LXXXVIII. Answers to “questions addressed to naturalists”

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To cite this article: Mr. Gavin Inglis (1821) LXXXVIII. Answers to “questions addressed to naturalists”, *Philosophical Magazine Series 1*, 58:284, 435-442, DOI: [10.1080/14786442108652657](https://doi.org/10.1080/14786442108652657)

To link to this article: <http://dx.doi.org/10.1080/14786442108652657>

Published online: 27 Jul 2009.

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champed the woody part so as to get the pith and sugary part out of it. Taking the average between 60 tons [the acreable produce in August], and 120 tons [the acreable produce in October], the mean produce would be 90 tons per acre, which no other crop, that I know of, could equal. I must here observe, that the ground on which the maize was raised, had every advantage that could be given to it; it was under a south hedge, and highly manured: to counterbalance these advantages, the soil is naturally a cold wet clay.

I have this autumn sown a patch of ground with winter tares. As soon as they are eaten off, I mean to follow them with maize, to be consumed in the same way. As I mean to keep an accurate register of the stock that is maintained by each crop, and of the time taken to consume it, I can easily ascertain their respective values. I could wish that two or three other persons would try the same experiment. But I do not, alas! recollect a single circumstance, from the first commencement of the Board of Agriculture to its final dissolution, to encourage me in expecting a wish so rational to be gratified!

A PRACTICAL and EXPERIMENTAL FARMER.

LXXXVIII. *Answers to "Questions addressed to Naturalists."*
By Mr. GAVIN INGLIS.

To Dr. Tilloch.

SIR, — IN your Magazine for September last, you have quoted from a German paper certain Questions addressed to Naturalists.

"The analysis of the earth (we are told) shows that it consists of the five following kinds: 1st, Calcareous: 2d, Quartz: 3d, Clay: 4th, Magnesia: 5th, Vegetable mould." It is then stated, that "it is affirmed that repeated experiments have proved that the first four, as well alone as intermixt, are absolutely unfruitful. If this be true, many thousand plants which now thrive only in vegetable mould could not grow on our earth some thousand years ago. Must we adopt the opinion that plants and vegetables have risen gradually? In East Friesland, if earths are dug up on the sea coast, &c. from a depth of ten or twelve feet, plants then grow which are not otherwise to be met with in those parts of the country. Did those plants exist in the ancient world? Have their seeds retained the germinating power for some thousand years? Can that power be retained so long? Or, Whence do these plants come?"

Philosophical experiments, of whatsoever nature they be, should have one object in view, and only one—the discovery or elucidation of truth; and the experimenter should be possessed

of the requisite knowledge and information, or arrange his proofs under the guidance of one more thoroughly conversant with the subject than himself. Had these experiments been skilfully conducted, no such conclusion could have been drawn. It would have been found that magnesian earth alone is inimical to vegetation, and that it detracts from the fertility of even the most fertile soils in proportion as its quantity bears to the mixture. Hence the comparative inferiority of all magnesian lime as a manure.

Many parlour experiments are undertaken, more with a view to give a gossamer support to some favourite hypothesis, than by a diligent investigation to prove the instablity of a visionary theory. The mere theorizing philosopher is not the individual to conduct so interesting and delicate an inquiry: his ignorance of vegetable œconomy may give false results, from which he may draw the most erroneous conclusions. He who undertakes to elucidate this department of natural science, ought to be a practical horticulturist, a botanical amateur, thoroughly acquainted with the habits, œconomy, and habitat of every plant. If such an individual had been the conductor of these experiments, he would have proved that, although these earths supposed "*absolutely unfruitful*," either *per se* or mixed in any proportions, were not sufficiently fertile to give birth to plants that would flourish in garden soil, still they were capable of giving life to some more humble and hardy race, and that there was no reason for pronouncing such a doom. Before coming to such a conclusion, an intelligent mind has only to cast a thought over the globe, to be satisfied that every zone, as well as every soil, has plants exclusively its own.

As well may a theorizing philosopher, or parlour experimenter, look for the Lapland Lichen on the Libyan shores, or the great Aloe under the frozen snows of Nova Zembla, as expect that seeds the natives of rich and fertile soils should ever show their germs in earths they scorn as beneath the pride of their families' luxuriance.

