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*From the author*

ON

THE PLEASURES AND ADVANTAGES

TO BE DERIVED FROM

THE STUDY OF NATURAL HISTORY :

A LECTURE,

DELIVERED BEFORE THE MEMBERS OF THE CROYDON LITERARY AND  
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BY

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PLEASURES AND ADVANTAGES TO BE DERIVED  
FROM THE STUDY OF NATURAL HISTORY.

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It is not unusual, to hear allusions made to the pleasures and advantages which may be derived from the study of Natural History, by those who have evidently but little considered the subject, and who, therefore, attach but a vague meaning to the expressions which they use. In this, as in other instances, certain phrases have so long passed from one to the other, that they have acquired a ready and easy currency, and are freely given and received, neither the giver nor receiver pausing to consider their intrinsic value. I trust that it is not inconsistent with the duty of one who addresses an audience, on such occasions as the present, to ask his hearers to pause, and examine, in order that they may accurately define, the nature and value of that coin which passes so currently amongst them, and with the image and superscription of which, they are familiar: if, indeed, the study of Natural History has advantages, the more fully we are made acquainted with their nature, the better shall we be able to avail ourselves of them; if it has its pleasures, we shall not esteem them the less, from being more accurately informed in what they consist.

Let us, then, first describe and define that of which we speak. Natural History may, perhaps, be most accurately defined as a group of allied sciences, which once constituted a single science. It is not very many years since, that almost all that was known on the subject, might be acquired

by an intelligent and industrious student in the course of a life of average length; but within the last century, the progress in this, as indeed in all other sciences, has been so rapid and so vast, each new discovery invariably serving to introduce some other, that the science has, so to speak, fallen to pieces by its own weight; and each of the sections thus formed, has long had its own band of collectors, students, and admirers, who, in obedience to that law of our nature, by which the division of labour, in intellectual as well as in economical pursuits, is secured, attach themselves to its study, and thus chronicle and secure the triumphs of the past, and prepare the way for those of the future. The word 'science' is a term which has been well defined to mean, the knowledge of *many*, orderly and methodically arranged, so as to become attainable by *one*; and when applied to Natural History, it may be taken to refer, not only (as the words would seem to import) to the origin and past history, but also to the actual nature and qualities, and the future condition, of every object or substance which exists naturally, as distinguished from that which is the result of man's labour and skill, and is, therefore, termed artificial. The word 'history,' commonly used to describe past events only, cannot properly be used in the same restricted sense, when applied to the present subject. The whole realm of nature must be regarded as one creature, which has been, and still is, and will continue to be; and in this sense, it has no past existence, and will have no future, for the past is part of the present, and the present will be part of the future. Nor are we to consider that we are dealing with that which has been, or is, or will be, in itself alone, but we have to consider it with reference to its relations to, and its influences upon, all other things that have been, or are, or will be—for there is no solitary existence in nature, since each creature and condition has relation, more or less remote, with every other creature and condition.

Having thus endeavoured to define what is to be included under the term Natural History, let us proceed to consider, in what the pleasures and advantages to be derived from the study of it consist; and here it may be observed, that no very rigid line can be drawn between the pleasures and the

advantages, for they are intimately associated with each other—that which is advantageous, is also productive of pleasure, and that which is pleasurable in them, is advantageous.

From what has been already said, it will be evident that the advantages here referred to, are not those which may be termed economical—those which are connected with the pursuit of wealth and worldly position. In this particular, indeed, the advantages to be derived from an intimate acquaintance with Natural History, are neither few nor unimportant; for, without it, the labours of the mechanist, the chemist, the surgeon, would be almost in vain, and their gains would, consequently, be but small; but it is not of these that we have here to speak—they come under another and a very different category. It is only of the moral and intellectual advantages to be gained from these pursuits, that we have now to consider, and those advantages are in truth mainly due to the circumstance, that these studies are in no way connected with that eager strife for riches, which is the besetting sin of our age and country. We all know, and can fully appreciate, the truth of what Wordsworth says, in one of his best sonnets—

“The World is too much with us; late and soon,  
Getting and spending, we lay waste our powers:  
Little we see in Nature that is ours—  
We have given our hearts away.”

The inordinate esteem in which wealth and station are held by all classes of men, and the intense desire and incessant eagerness which, on that account, they evince for the possession of them, appear, indeed, to be inseparable from a highly cultivated and luxurious condition of society. In every civilized nation these evils have alike been felt, and have alike, in vain been made, the subject of the poet's satire, of the philosopher's reasoning, and of the exhortations of the ministers of religion; and although we may not hope, by human means, to stem this ever-flowing stream—to find an antidote for this wide-spread disorder—we may surely do somewhat towards mitigating its severity, both in ourselves and others, when we cultivate a taste for pursuits which, like those of which we are now speaking, are entirely

removed from the mean and sordid cares and anxieties of this working-day world. We may not be able to dissipate the mists which hang about our daily path, but we may avoid them, by ascending into a higher and purer region.

The pleasures and advantages, then, which are derivable from these studies, may be said to consist in this: that they enable us to appreciate in a much higher degree than we otherwise should do, and, appreciating, to admire and love, the Divine goodness, power, and wisdom, as displayed in the various works of creation; and, by removing us to the study and contemplation of matters of a noble and exalted nature, they tend to alienate us from that which is sensual and sordid, and thus purify the affections, and elevate and refine the taste. A love-sick poet once said, or sung,

“There’s not a bonny flower that springs  
By fountain, shaw, or green,  
There’s not a bonny bird that sings,  
But ’minds me of my Jean.”

It is reserved to the Naturalist to paraphrase this sentiment, and to apply it to an object more worthy of his affections. To him who has become enamoured of the works of creation —“who has eyes to see, and ears to hear, and heart to apprehend”—there is not a flower that buds, not a bird that sings, nor a dew-drop that glistens, that does not present to him an example of infinite variety and beauty and admirable adaptation. It is given to him to see a hand which is hidden to many of his fellow men—he hears a voice which others may not hear; and that hand seems to beckon him, and that voice, in gentle accents, seems to invite him, to the contemplation of an exhibition of goodness and loving kindness, of images of exquisite skill—nay, not *one* image only, but a crowd, or rather a net-work, overspreading and embroidering the surface of the wide earth.

And now I have about exhausted my stock of definitions: for if you ask me, *how* it is that all men feel such singular delight, in contemplating whatever is presented to their notice, wearing the aspect of dignity, and beauty, and harmony; *why* it is, that whenever we see a rainbow in the sky, or listen to a lark, singing as it soars towards the clouds—

when we see the hoar frost sparkling in the morning light, or look upon the hills purpled by the setting sun, or peer into the gloom of a leafy forest—we find that our hearts are filled with a grateful and joyous emotion; I answer, that I cannot tell, nor can anyone tell more about it than this, that these emotions are given to us, like all others, to answer some good purpose. That men have by nature a delight in the perception and recognition of beauty, and harmony, and excellence, is an abstract truth, neither capable of proof nor requiring to be proved, since it is attested by the universal consent of all mankind in all ages, and every one is as well convinced of it, as of his own identity. We might as well believe that the eye, which is so curiously and skilfully fashioned, was never intended to receive the rays of light, or, that the exquisite structure of the ear, was to remain for ever closed to the soft influences of sound, as, that the affections of men were to remain insensible to the wonders and beauties of creation.

But, although it is difficult, if not impossible, to define the exact nature and quality of those pleasures which these pursuits yield to the student, in describing the advantages due to them, I shall in fact be indicating the purposes for which men were endowed with this capacity of admiring, and this disposition to admire; for, it is a maxim with Naturalists, as it must be with every christian and philosopher, that nothing is made in vain. Nature abhors a superfluity, as much as a deficiency, and this holds true in the moral as well as the material world. Not only every faculty and disposition, but every affection and impulse, which men have by nature, must have been given for some good and wise end; and it follows, that every pleasurable emotion, when controlled and kept within due limits, by the intelligent will, is conducive to our happiness and welfare; that which is indispensable or useful for us, being uniformly made agreeable and pleasing, we conclude that inasmuch as all men instinctively take delight in contemplating that which is excellent and perfect in creation, there must be some advantages to be gathered from such contemplation, and we proceed to enquire in what they consist.

