Address to a Meeting of the East Kent Natural History Society, at Canterbury, Oct. 12, 1871, by its Vice-President and Monetary Secretary, George Gulliver, F.R.S.

if the presiding local genius had set his wits to work in order to prove how much time and money might be most effectually expended with the least profit to a knowledge of the natural history, or any history, of the neighbourhood; and indeed for exemplifications of the solution of this knotty point we have too commonly only to appeal to the museum of the place. Instead of methodical illustrations of the natural history and antiquities of the district, we are likely to find a few good things overlaid by such a rabble-rout, such a multifarious and disorderly medley of outlandish and queer odds and ends, as are rather fitted for a laughing-stock than a sober exposition of science. Thus we are met at once in the hall and saloons by such incongruous lots as effigies of double women, elephants' teeth, nose-rings, brain-stones, tomahawks, stuffed alligators, moccasins, New Zealanders' heads, cockatoos, canoes, Babylonish bricks, cocoa nuts, boas, javelins, lions and tigers, calumets, matchlocks, palm-branches, shields, monkey-stones, sugar-canes, Roman cement, Oliver Cromwell's watches, Panama hats, fabricated elephants, walking-stick insects, and numberless other eccentric things of this motley and confounded order. The garniture of Romeo's apothecary's shop, or the countryman's museum on the barn door, would be more instructive or intelligible and less ridiculous or perplexing.

It might be painful or appear invidious to inquire minutely by what means or under whose misconduct so many provincial museums have sunk into their present disgraceful confusion and uselessness; especially as it is little creditable to the intelligence of that community under the tolerance or approval of which this reproachful state of things exists. If the fault be attributed to the apathy or something worse among the majority of the rate-payers, it is one that the friends of popular government should hasten to correct. However this may be, it is enough for us to know that this notorious evil has increased, is increasing, and ought to be diminished; it will otherwise remain a foul blot on and a costly nuisance to the places under such unprofitable infliction. Hence every naturalist and antiquarian, every intelligent and honest member of the community, should be ready to lend his hand cordially to the good work of reform in this direction; more especially as soon as the truth is realised that the difficulty is by no means insuperable, but may be easily removed, is a consummation devoutly to be wished, and would involve no addition to the customary and regular expense. The remedies are sufficiently obvious, and to point out how they should be used, after having described the disorder and the necessity for them, is the object of the present observations. To this end we have in the first place to consider what is desirable and practicable. To instruct ourselves and the rising generation, by means of local museums, in the elements of natural history generally, and in the local examples of it particularly, is obviously both practicable and desirable. For the first purpose, when indigenous specimens are wanting we must get exotic ones; and these should be limited to such typical examples only as are absolutely necessary for the elucidation of fundamental or comprehensive facts; for which purpose anatomical preparations, whether botanical or zoological, are chiefly, but not exclusively, to be esteemed. On the other hand, all and every species belonging to the district should be preserved and displayed so far as they admit it; partly for the knowledge they display of the science, but principally for the information they afford of the natural history of the locality. Antiquarian objects should be treated in a similar spirit. Thus would be collected at one view, or at least under one roof, much of that important knowledge which is within the means and scope of any country museum, so that every visitor to it might easily find therein both pleasure and profit in natural science in general and in the natural features of the locality in particular. The museum would then also be in a condition to fulfil one of its leading offices, as a centre for the meetings, lectures, and conversations on the natural history and antiquities of the district, and in this mode be available for contributions in furtherance of the special objects of local societies, and likely thus to add to the general stock of knowledge. And happily, this is now being regularly ventilated and popularised in such useful publications as the *Zoologist*, the *Field*, and *Land and Water*. When will the *Times* discover the fair and fertile field of instruction in the Provincial Museums, now lying waste for want of culture? NATURE, in a recent notice of certain donations to the Ludlow Museum, has shown a judicious sense of the subject.

But how are you to get the desirable specimens, and what are you to do with them? Most of those wildernesses miscalled Museums already possess a large quantity of objects only awaiting

and inviting intelligent attention. This will consist in a careful preparation, display, and description of them. After having been separately grouped under their respective kingdoms—the mineral, vegetable, and animal—they must be arranged according to the method of their natural relations, in their respective classes, orders, families, genera, and species; then accurately numbered, ticketed, and catalogued. Thus the otherwise chaotic mass of particular facts will fall into an orderly method, and be always ready to convey an accurate knowledge to visitors. Still further illustrations will be requisite, especially as regards fundamental and comprehensive phenomena, by preparations to display the essential characters at least of the classes and orders, and of the anatomy and physiology of the members thereof; and one or two careful dissections will be commonly sufficient for this purpose in each order. And now will arise the question, Who is to do all this work? Certainly neither by nor under the direction of "incorporations" of aldermen quite incapable of it can we expect any effectual labour of the kind. But with proper encouragement students of the different departments will, from a pure love of the subjects, not only be found to perform all this but probably more, and without the least expectation of any pecuniary reward. They will surely add important preparations and other objects to the collection, whenever it becomes manifest that such contributions will be duly appreciated and cared for; indeed, with regard to at least one Museum very zealous and skilful naturalists have only been prevented from giving such desirable aid by a knowledge that their work would simply be "missing," smothered, or destroyed, amid the carelessness and the maze of misplaced rubbish there undergoing a like fate, and most significantly and effectually warning them, and others like them, what they have to expect. Fortunately minerals and antiquities are commonly less perishable.

Having discussed what is desirable and practicable, we come to that which is neither one nor the other. And having somewhat irreverently adverted to the rubbish of so many Provincial Museums, a further explanation may be necessary, and the more so as this very accumulation of jumbled and useless materials is the sad *bête noire* of these collections, and so vigilantly intrusive as to force admission and predominance against all reasons of fitness or utility. Any disorderly materials when hurtful by being out of place fall into the character of rubbish, just as any plant is a weed when encroaching injuriously on the legitimate crop. In their proper place they may be very valuable; such they might be in the great general collection of the British Museum, or in a botanical garden. But nobody in his senses can suppose that it is either desirable or practicable for a provincial society to attempt an imitation of the vast and boundless metropolitan institution. This would be simply out of the question, and calculated only to provoke a smile, except peradventure among the guardians of the local museums. Indeed, with all the excellent arrangement, the army of properly paid experts, and immense space and appliances, the British Museum has become so crowded and unwieldy, especially for reference and use concerning British products, that some steps for an extrication of them from the surrounding masses of exotic things has become necessary. But the guardians of the Provincial Museum will reasonably ask, Granting that we have so much rubbish, what are we to do with it? Sell it if you can, or give it away; but by all means get rid of it, and that swiftly; to which end a bonfire might be the best thing. And having thus learned by experience the noxiousness of such rubbish, most resolutely and remorselessly refuse any quarter to it in future. At present this sort of lumber only occupies space and involves expense that might and ought to be employed for more useful and legitimate purposes; and how and why has already been mentioned. At the execution of the sentence many a wailing thro' will out, some natural tears be shed, for the overfraught heart will speak. The very civil and complacent local genius will meekly plead for his idols, telling you how he loves them, and how some other equally wise and more potent individuals hold the same faith; and above all that the visitors to his temple have ever regarded all those very things with an admiration and delight amounting to veneration. He will refuse to be comforted by your assurance that what he says is no doubt very true, though Punch and Judy and Madame Tussaud may be almost as delightful if not quite as good in their way; but that your way is to show how the Provincial Museum may be made not to suppress or degrade but to develop and elevate the taste of the multitude; and that after all a good museum will sooner or later become more popular than a bad one.