How would the West Indian smile at the grave tale of such experimenters, when viewing the now productive cultivated fields that but a few years before presented nothing to his forefathers' eye, but the hard unsubdued surface of a porous, calcareous rock? Even this as yet unpulverized calcareous earth was found under a skilful experimenter not absolutely unfruitful. But did the cultivator of this hitherto barren petrification ever think of planting on its obdurate surface his plantain, his corn, or his cane? No! Why? Because to *these* this rock would have been found "*absolutely unfruitful*." But into the pores of the rock this scientific cultivator insinuates the seeds of the Guinea grass.

The

The first rain that falls, fills the pores : the seeds drink up the moisture. They germ, and put forth their tender piles to receive strength and vigour from the solar rays, and prepare themselves to sip the dews of the evening, or drink deep of the next succeeding shower ; while the roots indent deeper, and draw nourishment from the surface dust of this calcareous mass. The Guinea grass in time acquires strength and body sufficient for the planter's object. He then sets fire to the field and burns it down, reduces the whole dry foliage to ashes, which not only creates a quantity of vegetable earth, but at the same time produces a quantity of stimulating and fertilizing manure ; while the fire calcines the exposed parts of the calcareous fragments, which pulverized by succeeding damps, and mixing with the ashes of the grass, adds to the accumulation of this newly created field. This operation is continued, and the burning repeated by the planter, till he has acquired a sufficient depth of soil for more profitable cropping. In like manner does the hardy Norwegian select patches to raise a little corn for his scanty pittance of bread. When nature has shed over the shelves and flats of his bleak inhospitable rocks, a quantity of the leaves or needles of the fir, sufficiently thick to retain moisture for the germination of seeds that fall in promiscuous profusion, the young firs spring forth thick as the matted turf. When these have attained a few years growth, in the autumn, preceding the corn crop, they are burnt down. The winter snows prepare the ashes for receiving the seed : on the first return of spring, the corn grows up, is cut down when ready, and the patch left for a succeeding crop of young firs, and again burnt, in regular rotation.

To be satisfied that quartz is not absolutely unfruitful, we have only to take a view of the sands along the sea-beaten shore, raised originally from the depths of the ocean and dashed on the beach by the surging waves, blown by stormy winds till imbanked beyond the rise of the highest tides. These sands are scarcely dried in the sun and washed by the vernal rains, when a race of vegetables peculiar to themselves bud forth and flourish, from seeds that may also have come from the ocean. These plants, by producing seed, propagate their species, and die. Their remains produce the first germs of vegetable mould, which in process of time accumulate, and may then be enriched by plants of a more luxuriant kind, and the soil become too effeminate for the coarse-grained aboriginal, whose existence may not now be traced, but whose seed lies safely imbedded and gone to rest. Disdaining the soil of the effeminate and voluptuous, they claim their primitive sand as a dormitory, ready to assume new life the moment they are left to the enjoyment of their native quartz.

In

In this manner soils gradually accumulate, and new vegetables appear, not by creation, nor the spontaneous effects of any admixture of the primitive earths, but from seeds the produce of former vegetable life; and to whatever depth this sand or soil may be buried, either by augmented accumulation or alluvial deposits, the seeds reposing in their native strata will remain for ever sound, and fit for bursting into new existence, when dug up from any depth, at any future period of the world, however remote.

Accumulating soils may be stored with new plants in a variety of ways, without having recourse to any supernatural production. The seeds of many plants are furnished with wings, and may be blown to a great distance. Birds may carry those that are destitute of the means of flying, and many a variety may be translated from one soil to another by the wanderings of cattle. Many of the winged tribes brought originally from the continent of America to enrich the botanical gardens of France, are now domiciled and scattered over and beyond the confines of Europe. When rivers are swoln with deluging floods, break in upon their banks, and carry to the sea the deposits of former times, the seeds of a very remote period may be thrown by the tempestuous dashing of the raging billows high upon the banks of a verdant shore, and give new life to a race of plants whose identity may have been extinct for many revolving ages. Even after the surface has acquired, by accumulation or otherwise, a fertility and richness of soil, such as to produce a covering of verdure sufficiently matted and interwoven to deny the intrusion of an aerial wandering variety, the mole comes in for his share of the general arrangement, and, by heaving up his mouldering heaps, interposes his aid in preparing a receptacle for the air-borne exotic, whose birth might be claimed by some very distant clime: Here a plant of another region bursts upon our notice—from whence, we know not till the scrutiny of the botanist retrace its flight to the land of its nativity.