Why, then, is it advantageous to us, thus to attain to

that higher and better appreciation of the divine beneficence and wisdom, of which we have spoken? The process seems to be this: we first consider and examine; then are led to admire and esteem; what we admire and esteem, we have by nature a disposition and faculty to imitate; and the very effort to imitate, (feeble and imperfect as it may and must be,) is found to strengthen the mind, and elevate and purify its affections: all this takes place in the natural and regular course of events, and is, so to speak, a chapter in the natural history of man. The human mind, in this respect, is constituted like a mirror, imaging the features of the objects presented to it: but it can do what a mirror cannot do; by some mysterious sympathy—some chemistry of its own—some process which, like others of the most powerful influences in nature, is hidden from our view, and only to be known by its results—the soul may appropriate and retain something of the character of that divine beauty, grace, and fitness, which it thus contemplates, and for which it has an affinity, as we see that a plate of metal, chemically prepared, may not only receive, but retain, the shadow cast upon it by the sun.

The advantages which these studies procure, are evidenced by their influence upon the character and disposition of the student, for not only do they tend to fill him with a well-grounded hope and confidence in himself, but they are also calculated to inspire him with humility and modesty: on the one hand, he becomes familiar with instances, in which the most beneficial discoveries have been unexpectedly made by perseverance and skill, and by that hidden dispensation, which men unduly call, chance or accident—when the apparently barren rock, touched by the wand of science, has sent forth, a rich and copious spring of knowledge and usefulness; and on the other hand, he perceives that in the vast and complicated system which he is contemplating, he himself performs but a very minute portion of the work which has to be done—that it is more than the labour of a life to comprehend, even in an imperfect degree, any one branch of natural science, and that even the wisest of men is

“only like a youth,  
Picking up shells, by the great ocean, Truth.”



If any further proof were wanting, that these pursuits are attended with real and lasting advantage to their followers, it may be found in the fact, that the lives of Naturalists have been for the most part innocent and happy, and free from many of the cares and anxieties which wait upon other occupations. There are rewards and inducements for the votaries of natural, as well as for those of revealed Religion; and although they are of a very different and far inferior character, they are neither few nor small. Exposed like his fellow men, to the vicissitudes of fortune, to care, to sorrow, and suffering, the Naturalist has compensations which are above the reach of fortune, and which many of his fellow men want; for he feels that even care, and, sorrow and suffering, must of necessity be parts of one harmonious system—links in that one bright chain of cause and effect, which binds together all creatures and conditions; clouds and darkness may be and often are about his path, but he has learned that they will eventually be swept away, and that behind those clouds, and undimmed by that darkness, sits the mighty Mother, serene, majestic, and untroubled, ever ruling, guiding, and blessing her multitudinous offspring.

Many remarkable instances of the happy influences of the study of Natural History, might be adduced, but I must content myself with citing the testimony of two or three authors, who, although in very different degrees, were themselves masters of the art, and who spoke from their own experience of the feelings of contentment and resignation, which are induced by the study and love of nature. Sir John Herschel, than whom no one better appreciated the study of Natural Philosophy, has observed in one of his admirable essays as follows:

“There is something in the contemplation of general laws, which powerfully persuades us to merge individual feeling, and to commit ourselves unreservedly to their disposal; while the observation of the calm, energetic regularity of nature, the immense scale of her operations, and the certainty with which her ends are attained, tends irresistibly to tranquillize and re-assure the mind.”

Wordsworth, in the last of his sonnets to the river Duddon, has thus admirably expressed the same sentiment:

“And may thy poet, cloud-born stream, be free  
 The sweets of earth, contentedly resigned,  
 And each tumultuous working left behind  
 At seemly distance, to advance like thee  
 Prepared in peace of heart, in calm of mind  
 And soul, to mingle with eternity.”

And last, though not in my estimation least, I shall quote those touching lines from the little poem, entitled, “The Angler’s Wish,” in Izaak Walton’s beautiful pastoral—the only verses, probably, that he ever wrote, but which seem to breathe his simple and pious nature :

“I in these flowery meads would be ;  
 These chrystal streams shall solace me,  
 To whose harmonious bubbling noise,  
 I with my angle would rejoice ;  
 Here, hear my Kenna sing a song ;  
 There, see a blackbird feed her young ;  
 There, bid good morning to next day ;  
 There, meditate my time away —  
 And angle on, and seek to have,  
 A quiet passage to a welcome grave.”

It has been already noticed, that one of the advantages of these studies, is to be found in their tendency to purify and ennoble the taste. As this is a trite and well used phrase, of which the real meaning is often not considered by those who use it, or those to whom it is addressed, I proceed to explain more fully what is meant. Taste may be defined to be, a capability of perceiving and appreciating that which is excellent in its kind ; some men, it is true, have naturally a better taste than others—that is to say, it is a gift or endowment, bestowed in larger measure upon some men than upon others, just as we find that the organization of one man is so arranged, as that he has greater muscular strength, or a finer sense of hearing, or of seeing, than his neighbour. The reason why nature has thus, in this, as in other instances, endowed men differently with different qualities, or rather with the same qualities, in different measures and in different combinations, appears to be obvious : there is much and various work to be done in this workshop of the world ; and in order to get it done, in this, as in other workshops, workmen of different capa-

cities are needed, and being needed, they are provided. But although every man is endowed with taste, in a different degree from his neighbour, all have the faculty in a *greater* or *less* degree; and, like every other faculty, it is capable of being deteriorated by neglect and disuse, and of being greatly strengthened by discipline and exercise.

When therefore I say, that this study tends to the cultivation and improvement of the taste, I mean, that by constantly contemplating that which is excellent and admirable, we are enabled to appreciate, and measure it, much more accurately, than we otherwise should do, and that it is this higher and better appreciation of that which is excellent, which constitutes true taste. The same object may be more or less attained in many ways; men may cultivate and improve their taste, by the study of painting or sculpture or of literature, but of all the varied pursuits which engage their attention, probably none can be found more purely intellectual, than that of Natural History. All others are more or less instruments of man's luxury—they are often made to image and reflect his passions; but the face of Nature is ever fresh, and fair, and pure, and a taste formed and cultivated by its study, can hardly fail to be pure and true.

Not only is nature beautiful, but it may be said that she is *the only* beautiful; for she is the fountain from which all beauty springs. Nothing in art is beautiful, except in proportion to its resemblance to nature; and the highest censure that we can pass upon any work of art is, that it is *not* natural. In truth, man can no more create anything beautiful, than he can create anything material; and thus, just as we find that the united force and skill of all the human beings that ever existed, or will exist, would not suffice either to create or to annihilate one particle of matter, so, not all the wit and ingenuity and genius of mankind, would avail to invent or create anything beautiful. The actual and the ideal, are alike too precious, to be trusted to the rash hands of man. He may arrange and disarrange and rearrange them—he may put them into all the varied forms that his necessities require, or his imagination can discover—but here his dominion ends; they are heir looms;

he did not and cannot create them—he inherited them from his fathers; and as little can he destroy them—they must descend to his children.

But to return from this digression: as it is usual and convenient for those who address an audience on occasions like this, not to confine themselves to the mere announcement of abstract propositions, I propose to illustrate and exemplify what has been said, as to the moral and intellectual advantages resulting from a study of the works of nature, and from that love for them, which invariably attends such study; and I am unable to find any more appropriate illustrations, than those which poetry affords to us.

Poetry is the beautiful and true expression of that which is most beautiful and true—glowing thoughts “married to immortal verse”; and, inasmuch as nature presents an incessant and most perfect exhibition of that which is good and beautiful, we shall find, in considering the works of the greatest poets of our own and other lands, that they owe their excellence, in no slight measure, to their knowledge and love of the works of nature; and in return for that which he thus receives, the poet redeems it from ignoble and sordid uses—for in his hands, the humblest and meanest of nature’s works, becomes a thing of beauty, and “that thing of beauty, is a joy for ever.” Like all other artists, poets derive their inspiration from draughts drawn from this fountain: nature is the raw material to which the poet, the painter, and the sculptor alike resort, and which they work up, according to the skill of each; and, just as the shapeless marble, or the dull canvas, under the hands of a master, may become a reflection of heavenly grace and beauty, so, in the hands of a poet, the meanest things in nature, may become images of beauty and of grace.

