LXXXVI. *A Letter from* James Parſons, *M. D. F. R. S. to the Rev. Mr.* Birch, *Secr. R. S. concerning the Formation of* Corals, Corallines, *&c.*

SIR,

Read June 18, 1752. THE ſeveral ingenious opinions of ſome of this learned Society, upon what M. Peyſſonnel has advanced, concerning the formation of ſome of the ſubmarine bodies by animals, have occaſion'd the following conjectures; which I lay before you, not at all preſuming abſolutely to decide a queſtion of ſo difficult a nature, but only to endeavour at throwing a little more light upon the ſubject, in general, by ſuch further obſervations, as I thought would be moſt conducive at leaſt, to come to a little more certainty about it.

I believe it may be ſaid, that there can be no ocular demonſtration of the fabrication of any of theſe bodies, whether by animals, or by vegetation; becauſe this happens under the water, far enough from any human obſervation. Therefore, when at any time ſuch of theſe, as are ſaid to be the work of animals, have been taken up, there is no doubt, but that thoſe ſoft gelatinous weakly animals may have been ſeen upon them, and thence have been concluded to be the makers of them. Certainly there is nothing impoſſible to Divine Providence, in the order and diſpoſition of every thing to the beſt advantage. Among the animals, from the largeſt to the moſt minute, none are deſtitute of proper habitations; and we ſee, amongſt

them, prodigious variety in the modes and deſigns of ſuch dwelling-places. Some are capable of erecting for themſelves commodious apartments to live in, as ſhell-fiſh, even out of their own conſtituent parts as they grow. Others lodge their young in the very ſkins of animals; and where there are any, who have neither ſagacity nor ſtrength enough to provide places for themſelves, they are at leaſt taught by their Maker to find them ready made.

Such are the bounds ſet to our intellectual powers here, that we can have no means of judging of objects, which do not immediately fall under our inſpection, but by comparing them to ſomething elſe, as near them as may be; or by conſidering their proportions and effects; what is probable, what is not, in the phænomena, that belong to them; and what abſurdities may ariſe from the uſes and actions aſcribed to them; for certainly they may be eaſily ſeen, by conſidering the objects themſelves.

I would neither conclude, with M. Peyſſonnel, that, becauſe I found animals upon ſuch bodies as he mentions, they were the makers of ſuch bodies; nor that, if one or more kinds of thoſe bodies were actually the work of ſuch creatures, all others, that had any relation to them, muſt alſo be their work; any more than I would, on the other hand, conclude, that, becauſe one or more of theſe ſubmarine ſubſtances were not made by them, none at all were produced by them. I would rather examine the parts of thoſe bodies in as nice and ſcrutinous a manner as poſſible, and compare their characteriſtics with thoſe of other bodies in both the animal and vegetable kingdoms; and, by finding out ſome of their

their properties only, be, in a great meaſure, able to range them in the rank, which they were deſigned to hold by Divine Providence.

In order to this, let us ſee firſt what are thoſe animals, which we are acquainted with, who certainly fabricate their dwelling-places, as they grow for themſelves; and what the common or uſual advantages are, which they are in general obſerv'd to be endow'd with; which will be beſt done, by taking a near view of them. All the teſtaceous tribe, whether of land or water, and whatever their forms be, may be ſaid to produce their own habitations, but not to fabricate them. For we muſt obſerve, there are but two modes, by which theſe kinds of animals are furniſhed with them; the one by ſecretion from themſelves, and theſe neceſſarily grow with them; the other by a deſign'd appoſition of parts of the animals themſelves. Now, in the firſt caſe, there is a neceſſity for a juſt proportion between the animal itſelf, and the ſhelly matter ſecreted from it. It muſt be large enough, and have ſtability and ſtrength in proportion to the matter which it ſecretes, and is to move about with; and it will appear, that this is the general rule thro' nature: Or, if it be an immoveable body, the creature ought certainly to be allow'd ſo much ſignificancy and ſtrength, as would, on the one hand, ſeem neceſſary for the ſecretion of ſo much matter, as was ſufficient to conſtitute that body; or, on the other, to be capable, by its own proper action, of gathering together the matter, and building up the ſtructure. Where this is wanting, I, for my own part, would be far from haſtily concluding ſuch work to be the fabrication of ſuch

ſeemingly weakly inſignificant animals; more eſpecially if, upon theſe very bodies, there were appearances of other characteriſtics, that, at the ſame time, were likely to lead me into another arrangement of them.