Land gained from the waters of either the lake or the ocean, the deposite of rivers or of seas; the verge of gulfs, bays, or inlets, are the likeliest places in the world for the rise of strange plants, or the occurrence of such wonders as seem to astonish the natives of East Friesland. There is no country, however remote from the sea, or however elevated above its level, but communicates by its streams with the mighty waters of the ocean. There is no plant, however towering its situation, even those cresting the highest and most distant mountains, but whose seed may be blown or washed into some neighbouring stream, and carried uninjured along with its descending waters to the main, and wafted by

by the waves in a state of perfect preservation, to some very distant shore, and there find a root-bed and flourish, and in its turn shed its seed over the surrounding country; or find a preserving dormitory deep in the watery sediment, and remain in reserve for the incidental occurrences of revolving time. This sediment has been accumulating for ages on all the coasts of the Low Countries, and what was shore and surface some thousand years ago, may now be deep in the earth and far inland. This, however, does not prevent these former surfaces being dug up; and when dug up, nothing in nature can be more natural than the evolution of the native plants of the various strata, and even plants of very different and distant regions, whose seed may have been floated on the waters, or borne through the air on the wings of the storm. Vegetable productions of the West Indies and America have been floated across the expanded Atlantic, and thrown ashore on the beach of the Hebrides, the Orkneys, and Shetland: and very probably some of these may have found their way to the more southern shores of Europe, not excepting the coast of East Friesland.

The natural period of human existence is so very limited, as to preclude the possibility of watching the slow progressive operations of nature: the incident of to-day, may have had its embryo deep laid in nature a thousand years before its development. Our scanty knowledge of natural phenomena can only be gleaned from the few authenticated facts that are fortunately on record, and by calling to our aid the analogical reasonings that may be drawn from the wide field of material existence. In this contemplation, we soon perceive the perishable insignificance of the higher classes of animated nature, that a few revolving years lay prostrate in their kindred dust. But in the lower links of the animated chain, to the productions of the ovum, the duration and preservation of *latent* life are beyond the powers of our limited comprehension to calculate. The germs of vegetable existence I believe to be imperishable when bedded in their native strata, however deep. To the higher classes of the creation, to all who are endued with intelligence and power to protect and continue the existence of their kind, the principle and power of laying aside and resuming life has been denied;—while to the inferior orders, to the fly and to the reptile, either in the egg, the chrysalis, or the perfect animal, when bedded in earth beyond the influence of light, or inclosed in the solid rock, the revolution of a thousand years must be as one day, and one day as a thousand years; and when again called into new life, they are as capable of producing and propagating their kind, as when first laid to rest in their millesian dormitory.

However

However excentric, I am of opinion that the ocean has been, is, and will be the grand emporium and conservator of insect, reptile, and vegetable life. The rivers are daily running into the sea loaded with the spoils of the earth, carrying along with them the egg and chrysalis of the insect, the spawn of the reptile, with many of the reptiles themselves. These get imbedded in the calcareous and siliceous deposits of the waters. As this settles down, the animal keeps turning and moving; and as the soft substance begins to press upon its inmate, the creature, by pressure against the sides of the still impressive mass, *bakes* a bed, and keeps open sufficient space for itself, where it is destined to remain for time inconceivable. In the progressive revolutions of matter this mass consolidates, and petrifies around its prisoner, and in this state have the banished reptiles been found alive in the stratifications and formations of a former world. Here, the duration of latent life is beyond the extent of human knowledge.

The seeds of every plant of every region of the earth may be carried by the mountain torrents to the sea. Seed from the highest pinnacle of the mountains that verge the western shores of Southern America may be carried down the Amazonia, Rio Plata, &c., and meet those of other tribes from the interior of Africa, on or in the South Atlantic; while the expanse of the North may be furnished by the river St. Lawrence, &c. Seeds from the mountains and shores of the Volga, the Danube, the Po and the Rhone, &c. may fill the Black Sea, the Archipelago, and the Northern Mediterranean, while the Nile fills up the African shores. The Western European rivers plenish the North and the German Oceans; the Ganges, &c. the Indian Seas: and there these seeds remain, in store and in entire preservation for the incidents of futurity.