Probably in no language, ancient or modern, is any poetry to be found, combining so many excellencies, with so few defects, as our own; and I conceive that this excellence may be traced, in a great degree, to the rural bringing up of our poets—or, rather, to the fact that all Englishmen, poets included, have a much greater attachment to country life and country pursuits, and a much better acquaintance with them, than the men of any other nation.

It has been said, that the superiority which we attribute, and as we hope not unduly, to the character of Englishmen, as compared with the French and Italians and Spaniards, is in no small degree due to this attachment to rural life, and to the pursuit of field sports and athletic exercises, which is found, not only amongst our noblemen and gentlemen, but in every rank and order of life; and we may very fairly place our poets under the same category—like the Antæus of the heathen mythology, the poet acquires fresh vigour whenever he touches the earth. We might spend many hours in tracing out instances, to shew how truly those of our poets whom we most esteem—namely, Chaucer, Spenser, Milton, Shakespere, Cowper, Burns, Wordsworth, Shelley, Byron, Coleridge, Keats, and Scott—loved, and how well they understood, nature; but this is not the proper opportunity for any such criticism, and I shall refrain from pursuing the subject further, than by adducing one or two illustrations of what has been before said; and I have selected the following, not only as an instance of what a poet may do with very few and common-place materials, but also as an example of the very different mode, in which two great masters, may deal with the same materials.

In Chaucer's poem of the "Knight's Tale," (our earliest lyrical poem, and one of the best in any language,) the following fine description of the early dawn is introduced:

"The besy lark, the messenger of day,  
 Saleweth in hire song, the morning gray;  
 And firy Phœbus, riseth up so bright,  
 That all the Orient laugheth of the sight;  
 And with his stremes, he drieth in the greves,  
 The silver dropes, hanging upon the leves."

Now we should have looked upon this, as a very beautiful and expressive passage, if it had no rival; but unfortunately for Chaucer's fame, a greater than he, was to succeed him. The passage evidently fell under the notice of Shakespere, who seems to have stolen it without hesitation or remorse; and having stolen it, his next step was to disguise it; and in order to do this, he proceeded, to use his own phrase, "to gild refined gold and paint the lily"—"to add new perfume

to the violet." In his poem of "Venus and Adonis," he introduces the following well known stanza :

"Lo! here the gentle lark, weary of rest,  
From his moist cabinet mounts up on high,  
And wakes the morning, from whose silver breast  
The sun ariseth in his majesty,  
And doth the world so gloriously behold,  
That hills and cedar tops seem burnished gold."

This stanza has always appeared to me to be one of the most perfect in our language, and as it also serves to illustrate the subject now under our consideration, I trust you will pardon me if I ask you to pause, and consider it with some attention, and notice how a poet, who is thoroughly imbued with that love of nature, of which we have spoken, can work up the most common-place and homely materials—how he can cast them in the crucible of a vivid imagination, until the dull dross becomes bright beaming silver, or burnished gold—how he can tinge them with the glow of his genius, until, like the hills and cedar tops, in this exquisite picture, they acquire hues of beauty and of glory.

The materials which Shakespere had here to work with, were few, and these of the most ordinary description,—the *lark*, the *dawn*, the *sun*, the *hills*, and the *trees*—things familiar to every one, and therefore but little heeded. The poet however has handled them, and in his hands they become things of life and beauty—gems linked to each other, by golden bands; and thus impressed with the stamp of his genius, they have acquired for us a value before unknown. Often in the busy hum of towns and cities, as in the loneliness of woods or fields, are these bright pictures, and such as these, reproduced to our minds, "making it sunshine in a shady place;" and of those who have thus learned to love them, it may be said, as a modern poet has said, when dealing with another topic, that they

"Carry music in their heart  
Through dusky lane and wrangling mart;  
Plying their task with busier feet,  
The while their inmost hearts the melody repeat."

But to resume our criticism: first, observe the accuracy of the expression, "*Lo! here the gentle lark.*" I do not know

that the epithet 'gentle' was ever before applied to a bird; but certainly none could be more happily applied, for the lark is graceful, amiable, and innocent,—one of nature's *gentlefolks*,—neither doing nor imagining wrong or evil, to man, or bird, or beast. Chaucer calls him "the besy lark;" but this is a term which we associate with the labours of life, the plough, or the market, and which is inappropriate, as applied to a creature which neither toils, nor spins—which has neither storehouse nor barn. "*Weary of rest.*"—How simply and yet how artfully is this sentence constructed! The word *rest* is used by way of contrast to the word *weary*; but how much is the effect and beauty of this antithesis heightened and improved, by representing the little creature as *weary* of that very thing, which is the antidote and remedy for weariness! and why is it that he is thus impatient of patience—thus weary of rest? no factory bell has summoned him to a long and ill-paid day's labour; no stubborn field awaits his toil; he is eager to mount up on high, that he may chaunt his morning hymn of love and praise and thanksgiving—so eager as to be unable to bear the repose of a short summer's night—he begins his matins, before others have well ended even-song.

"*From his moist cabinet mounts up on high.*"—How exactly does this image represent the gentle bird! we see him leaving the little lair—half clod, half tuft of grass, in which he has had his night's lodging, moist with the heavy dews of the midsummer's night—and as soon as he has opened his mild eyes, bounding forward, and fluttering up towards those heavens, of whose inhabitants he is no unfitting emblem, since—to quote a quotation of old Izaak Walton's—

"Since all we know  
Of what the angels do above,  
Is that they sing, and that they love."

"*And wakes the morning.*"—The poet here alludes to a fact in Natural History, to which Chaucer also alludes, when he calls the bird the "messenger of day," but which you may not all have noticed. Most birds begin to sing at or soon after sunrise, but the lark begins his song long before; and of this little circumstance the poet avails him-

self very happily, to represent the bird as awakening the morning—chiding it, as it were, for delaying to manifest its thankfulness to their common parent; in the same way, he introduces the lark in the contention between Romeo and Juliet: “It is the lark, the herald of the morn—no nightingale.”

“*From whose silver breast.*”—Here we have another image as accurate as beautiful: as you well know, long before the sun rises above the horizon, the quarter in which he is to appear, exhibits a silver hue, turning gradually into orange and crimson. The ancients represented the sun-rise under many beautiful emblems: thus, Aurora is described as rising from the bed of Tithonus, or as clad in orient purple, and unbarring the portals of the roseate East; but no one probably had ever before presented the sun by so happy a figure, as rising from the silver breast of the morning.

“*The sun ariseth in his majesty,  
And doth the world so gloriously behold,  
That hills and cedar tops seem burnished gold.*”

Here we have the peroration of this eloquent discourse, the close of this sweet harmony; one of apparent simplicity, but under which is veiled the most exquisite art: the verse begins with the little bird leaving his low-roofed couch, because it was tired of its night’s rest; then awakening the bright morning; and from this subdued yet harmonious commencement, it swells forth into a volume of splendour,—the sun appearing like a crowned monarch in splendid array, so gorgeous, that even those of his subjects upon whom he deigns to look are made glorious, by the mere reflection of his glory.

To return, however, to our more immediate subject, from which, in my admiration for this stanza, I have been somewhat led away. To what cause, are we to attribute the secret of the mastery which poets acquire over us, except to the circumstance, that our organization is so framed and adapted, as to respond readily to all the harmonies of creation, when thus wrought out and exhibited to us by the genius of the great masters? and thus also it is, that under such influences, men can hardly fail to become less sordid,



and less unkind to each other. "*One touch of nature, makes the whole world kin;*" and when we contemplate the vast and beautiful heritage, which is spread forth in the kingdom of nature, and reflect that it is intended as well for the vilest and meanest of our fellow men, as for ourselves, we cannot but feel, that we are coheirs with each other, children of one common parent, and therefore bound to regard each other with goodwill and kindly affection; and if we see them degraded and debased, and sunk in misery and ignorance, we can but weep, that they should thus have lost their birthright—we can but desire that they should regain it.