I have produc'd here before you ſuch of the ſhell-animals, as are unqueſtionably the makers of their own houſes, that are furniſh'd with theſe requiſites mention'd; and others I ſhall now offer you, being ſomewhat nearer thoſe ſaid to form the coral, *&c.* than other teſtaceous kinds.

The *dentalia* are tubular ſhells, formed from their inhabitant animal, as much as a cockle, or an oyſter: and we muſt obſerve, that each of theſe has a ſufficient cavity for its habitation, and in itſelf has the proportional ſize and ſtrength neceſſary for the purpoſe.

The *vermiculi marini* enjoy the ſame privileges, and are always attach'd to their ſhells at their poſterior extremities, as well as the others, of whatſoever kind. They are found in groups, adhering together by a natural cement, blended, and, as it were, confounded together; and yet every one has its own cell, and is ſufficient to produce in thoſe requiſites beforemention'd. All the kinds of theſe have one extremity ſmall, and increaſe in diameter to the anterior extremity; which is indeed the caſe of all the turbinated fiſh of whatſoever kind. To theſe we may add, that the cruſts of cruſtaceous animals, and thoſe of inſects in their chryſalis ſtate, will always ſhew, how neceſſarily an animal muſt have power and ſufficiency to form his habitation, either by ſecretion, or actual operation.

The *ſyringoides*, ſo call'd from their forms, carry the ſame teſtimonies of their ſtrength and power; many

many ſpecies of which we find foſſil, of which I have the honour to ſhew ſeveral ſpecimens: And I have no doubt, but it will be hard to find any creatures more deficient, or, in other words, more abandon'd to deſtruction by the Creator, than theſe, in any part of nature.

Whatever is conſtructed by an animal, that is, among thoſe, that we know with any certainty, it is ſurely to dwell in themſelves, or to depoſit eggs or young in. There was really no need to build a fabric to dwell upon; becauſe all thoſe creatures, ſuch as the polypi of every kind, which attach themſelves to bodies, have innumerable ſorts of matter, to which they can adhere every-where, near them: And if theſe of the ſea have, in their nature and properties, any analogy with our freſh-water polypi, as to their propagation, and the detachment of their young from themſelves; with the ſeveral kinds of the ſame genus, the *polypes à panache*, *polypes à bouquet*, the bell-like polypi, and every other kind, diſcover'd by our ingenious obſerver Mr. Trembley, all which detach their young from them nearly in the ſame manner; one would almoſt be perſuaded, that they were never intended to dwell in cavities, but upon *nidus's* convenient for their attachment only, with full liberty, at proper times, to detach their young in like manner; who immediately meet ſome or other of theſe ſubmarine bodies for their ſecurity alſo; for indeed there is hardly room to ſuppoſe any other way of propagation for theſe, than for thoſe of M. Trembley, ſince they are much of the ſame ſubſtance and conſiſtency every way. And it muſt be remark'd, that few or no animals, that have

ſhells

ſhells of any kind, can ever quit them, but muſt remain in them till they die.

We are now, ſecondly, to conſider ſome of the moſt obvious marks, that diſtinguiſh vegetable from other ſubſtances.

Whatever body is fixed by its root, no matter, whether it be flat or fibroſe, increaſing upwards, and ramifying into ſmaller and ſmaller branches, till they become more and more pointed to their extremities; having fibres either apparently tubular, or only porous or woody, would incline one, who had at all made the works of nature his ſtudy, rather to favour the idea of a vegetable in ſuch a body, than that of any other production. If theſe characteriſtics are common to any of the ſpecies of corals, corallines, madrepores, *&c.* it would be no wonder they ow'd their increaſe to a kind of vegetation; nor would their hardneſs weigh at all againſt it, becauſe every one knows, that water is the univerſal vehicle of all matter into bodies of this kind. It is by water, that the teſtaceous matter is carried into the juices of ſhell'd fiſh, and from it detach'd into the order we ſee it in the ſhells. It is from water, that ſparry incruſtations upon vegetables are made: It is a depoſit from water, that lines our common tea-kettles with a ſparry cruſt: And it is alſo this fluid, that conveys the particles of tartar into the grape, which is afterwards depoſited upon the ſides of the wine-veſſel; and no doubt but it is water, which carries up into thoſe hard bodies their ſtony matter; for there can be no doubt of their being organized bodies. Beſides, tho' the organization, in its origin, is probably flexible enough, yet the arrangement of

theſe

theſe petrific particles in ſo exact a manner would inevitably render the whole hard enough, in the courſe of its growth. Is not the ſhell of a common egg hard enough? and yet its membrane, into the cellules of which the teſtaceous particles were ſecreted and ranged, in order to produce that hardneſs, was ſoft enough before.