Many proofs have been adduced of that portion of the globe which we inhabit, having at one period been the bottom of the ocean: if so, *vice versâ*, what was then inhabited and clothed in all the verdure of botanical glory, must now lie at the bottom of the mighty waters. In this case, had seeds of vegetables or eggs of vermes been perishable, all nature must have died, and the present world would have presented nothing but the bare surface of the water-worn rock and the noxious sludge and putrid deposits of by-gone ages, where food for neither man nor beast could have been found: nothing but one dreary waste of fearful extent would have covered the globe. Every maturized seed is an egg of the plant that produced it, and, like the animal ovum, contains within itself all the requisite powers and principles of evolving into life, of assuming the same organized sym-

metry

metry of its parent plant, and of reproducing its kind. In nothing does the protecting hand of Providence show solicitude more conspicuously than in the formation of the seeds and preservation of vegetable life; every seed is covered with a shell—a coat of mail to shield it from external injury; and as the vegetable egg is left without the fostering care of a watchful parent, its shell has the power of absorbing and giving out moisture, of dilating and contracting as the state of its charge may require; and although originally a mere vegetable pulp, yet its constituent principles are furnished with powers of defence, capable of resisting, uninjured, the utmost effects of animal digestion, even of those animals whose gastric energies are sufficient to dissolve the hardest bones. In proof of this, I may state two instances that must be familiar to every one. Pease fully ripened, and allowed to harden in the pod, if swallowed whole, will defy the strongest digestive powers, pass through the intestines, and grow. Let the hardened pease be boiled till the farina is reduced to pulp, still the shell of the pea will remain undissolved; and although taken into the stomach, with all this previous preparation of boiling, the shell will yet resist the utmost efforts of animal digestion, and pass through the intestines unaltered. Thin as the bran of wheat may be, that shell is sufficient to defend the grain against the digestive powers of the horse. When taken unbruised into the stomach of that noble animal, the grain passes through his entrails, not only uninjured and fit for vegetation, but will be found to have absorbed a fertilizing principle, and to produce more luxuriant foliage, and better grain, than when sown in its natural state. If seeds resist animal digestion, the natives of East Friesland and the Querists may cease to wonder at their dormancy for any length of time. Not to repeat any of my notes (see Phil. Mag. for December 1818), I may be allowed to state another instance of seeds retaining their germinating principle, that has since occurred.

On clearing out the *Monk barns* of an old religious establishment in the North, and subjecting the site to the operations of the plough, several varieties of oats sprung up the succeeding spring, that have long been unknown in the country, whose seed must have been carried by mice or rats, &c. deep into their burrows as winter store. The collectors of this latent repository may have perished by the cats, the weasels, or the *traps* of the Holy Fathers, and their little store remained unconsumed. These oats must have retained their vegetating powers (since the days of *John o' the Gurnal**) at least for some hundred years. If for hundreds, why not for thousands? and if for thousands, why not for ever?!!

* See The Antiquary.

Many of my observations and ideas may appear prolix and trifling, yet I cannot resist bringing forward whatever may assist in elucidating a subject I consider so very interesting. Well may we say with the Spectator, "that to enjoy the world is to know it; and to have just conceptions of our Almighty Creator and Preserver, is to trace the infinite greatness and wisdom of creative power, and the unbounded intelligence and design so conspicuously displayed in protecting and preserving the work of his grace."

Nov. 12, 1821.

GAVIN INGLIS.

LXXXIX. *On Mr. SOUTH's Catalogue of Double Stars.**By A CORRESPONDENT.**To Dr. Tilloch.*

SIR, — I AM a man fond of science, but, having received only a plain education, have been obliged to work my way by my own exertions, and such helps as I have been fortunate enough to meet with.

I shall ever remember with gratitude the obligations I am under to your and other periodical works, by whose kind assistance I have been enabled to ask, and have generally received, such information as I at times stood in need of, and without which I never could have surmounted the many difficulties which opposed my progress. Believe me, it is only persons like me, who have been obliged to fight their way through the difficult paths that lead to mathematical knowledge,—it is only such, I say,—that can appreciate the utility of such publications. But, my gratitude is leading me from my object, which, as aforesaid, is to ask assistance. Chance, some time ago, threw in my way a Catalogue of Double Stars, presented by J. South, Esq. to the Astronomical Society. Their places, as the learned author informs us, are taken from Bode's Catalogue, but reduced by him from the year 1801 to that of 1821. I was acquainted (at least I thought so) with the method of making these reductions; but as I had never attempted it, I thought it a good opportunity to put my knowledge to the test, by trying the reduction of a few of these stars, and was much pleased to find the declinations, with which I first began, to coincide with the numbers in the table before me:—but judge my astonishment, when I found scarce a single right ascension to agree. I looked over my calculation again and again; I re-perused Dr. Maskelyne's rule, re-calculated the annual variations; and, to be certain that I had made no mistake, I set my son, a clever little fellow of ten years of age, to work the calculations, as an arithmetical exercise, explaining to him,

as