Shelley has beautifully described the kindly influences, which a love of nature brings with it, in the commencement of his poem entitled "Alastor:—"—

"Earth, Ocean, Air, beloved brotherhood!  
 If our great mother have imbued my soul  
 With aught of natural piety, to feel  
 Your love, and recompense the boon with mine;  
 If dewy morn, and odorous noon, and even,  
 With sunset and its gorgeous ministers,  
 And solemn midnight's tingling silentness;  
 If autumn's hollow sighs in the sere wood,  
 And winter, robing with pure snow, and crowns  
 Of starry ice, the grey grass, and bare boughs;  
 If spring's voluptuous pantings, when she breathes  
 Her first sweet kisses, have been dear to me;  
 If no bright bird, insect, or gentle beast,  
 I consciously have injured, but still loved  
 And cherished these my kindred;—then forgive  
 This boast, beloved brethren, and withdraw  
 No portion of your wonted favour now."

The ancient poets, seem to have been nearly destitute alike of any knowledge of Natural History, and of any real love for Nature—they were acquainted with, and could well describe its outward forms, but its inner life was unrevealed to them; and it is to this that we may attribute the little influence that they have had upon the affections of mankind; they admired but did not understand nature, and therefore could not love it—and we admire them, but do not love them. The study was one utterly unknown to them, and to those for whom they wrote; they dealt with what they deemed, far

nobler topics—the strife of men, the rage and varying fortunes of war, the councils and contests, the loves and the hatreds, of their gods, the intrigues and gossip of the court, and the forum; these form the staple of their poems, and these but little accord with a perception and love of the quiet beauties of nature. We cannot imagine Homer or Hesiod condescending to write, upon a subject so homely, so little heroic, as a mouse or a daisy, and yet we may venture to affirm, that Burns' little poems to a mountain daisy, and to a mouse whose nest he had turned up with his plough, have had a more kindly and genial influence upon mankind, and have awakened deeper and better sympathies, than all that Homer or Hesiod ever wrote. Let us suppose that a Greek or Latin poet had written in such a strain as this :

“A presence that disturbed him with the joy  
 Of elevated thoughts; a sense sublime  
 Of something far more deeply interfused;  
 Whose dwelling is the light of setting suns,  
 And the round ocean, and the living air,  
 And the blue sky, and in the mind of man,  
 A motion and a spirit that impels  
 All thinking things, all objects of all thought,  
 And rolls through all things. Therefore is he still  
 A lover of the meadows, and the woods,  
 And mountains, and of all that we behold  
 From this green earth,—of all the mighty world  
 Of eye and ear, both what they half create  
 And what perceive, well pleased to imagine  
 In nature, and the language of the sense,  
 The anchor of his purest thoughts, the muse,  
 The guide, the guardian of his heart, and soul  
 Of all his moral being.”

If an ancient poet could by any possibility, have written in such a strain, his contemporaries would have been as greatly perplexed to make out his meaning, as if he had written in the French or English language; not that I would be supposed to mean, that the great poets of antiquity had no love for nature, or were quite incapable of appreciating its beauties—no great poet could possibly be so; and as a proof of this, we may observe, that the greatest of their poets, Homer and Virgil, seem to have had the greatest degree of

this love ; but still they were not imbued and filled with it, as many, or indeed all, of our own best poets have been, and they could not reproduce, that which they had not received. When they allude to natural phenomena, they introduce them merely by way of comparison to some human transaction, as illustrative of the working of human passions, making nature the handmaid and servant of art, instead of its mistress.

Thus the plays of the great Greek dramatists, Æschylus and Euripides, are almost destitute of allusions to objects of Natural History ; the temple—the fatal bath—the battle field—the triumph and the sacrifice—the inexorable furies, are all described in vivid and enduring colours ; but beyond a casual notice of the milk white heifer, or spotless lamb, for sacrifice, of roses as garlands for the victim, or myrtle or laurel for the wreath of the victor, the fatal hemlock for the death draught, these poems contain hardly any notice of those things, which we now look upon, as most worthy of a poet's theme ; for aught that they tell us, nature was almost a sealed book to those who composed them, and the bright and glorious world in which we so much delight, the mountain, the sea, the stream, and the forest, and all “the populous solitude of birds and bees, and fairy formed and many coloured things,” with which they are peopled, did not exist for them as they do for us ; and thus it happens that these plays, wonderful as they are as works of human genius, as expositions of human passion and suffering, awake but little sympathy in us ; they exist for us, as do those ruined temples in which these poets once worshipped, standing forth in severe beauty, upon the face of the white rock, and in the cloudless sunlight, but no roses climb along their sides, no clustering ivy overhangs their pediments, no violets peep forth at their base ; and thus, glorious and majestic though they be, we wonder at them, but we cannot love them, for they remind us not of home—they resemble nothing that is ours.

But it is now time to turn from poetry and romance, and to contemplate another group of the worshippers in the temple of nature. At first sight, the poet seems to be so dissimilar from the naturalist, that it is hard to believe that they do indeed worship at the same shrine ; the poet is of

imagination all compact, and the naturalist dreads imagination as a dangerous and perfidious ally—

“The poet’s eye in a fine frenzy rolling,  
Doth glance from heaven to earth, from earth to heaven;”

but its glance is far too rapid and fitful to answer the naturalist’s purpose. The one revels in the glorious forms which are to be viewed in earth, and sea, and clouds, and presents to us pictures of beauty and grace, drawn from their combinations, while the other is busied with a beetle, or a weed, and as the result of his labours, he hands to us, pages filled with barbarous names of species and genera, and references to synonyms, and habitats, and names of authors, of whom we have never heard; yet both are labourers in the same workshop—dressers of the same vineyard, for in the moral and intellectual world, in art, and in science, as well as in the factory and in the workshop, the value of the product, depends upon a judicious division of the labour—every man, cannot do everything, and thus poetry and scientific pursuits, although the only true incentive for each is to be found in the love of nature, can never be well combined; it is true that some adventurous men, like Darwin, in his “Temple of Nature,” have tried their hands at scientific poetry, but the attempt has signally failed, and in future, in this as in other pursuits, each would do well, to adhere to his own particular function.

In Natural History, as in all other sciences, there are various orders and degrees of labourers; some are endowed with dispositions and faculties to observe and record the phenomena of nature, while others only speculate on the causes—the former are, so to speak, the purveyors for the latter—but both have their uses, and the labours of either *alone* would be profitless. First, then, we see the collector, of whom Wordsworth, in his little poem, entitled the “Poet’s Epitaph,” has spoken very disrespectfully, and very unjustly;—he refers to his poor relation as

“A fingering knave,  
One who would peep and botanise  
Upon his mother’s grave.”

See him poring intently over an insect, or a shell, yet is he working a good work—he is assisting in his degree, to build

up the Temple of Science; he has found a shell, with more lines or markings upon it, than had been before noticed in any shell like it; or he has discovered some disagreeable looking little insect, with two pairs of antennæ, whereas no other has hitherto been found, with more than one; and lo! his triumph is complete—the labour of many weeks is paid and over paid—he has discovered something before unknown—he has restored to light that which otherwise had been lost, and thus, as Niebuhr has said, “enjoys a bliss analogous to that of creating;” and if he be ambitious of fame, that desire may be gratified, for his weed, or his shell, or his little insect, may forthwith win for him an undying renown—it will be inscribed in scientific catalogues under the name of the finder; not, however, that these honours are always peacefully enjoyed, for, but too often, our zealous friend is driven to fight strenuously for the glory which he has gained, with some rival claimant to the merit of his discoveries.