If we were to make tranſverſe ſections of the generality of theſe bodies, we ſhould ſee a regular radiated order of pores from their central medullary pipes, ſome foliated, others more tubular, others barely porous, all differing from one another only according to their own natures. What more is there in the order of the fibres of trees or plants? Tranſverſe ſections of any of theſe will ſhew you the moſt beautiful figures, in ſuch orders, that can be conceiv'd; which, long ago, that accurate and learned naturaliſt Dr. Grew has ingeniouſly obſerv'd, in his *Anatomy of Plants*, where he has given elegant figures of ſuch ſections in a variety of examples. And altho' ſome of theſe bodies have their pipes and pores quite ſtopp'd up, as they grow, yet their external appearance will ſhew them fibroſe.

In like manner ſome trees are ſo very hard, from the ſtrong connection of their parts, that, in a tranſverſe ſection, neither pores nor fibres can be diſtinguiſh'd; and they are as ſuſceptible of a fine poliſh as any ſtone. And indeed it would ſeem to me much more difficult to conceive, that ſo fine an arrangement of parts, ſuch maſſes as theſe bodies conſiſt of, and ſuch regular ramifications in ſome, and ſuch well-contriv'd organs to ſerve for vegetation in others, ſhould be the operations of little, poor, helpleſs, jelly-

jelly-like animals, rather than the work of more ſure vegetation, which carries on the growth of the talleſt and largeſt trees with the ſame natural eaſe and influence, as the minuteſt plant, in a manner, which I have elſewhere explain'd.

Is it not alſo ſomewhat particular, that, if corals are the work of theſe inſects, there ſhould be no cavity left behind them, as they raiſe it into branches; but that they ſhould leave it ſolid within? And would it not be very ſurpriſing, that ſuch cellular paſſages, as we ſee diverſified into many kinds, ſhould be made by theſe creatures from the baſis, to be left behind them, as they carry up the building, without any further purpoſe, in brain-ſtones, *&c?* If this was the caſe, and that theſe little creatures could be ſuppoſed to build them, there would be a deviation from the general uniformity and purpoſe, that is obſerv'd every-where elſe: For certainly cells are built by every animal to depoſit ſomething, eggs, young, or other matter, in them; neither of which can be ſaid of the inſects in queſtion.

It has been ſaid, that flies, waſps, and bees, build themſelves cells; in order to make a compariſon between them and theſe polypi. They do ſo; but is there no diſtinction to be made? I can find ſeveral. Bees, waſps, *&c.* are in themſelves, compact ſtrong animals, well made for the work allotted them, very able to bring and put together the materials of their neſts; and when they have done their work, that proportion between the fabric, and the creatures which raiſed it, is apparent, which all nature points out, and the purpoſe is fulfilled ſoon, in their filling them with what nature had deſtin'd they ſhould

ſhould hold. But can this be ſaid of our polypi? Where is that proportion between a little configurated jelly, and the maſs of matter ſaid to be their work? What is depoſited in the cells they form? What makes others ſolid? And how do theſe jellies ſo wonderfully diſpoſe the fine arrangement of pores, fibres, nodes, branches, *&c.*? And to what purpoſe, if they could be ſuppoſed capable of it? In a word, I humbly purpoſe to ſum up this eſſay in two general ſentiments; and theſe will be the rule, by which I, for my own part, ſhall always judge of things of this nature; *viz.*

1. Whatever bodies ſhall be found to carry the appearances and characteriſtic marks of vegetables; even tho' animals are found upon them, they certainly will paſs with me for ſuch, till ſtronger evidence ſhall evince the contrary. And,

2. I ſhall ever expect to ſee, at leaſt, a ſeeming power, proportion, and ſtability, in animals, to render them capable of performing what they may be thought to have done. I am,

SIR,

With the utmoſt reſpect,

Yours and the Society's

moſt obedient ſervant,

J. Parſons.