We might spend some time, and not altogether without advantage, in considering this subject of the division of labour in intellectual pursuits, and in tracing it back to the varying dispositions and faculties with which men are endowed, nor would such an enquiry be foreign to the present purpose, since it constitutes an interesting passage in the Natural History of Man; but although the opportunity is inviting, I must refrain—and I proceed to notice, what astonishing and unexpected results have been gained, even from the humble labours of men like the collector, and his fellow workmen. As the world has always had much to learn, and men have always arisen to discover and to teach it, we may reasonably infer, that the world has still much to learn, and that men will ever arise to discover and to teach it; and further, that the same methods of learning and teaching that have ever availed, will still continue to avail; and that just as the most glorious fabrics that human hands have ever reared, are due as well to the patient industry of the labourer, the bricklayer, the mason, and the carpenter, as to the skill of the architect, so the greatest discoveries, the most brilliant results, in scientific knowledge, have been, and will ever continue to be, attributable as well to the patient labours of the collector and naturalist, in seeking

for and collecting and arranging facts, (which may be compared to the *stones* of the edifice,) as to the genius and intelligence of the philosopher, in generalizing and drawing conclusions from the truths so learned, and thus building them up into one symmetrical fabric.

This truth cannot perhaps be better illustrated, than by reference to the discoveries which have recently been made in the science of Geology—or it might almost be said, to the discovery of that science, for until it was placed upon its present footing, principally by the researches of him, of whom I have now to speak, geology can hardly be said to have existed as a science.

For many years prior to the year 1790, frequent and fierce controversies, as to the origin of the earth, had taken place between two rival schools of scientific men—Hutton in England, and Werner in Germany, represented these factions; the disciples of the former were termed Plutonists, those of the latter, Neptunists—one party ascribing the appearances which the earth presented, to the action of water, and the other ascribing the same appearances, to the action of volcanic fire.

While this dispute raged throughout Europe, and as such contests usually do rage, with some acrimony, and with various fortune, it was reserved for William Smith, an English surveyor, unendowed with the gifts of fortune, and with but few advantages derived from education, to compose this mighty strife—this truly Titanic warfare, of which mountains, and valleys, and basalt, and limestone, were the chief weapons. Being articled to a land-agent, who was engaged in extensive business in Oxfordshire, Mr. Smith had opportunities, of which he frequently availed himself, of examining the lias and oolite rocks, in that and the neighbouring counties, as well as the new red sandstone and the coal measures of Somersetshire, and of becoming acquainted with their fossils or organic remains.

The existence of these fossils had been known for many ages, but until this time, their real place or function, with reference to the history of the earth, was utterly unknown. Nothing could be more wild, and, as we now see, more absurd, than some of the theories, which even learned men had set

up regarding them. No one had ever imagined, that they were in any way connected with the formation of the earth—that they were, in truth, what a conchologist would term, lines of growth, indicating, with unerring certainty, a vast number of successive stages in the earth's history. One hypothesis propounded regarding them, was, that they never had formed any portion of living creatures, but that they were “the effects of some plastic power in the earth, being the regular workings of nature, wherein she sometimes seems to sport and play, and make little flourishes and imitations of things, to set off and embellish her more useful structures.” Some learned men held the monstrous opinion, that although these fossils were indeed the remains of living creatures, yet they had been produced by spawn or eggs, washed into the earth at the general deluge, or dropped upon it from exhalations from the sea, and thus washed into fissures, and so generated; while a third party, not less unreasonably, held that these shells and other marine fossils, were carried to those places in which they are found, by some deluge, inundation, earthquake, or such other means, and there left.

Such was the conflict which raged with various fortunes, when William Smith appeared upon the arena. This is not the fitting occasion for any detailed account of his discoveries; it suffices for the present purpose to say, that he was the first person who ascertained with certainty, that each of the very numerous strata which are found in England, preserves with unfailing precision its due order of superposition; and, further, that each of them is distinguishable and easily distinguished, from all the others, by its peculiar fossils, or remains of organized creatures. After many difficulties and discouragements, his labours and his merits were at length fully recognized; the Geological Society of London, awarded to him their first Wollaston medal, in consideration of his being a great original discoverer in English geology, and, especially, for his being the first in this country, to discover, and to teach the identification of strata, and to determine their succession by means of their imbedded fossils. The following eloquent encomium, which was pronounced by Professor Sedgwick, the president

of the Society, and the truth of which was recognized by all who were competent to form a judgment on the subject, will best shew, in what esteem the results of his labours were held, by those best able to appreciate them :—

“If,” said he, “in the pride of our present strength, we were disposed to forget our origin, our very speech would bewray us, for we use the language which he taught us in the infancy of our science ; if we, by our united efforts, are chiselling the ornaments, and slowly raising up the pinnacles of one of the temples of nature, it was he who gave the plan and laid the foundation, and erected a portion of the solid walls, by the unassisted labour of his hands.”

It need hardly be said, that Smith’s fate resembled that of many other men, who have loved and cultivated science for herself alone. Wealth and station, as we know, are jealous mistresses, and allow their votaries to follow no other pursuit : Smith’s little patrimony was soon spent, his profession was neglected, and it is not to be wondered at, that he passed through perils and privations, such as even few scientific men, that much-enduring race, have suffered. For several years, we are told, that he had scarcely any home but the rocks ; and it was only when he had nearly attained to his seventieth year, that a small annuity, sufficient for his maintenance, was granted to him by the crown. He did not long live a pensioner—he died suddenly in the year 1836 : and it is worthy of remark, as shewing the constancy and earnestness of his disposition, that even in death he remembered the scene of his boyish labours, the memorial of the triumphs of his manhood ; for just as we sometimes hear of a poet desiring to be buried upon some sunny headland, or a soldier wishing that his grave may be on the battle field, or a churchman hoping to repose in death, at the foot of that altar, at which he ministered when living, so, poor Smith desired that he might be buried in the Oolite—

“*Moritur et moriens, dulces reminiscitur Argos.*”

Such was the life, and such the death, of one who was justly termed by his contemporaries, the ‘Father of English Geology.’ I have quoted his history for a double purpose : and, first, as shewing in an eminent degree, how much may



be accomplished by any man of ordinary skill and intelligence, who chooses to make the best of those faculties and opportunities which he possesses. For ages, the materials of which William Smith availed himself, had been open to all—the hills, the cliffs, and the mine, had exhibited the remains of extinct animals, and plants of strange and unknown forms, but had exhibited them in vain. Poets and philosophers had spoken of them, collectors had searched for them, naturalists and men of science had examined and disputed about them, but no one had ever dreamed, much less suggested, that these successive layers, or beds, of fossil remains, were, in truth, so many chapters in the world's 'Book of Chronicles:' the history of the past has ever had, as it now has, its admirers and students—men have always, and with reason, been curious to learn something, of those who walked the earth before them, and to measure their own progress in arts, and arms, and letters, by comparing it with that of their forefathers, and thus the well-worn coin, the rusted weapon, the buried column, the mutilated statue, the half-obliterated manuscript, have, at all periods, been eagerly searched for and questioned, as to what they could reveal of the past; but no one had hitherto read aright, or had deemed it possible to read at all, the hieroglyphics thus sculptured upon the rocks—none had studied the history of that mighty warfare, that wreck and ravage of extinct creations, which was consummated in the construction of these fair and fertile lands; but now the time for this discovery had arrived, the map was to be unrolled, the book was to be opened, the scheme was to be explained—and it was given chiefly to one, who was by profession neither a poet, nor a philosopher, nor a chemist, nor even a naturalist—to one who was of humble origin and fortunes, and of imperfect education, to draw aside the veil from this bright picture, to disperse the clouds which obscured this glorious landscape.

But the history of William Smith serves, also, in no slight degree, to illustrate the truth of the proposition, that these studies have their full share of those advantages and pleasures, which attend upon the exercise of the intellectual faculties: why did he thus consent to "spurn delights and live laborious days," but that he found an intense delight

in discovering for himself, and in disclosing to his fellows, these evidences of the consummate skill and infinite goodness of the Divine Providence; and when any of us may chance to feel those misgivings, which present themselves in the prosecution of every undertaking—when we are led to doubt, whether we are not wasting our labour, in observing and accumulating a number of apparently insignificant facts in Natural History—whether we are not, as Cowper said of another pursuit,

“Letting down buckets into empty wells,  
And growing old, in drawing nothing up”—

let us remember, that thus it was, that he of whom we speak, built up the superstructure of his discoveries; and let us remember, too, that he was not unrewarded—although his little fortune was exhausted, his profession abandoned, in old age and weakness, he was happy and contented—Nature did not leave desolate, him who had so long and so ably ministered at her shrine, and he to the last exhibited to his fellows, the touching spectacle of one

“Poor and in misery, but beloved by the gods.”

And now let us turn from the labourer, to consider the results of his labour, and see how far they have contributed to that higher and better appreciation of the divine goodness, power, and wisdom, to which allusion has been made, as being gained by these studies, and without which they appear to be nearly valueless. Every discovery that has been made in natural philosophy, leads us inevitably to the belief, or rather confirms us in it, that everything in nature—every creature in the animal, vegetable, and mineral world, every mechanical, and every chemical condition—is in exact harmony, with every other creature, with which it has relation. The whole material universe is, so to speak, one great system of ball and socket—everything is adapted to everything else, as regards the past, the present, and the future, as well as in regard to quantity, place, time, and quality: that this is true in detail, no one can doubt, and if true in detail, it must be true in general, since the general is composed, and made up of details; and I proceed to illustrate this truth, by reference to some features of the structure

and condition of the earth itself, as shewing its adaptation, not only to the physical condition of human beings, but to their social and commercial, their moral and intellectual, nature. I shall endeavour to point out how, as we have good reason for believing, the habitable portions of the earth were formed, when they were formed, and of what they are composed; and, lastly, why, that is, for what purposes, we are induced to believe, that the earth was constructed in this particular manner, of these materials, and during these successive periods.

We know hardly anything of the interior of the earth: the surface which is exposed to our observation, is in comparison with the entirety, of extremely small dimensions—thus, it is said, that the cracks and crevices, which we find in the varnish upon a terrestrial globe, such as is used in our school-rooms, would bear about the same proportion to the body of that globe, that those portions of the earth which have been laid bare to us, bear to the whole earth.

The surface so far as it is laid open to our view, in a great part of England, and in most other parts of the world, is composed of successive coats or layers, one lying above or round the other, like the coats of some bulbous root; but each of these coats is of a different nature and composition from the others, and each is indeed neither more nor less, than the dried up sediment or mud, formed at the bottom of some ancient sea.

The ideas, however, which we have of mud or sediment, but very inadequately represent the condition of these beds—we think only of a few inches, or a few feet, but these sediments of the ancient seas, attained to enormous dimensions; thus, the thickness of the

	<i>Feet.</i>
London Clay, has been estimated at	1,800
Chalk	1,400
Wealden Beds	800
Oolites	1,500
Lias	1,000
New Red Sandstone	1,000
Coal Measures, and the Magnesian Limestone	10,000
Old Red Sandstone, or Devonian	3,000
Silurian	3,000
Cambrian	25,000

As these rocks derive their origin from the sediments of ancient seas, we know that in obedience to an universal law, they were deposited horizontally; water is the truest leveller, and allows no rock or stone, long to erect itself above its neighbour; we have, therefore, beds or sediments of between fifty and sixty distinct seas, each following or lying upon its immediate predecessor, in an order, as regular and uniform as the leaves of a closed book, and estimated to extend to the depth—if they could possibly be measured in one continuous line—of about 50,000 feet, equal to about ten miles.

These deposits were evidently formed, by the wearing down of islands and continents which no longer exist, partly, by the action of rivers, carrying down soil from the lands through which they flowed, but principally, by the action of tides and currents of the sea, perpetually washing against the coasts, and to some extent also, and sometimes to a very considerable extent, by the accumulation of fragments of corals, and shells of mollusks, and other marine creatures, which lived and died in these waters. From these various causes, and from the differing mechanical and chemical conditions to which they have been subjected, each of these beds has a mineral character peculiar to itself: thus, we have in this neighbourhood, clay, and chalk, and sandstone—each being the sediment or mud of a *different sea*, each therefore being of a different age—each having its distinct mineral character, and with that character, its own peculiar uses, of which uses, we shall have to speak hereafter.

As these various beds were deposited in the first instance horizontally, one above or upon the other, it follows that if each had remained in its original position, the lower beds (those first deposited) would have lain at a great depth: thus, the lower beds of the chalk, would have been about half a mile below the upper surface; the lias, a mile; while the coal and iron, and mountain limestone, would have lain at the depth of nearly two miles; and at this depth, even if these quarries had ever been discovered, which is almost incredible, they could never have been worked to advantage.

We find, however, conclusive evidence, that from time to

time, vast and extensive disturbances and displacements took place, in the arrangement or disposition of these beds. Two simple yet powerful agents—fire and water—have ever been, as they still are, actively at work, contending, so to speak, violently with each other, each producing great mechanical and chemical changes; and by means of the incessant and equal contest thus waged, maintaining the equilibrium of the world, which, if either were permanently in the ascendant, would be lost, and the habitable globe would sink into ruin.

Water, as we know, is incessantly engaged in levelling—fire, and the chemical changes which it brings about, are equally busy in upheaving and raising; and thus owing, probably, to the influences of earthquakes and subterraneous volcanic action, the various crusts or coats, which were formed from the sedimentary deposits of the ancient seas, have been raised from their original resting places, and forced towards the upper air—and then perhaps depressed, and raised again, more than once.

You will not, however, fail to perceive, that if all the strata had been upheaved together, in an uniform degree, we should have been as far as ever from reaching the lowermost beds, for although they would have been forced further from the *centre*, they would have been no nearer to the *surface*. But here, again, the force and virtue of water, as a great leveller, is exhibited: assuming that these upheavings of the strata so occurred, as that the upheaved mass was in the shape of a dome, (as probably it would be,) that an immense volume of water laid above it, and pressed upon it, and that this process continued, as probably it would continue, for a period of many centuries, we may believe that the mass, as it was gradually raised, would be subject to the action of this superincumbent water, to a much greater extent at the centre, than on the sides, and that thus the centre or crown of the dome, would be carried away, while the sides would be left; the consequences would be, that the lower strata, would not only be partially uncovered and laid bare, by the sweeping off of those beds which laid above them, but portions of them would also be raised to the surface, and would thus find themselves on a level, with their ancient oppressors.

This is but one of several different methods, by which the underlying strata, may have been raised to the surface; and in this neighbourhood, we have a perfect example of just such a change. Between the chalk hills which skirt Croydon on the south, and those which run parallel with the coast of Kent and Sussex, there is apparently a wide chasm or gap; this gap is filled up by the lower beds of the chalk, the greensand, the weald clay, and the Hastings sands; but these various beds, which are now found to be about on the same plane or level with the upper beds of the chalk, must originally have been several hundred feet beneath them. How then has this change occurred? Simply by the upheaval of the whole mass, and then by the sweeping off of the upper surface, in the way before described; and that this did actually take place, we have several conclusive proofs, although in judging how long the operation lasted, we have no data to guide us—perhaps several hundreds or thousands of years, possibly only a few months.

One of the proofs alluded to, is found in the position of those portions of the strata, which were not swept away. If the beds, were upraised in the way described, and the dome or upper part were truncated or cut away, we should of course expect to find, that those portions which were left, would preserve the position in which they were left, that is to say, inclined away from each other, like the rafters of a roof from which the ridge or summit has been cut away; and, accordingly, this is exactly the shape, in which they are found—the North Downs incline downwards, towards the north, the South Downs incline downwards, towards the south; and if we imagine those beds continued or produced, so as to fill up the interspace, they would then form a mountain of chalk, perhaps a mile in height, and the various subjacent beds, which are now exposed to view, and are subjected to the labour, and the uses of men, would not be visible. If the strata which are exposed at Tilburstow Hill, on the northern margin or edge of the chasm alluded to, are examined, it will be seen that they are broken off sharply and suddenly, and are inclined at an angle of about  $45^{\circ}$ , the dipping or declination being towards the north, and this dip or inclination being continued—as of course it would be—for a

considerable distance, and being perfectly visible even at Croydon, where the chalk may be seen slightly dipping or inclining towards the north, thus still exhibiting to our view, the marks of a catastrophe or series of catastrophes, that occurred, it may be, thousands, or even millions of years since.

This illustration has been selected, because it relates to a district with which you are familiar; many others might have been chosen, which would have served equally well, or perhaps better. The particular process was not always the same, but the general result was undeniably such as has been described.

But let us now consider, the time at which these changes happened. For anything that appears to the contrary, it seems that all these changes and convulsions, took place long before the appearance of man upon this planet. In every one of the fifty or sixty beds of ancient seas, of which we have spoken, we find abundant remains of corals, and marine and fresh water fishes, and shells, and in the upper beds, remains of some large mammalia—amongst others, we find in England, the mammoth, the rhinoceros, the hyena, the lion, and a gigantic beaver; but in none of these beds have any traces been discovered of the presence of man—not a human bone, nor a tooth, nor a coin, nor an implement, nor a weapon, nor a broken fragment of pottery, has been detected by those careful and exact researches, which have been prosecuted for many years, and in every quarter of the globe; nay, further than this—assuming that man's first appearance upon the earth only occurred about 6000 years since—it seems reasonable to believe, that the changes here spoken of, have been going on for several hundred thousand years, possibly for several millions. Thus, if we take the depth of all the sedimentary strata, to be about ten miles, and that they were deposited at an average rate, of one-tenth of an inch of solid matter per annum—which, from observations that have been made, has been considered to be a fair average calculation—the result would be, to give a period of six millions of years for the deposit of the whole: but we know only what remains—we know nothing of what is lost; no one can even guess, how many islands and continents,

formed from ancient sea beds, have from time to time, arisen and been consolidated, and again been destroyed—how often the same materials have been composed, and decomposed, and recomposed; but although we do not know to what extent the process has been going on, we know that it has gone on incessantly, because we find in every bed or stratum, portions of earlier beds, which must therefore have been destroyed, or which were in course of destruction, when the beds containing them were in course of formation—for instance, we find large pebbles of old red sandstone, imbedded in the coal; and the extensive beds of flint gravel, which extend almost continuously from this neighbourhood to the Thames, are but the ruins of mountains of chalk which have been broken up and dispersed, while the rounded pebbles which are found in large masses, on the hills to the south-east of Croydon, and in other places, are again the ruins left by some far earlier convulsion and breaking up of the chalk, entirely differing in extent, as well as in character, from that which produced the angular gravel.

It would not, therefore, be at all unreasonable to conjecture, that the beds which no longer exist, at least equalled in mass, those which have been lost; and this, at the rate before referred to, would give a period of about ten or twelve million years for the deposition of the whole. Of course this is conjecture, but not without some data, and it is about the best, that those data will allow of.

Several other arguments might be adduced, as tending to shew the great age of the pre-adamite earth; but we have only leisure to consider one of the most interesting, namely, that founded upon the fact of the creation of new, and the extinction of old, species of animals. We have no proof, and but little reason to believe, that many species of animals have become extinct since the creation of man, and we have no proof whatever, that any new species have been called into being, during the same period; whereas, prior to man's appearance on the earth, we have abundant proofs, that thousands of species and genera, and even whole orders and families of highly organized creatures, had been created, had flourished for widely extended periods, and then had died out, and were succeeded



incessantly by others, which ran the same course, and shared the same fate, genera and species succeeding to each other, as regularly and constantly, as with us, the son succeeds the father, and the grandson to both; and if, therefore—and we have not the slightest reason for the contrary belief—the extinction and creation of species, proceeded at the same rate, before the creation of man, as it has since done, it would not be at all unreasonable to imagine, that the events of which we speak, may possibly have extended over the vast periods before mentioned.

Thus, under any view of the matter, it seems clear, that for ages upon ages, before the appearance of man upon this planet, the changes of which mention has been made, were going forward; indeed, we may well believe, that while they were in progress, the world was not habitable for the human race—it was not, so to speak, ready for man—while he slept in the womb of time, nature, like the good fairy, of whom we read, in some nursery tales, was preparing his house, so that when he should awake, he might find it swept and garnished.

But when it is said that the world was made for man, how inadequately does that phrase express, the beauty and harmony of this divine handiwork! It was made for man—but for *what man?*—for man, frail and feeble, ordained to go through a long period of helplessness, in his infancy and childhood, and a long period of decrepitude, in old age—of a frame so delicately organized, as to be unable to bear the extreme vicissitudes of heat and of cold; in order, therefore, to shelter him in infancy, and in old age, and to protect him from the elements, he must have a house—and here, laid ready to his hand, in the London clay and other strata, are clay for the hovel, and brick-earth and sandstone for the dwelling place, and a little lower down in the series are marble and freestone, for his palaces and for his temples, while the lias and the chalk furnish him with lime and cement. But in cold climates, he requires artificial light and heat, and fire is also indispensable, for the forging and fashioning his tools and weapons—and accordingly, in the coal measures, he finds a storehouse of artificial light and heat, laid ready for his use. These vast beds of coal, repre-

sent the heat and light, which, given forth by the sun, many ages since, were absorbed by gigantic tree ferns, and other tropical plants, under a tropical climate; the decayed leaves and wood of these, were then carried down, in the shape of mud, into the deltas of great rivers—there, buried under enormous weights, and at great depths, for thousands of years, and exposed to subterranean heat, and now thrown nearly to the surface, and ready to be drawn forth, as if from a cellar, as the luxuries or necessities of the earth's tenants require.

But not only is man, frail and feeble in old age and infancy, but he is incapable of getting his food, as the brute creatures do: he must till and cultivate the ground, for which purpose he must have tools; he is incapable of defending himself from wild beasts—of subjecting them to his dominion, for he has neither talons, nor beak, nor teeth, for the purpose; he has no natural clothing like the sheep, or the ox, to defend him from the weather, no natural armour, to protect him from the attacks of his enemies—the tortoise, the elephant, and even the little shell fish, are all far better provided for, in this respect, than he is—he therefore requires both tools and weapons, and the materials for these, he finds in the veins of iron, and tin, and copper, once buried thousands of fathoms deep, but now broken up, and laid at his feet; and close to them lie the mineralized remains of myriads of zoophytes and corals, now forming those vast beds of limestone, which are indispensable as a flux, to bring these metals into a useful state; and over all these, he finds wolds of chalk, on which he may feed the sheep which supply him with clothing, and the valleys of fertile loam, from which he may raise his corn, and the grasses on which he may feed his cattle; whilst in other countries than our own, are found large tracts, from which may be raised the cotton, and the linen, which men require for clothing, and the sugar, the rice, and the tea, which they use for food. Such are but a few of the provisions, which have been made in the structure and arrangement of the earth, for the supply of man's physical wants.

But the arrangements, by means of which the surface of the earth, was thus prepared to meet the physical wants of

mankind, interesting as they are, present by no means, the most interesting aspect of these wondrous works. Its adaptation to his social and moral conditions, constitutes a chapter full of interest and delight, and one which has been but seldom considered. Man was to be an industrious animal—the world was not made for gentlemen, in the sense of men, who have nothing to do. As the old adage has it,

“When Adam delved, and Eve span,  
Where was then the gentleman?”

Like the bee, or the beaver, he is endowed with those qualities, which constitute *industry*, namely, patience, enterprise, a faculty to combine with others, to effect a common object, and a strong desire to acquire, and to accumulate the products of his labour. All these qualities are just what his position on the earth require, and the earth is so composed, and so adjusted, as to furnish in abundance, the materials upon which they can be used. These treasures of coal, and iron, and copper, of wool, of flax, of cotton, and of grain, of which we have spoken, are not produced spontaneously—they must be sought for, and laboured for; the mine must be wrought, the sheep must be tended, the field must be tilled, the hovel or the house must be built. Nature provides tools and materials in abundance, but man *must find* the *labour*, for his destiny is labour—his frame, and his faculties, are alike adapted to a life of labour—and if everything necessary, for his enjoyments, and wants, had been produced spontaneously, this destiny would have been unfulfilled.

But, further, man was to be a social creature—both individuals, and nations, were intended to intermix with each other, and by the imparting of knowledge, and by good and friendly offices, improve each others condition, and so strengthen and encourage those kindly feelings with which they are endowed. But one of the chief incentives to the active intercourse of men with each other, is commerce, and accordingly we find, that the earth is admirably formed to necessitate and promote commercial pursuits. If each country, or each village, had been provided with its own little assortment of timber, and iron, of sheep, of flax, and of cotton, of sugar, and of corn, there would have been no

sufficient inducement, for the inhabitants to go forth, from the village, or country, in which they happened to be placed—each would have remained isolated from the others, and as “home keeping youths, have ever homely wits,” each would have lost the great advantages which are gained, from extended intercourse with others. We find, however, that an incessant and active intercourse is maintained, as well between individuals, as between nations and races, in consequence of the varieties of produce, which different soils and different climates bring forth, and that these varieties of soil are exclusively due, to the various displacements and uncoverings of the sedimentary strata, to which allusion has been made. Thus, some portions of the district lying between the North and South Downs, produce corn abundantly—others are more adapted to the growth of hops—others produce timber—and others feed large flocks of sheep; and the same variety is, in a greater or less degree, found in every country under the sun. Added to which, the differences of climate, tend still more to diversify the various productions of the earth; and thus it falls out, that just as an English farmer, who lives on a clay soil, and grows hops, goes to the market town, and there meets with his neighbour, who has no hops, but wants to sell his barley; so does the American who grows cotton, bring it to market in England, and meet the producer of the iron, and coal, and tin, which he wants, but has not got at home; and by means of this intercourse, knowledge and civilization, and their attendant blessings and advantages, physical, moral, and intellectual, are conveyed without labour or anxiety, from one family to another family, from one parish to another, and from one nation to another nation.

It remains still to notice, one very interesting feature in the composition of the earth, as evidencing its adaptation to the social condition of men. It must be obvious, that to exchange directly, the productions of one country, for those, of another, would be so troublesome, and so dilatory and expensive, as almost to annihilate all commercial intercourse. Pure barter is indeed a system only adapted for savages, and hence arose the necessity for what is called a circulating medium—something, which every one would be willing to

receive, in exchange for his own commodities, because others would not refuse to take it, in exchange for theirs. It is also essential to a high degree of civilization, and progress in the arts of life, that some symbol should exist, to represent that accumulation of labour, which we call capital. Without such a medium and representative, society would be reduced to a state of barbarism: all the varied and complicated transactions of life would be impeded, if the property of each man were limited to the productions of his daily labour—if he had nothing else but this, to exchange for what he required, or to bestow upon those who needed his aid—if he had no means of preserving and investing—the surplus labour or acquisitions of past days or years.

Now this indispensable medium—a commodity so indispensable, indeed, that the ancients were wont to call it '*Rem,*' the thing, as if it were the representation or symbol of all other things—is provided in the shape of Gold, a metal difficult (as we all but too well know) to be procured, and valuable on account of its rarity, its purity, and ductility; and so accurately, as it seems, was this, like all other operations of creative providence, arranged and measured, both as to time and circumstance, that we have seen within the last few years, that just at that very period, when the extended commerce of all nations, required a corresponding increase of this circulating medium—when the increasing wealth of the world, the accumulation of men's labour, (for wealth is nothing else but accumulated labour,) required a new symbol, or rather an increase of the universal symbol, to meet the altered circumstances of mankind—this extension of the circulating medium was provided, by means of the unexpected discovery of vast treasures of gold, in California and Australia.

It seems thus to be evident, that the various advantages arising from commerce, are to be traced back distinctly to the mineral character of the earth—to the depositing of beds of mud or sediment, of various constitution and character, under the ancient seas, to their being consolidated and altered, by the influences of chemical changes and mechanical forces, and to their being thrown up, so as to be within reach of the labour and enterprise of man. In short, it

seems that the workshop was formed, and prepared, by an admirably adjusted system of foresight and preparation, extending over countless ages ; the materials to be worked upon, and the tools to work with, were also provided with exquisite skill ; and then, when all was thus made ready—when it was neither too soon, nor too late—the labourer was introduced to the scene of his labours.

Such then is a hasty and imperfect sketch, of some of the adaptations and harmonies, that may be traced in the constitution of the earth's surface ; and now let me ask you, to give the reins to your fancy, and with me, to imagine that during some part, of what must have appeared to any uninformed spectator, to have been a period of chaotic confusion, some intelligent being, some inhabitant of another planet, could have stood by, and witnessed what was going on—that he had seen those vast oceans of which we have spoken, ebbing and flowing from century to century, infested by gigantic lizards, and creatures of uncouth, fearful shapes, but never to be traversed by sailors of mortal mould—if he had seen those ancient rivers, on whose banks no human foot had ever trod, or ever should tread, age after age, silently gliding on, and working their appointed work—if he could have looked into the depths of those vast and gloomy forests, which no human eye had ever beheld or should behold—if he had seen continents, now rising from the bed of the ocean, and now melting away like snow-flakes, under the influence of tides, and currents, and rivers ; the seas sometimes subsiding, and leaving their beds dry, and now rising up in their might, and drowning every terrestrial creature ; the solid earth, now heaved up by volcanoes, and now shaken, and riven, and torn, by earthquakes ; mountains toppling to their bases ; huge boulders of rock “tossed with restless violence, round about the pendant world ;” volcanoes vomiting forth streams of lava and liquid basalt ; all the forces of nature apparently at variance with each other ; water and fire, each destroying what the other repaired, and each repairing what the other destroyed—if, I say, such a being, uninformed as to the result, had seen such a spectacle, he could have arrived at no other conclusion, than that he was witnessing a scene, of inextricable horror and confusion.

But if it had been given to him, in prophetic vision, to behold the consummation—had he been aware, that during each instant of those long rolling years, the earth's surface was being prepared for its future tenants—that instead of witnessing a fearful tragedy, he saw only, the dressing and preparation of the stage, for the rehearsal of a great drama; that drama, of which the first scenes alone have yet been played out, and which will have its end only, when time shall no longer be—if he could have known, that as surely as the blossom, which shall one day wound the eye with its beauty, and cheer the heart with its perfume, is enclosed in the green bud; as surely as the little egg, contains within its fragile walls, the bird that shall one day charm us with its warblings; so surely would these vast operations result in the production of this fair and fertile earth, nourishing upon its broad bosom, countless tribes of happy beings—had he thus seen our green slopes and wolds, whitened with the fleeces of thousands of sheep; the wide sea dotted with ships, bearing away the productions of every clime and country, to be exchanged for those of others; the valleys and the straths, smiling under their burthens of golden grain; the sunny landscapes; the leafy groves; the green pastures; the still waters; and the swift gliding streams—could he have witnessed all these, exactly harmonizing with the motions of the planets, and the alternations of the seasons, like the symphonies of some perfect melody, the harvest following upon the seed time, the summer upon the winter, the night succeeding to the day—could he have imaged to himself

“The starry nights, the golden-footed hours,  
Spring's roseate morn, sweet summer's evening hue,  
Still autumn's noon,”

in which we so much delight—how would his heart have filled with joy, at witnessing such beauty and excellence, such harmony and adaptation! and how might his joy have swelled into rapture, if it had been also given to him, to see in the far and dim perspective, the beings, for whom this glorious inheritance was destined, and to whom it should descend! to see this earth, peopled as it might be, by brave and earnest and good men, and by fair and gentle women—

men who should climb the mountain, explore the forest and the desert, dig deep into the bowels of the earth, navigate every sea and river, examine every herb and mineral, and by patient skill and incessant labour, should win from the reluctant earth, its treasures of corn, and wine, and oil—men, too, who should, in using these great gifts, admire and love, and reverence the Giver, and who, not content with contemplating their own possessions, in their eagerness to appreciate the divine handiwork, should dare the empyrean, should measure and weigh the sun and the planets, determine their orbits, and chronicle their past, and foretel their future, history.

Now all this is given to us : for it is ours to trace and measure and define the process, as well as to enjoy the product—it is ours to contemplate these great and glorious works, both in their beginning, and, thus far, towards their conclusion ; and when we do contemplate them, we need no argument to prove to us, that there are pleasures and advantages derivable from the study of Natural History—for we can then, in some feeble measure, participate in that joy which was felt by other intelligent creatures, when the foundations of the earth were laid, and such gladness thrilled through all the orbs of creation, that the Morning Stars sang together, and all the Sons of God shouted for joy !

F F D S.