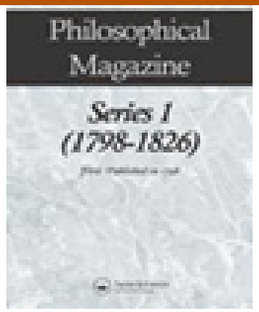

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IV. *Extract of a Memoir, and Experiments on the Nutrition of Plants. By* M. RAFN, *Aſſeſſor in the Office of Commerce at Copenhagen*.*

HASSENFRATZ conſiders carbon as the ſubſtance which nouriſhes vegetables†. Ingenhous, in his work on the nutrition of plants, publiſhed in 1797, endeavours to prove, that if carbon has any influence in this reſpect, it can be only in the ſtate of carbonic acid, as that acid is abſorbed and decompoſed ‡ by vegetables; while the ligneous carbon, furniſhed by Nature, produces no effect on the expanſion of plants. Mr. A. Young has endeavoured to demonſtrate the ſame thing by experiments. M. Rafn, deſirous of diſcovering the truth amidſt theſe contradictory opinions, made, for three years, a ſeries of experiments, from which he concludes, by the expanſion, ſize, and colour of the plants employed, that carbon, either vegetable or animal, has a decided influence in the nouriſhment of vegetables. What is new, and particularly worthy of remark in theſe reſearches, is, that, according to M. Rafn, the carbonic acid produces exactly the ſame effect as charcoal of wood. The following are the experiments which conducted the author to this reſult:—

Having half filled a large box with brick-kiln rubbiſh, or pounded tiles, which he covered with a layer of vegetable earth, he placed over the latter a ſtratum of carbonate of lime (pounded limeſtone) and alum, and then two or three of vegetable mould, in which he ſowed barley. He preſumed that the ſulphuric acid of the alum, abandoning the argil to join the lime, with which this acid has greater affi-

* Tranſlated from the Daniſh, with notes by C. Vauquelin and Brogniart

† This opinion of C. Haſſenfratz appears to be very probable; but, as he ſays, the carbon muſt be held in ſolution by hydrogen gas, by water, by that ſaponaceous extract which ſeparates from vegetables when in a ſtate of putrefaction, or by any other liquid.

‡ This decompoſition is poſſible, but it has not yet been proved by any direct experiment.

nity, the carbonic acid gas would be diſengaged, which would furniſh the means of knowing its influence on the vegetation. Another box was filled merely with mould, a third merely with charcoal, and a fourth with animal carbon. Theſe were to be employed in comparative experiments, and barley was ſown in them all.

Though the plants which germinated in the firſt box were ſown in a ſtratum of mould about two or three inches in thickneſs, they had no reſemblance, either in ſtrength or colour, to thoſe ſown in the ſecond box filled with mould alone; but they had, on the other hand, ſuch a perfect reſemblance to thoſe of the third box filled with charcoal, that it would have been difficult to diſtinguiſh the difference. This reſemblance continued ſeveral weeks, after which they ſeemed to have not quite the ſame vigour as thoſe which grew in the charcoal, for which it is not difficult to aſſign a reaſon. The author convinced himſelf that a decompoſition had really taken place, becauſe, on examining the firſt box in autumn, he found that ſulphat of lime had been formed. Theſe experiments ſeem proper to conduct to a knowledge of the manner in which plants attract the carbonic principle, which all the reſearches of the author demonſtrate to be neceſſary for vigorous vegetation. He propoſes to repeat them on a larger ſcale, and to vary them as much as poſſible *. He repeated, ſeveral times, thoſe of M. Humboldt on germination, accelerated by the oxygenated muriatic acid, and always with ſucceſs, though with this difference, that this acid did not favour vegetation ſo much as that philoſopher aſſerted.

M. Raſn ſowed barley in a mixture of mould, ſand, and manganeſe, in order to ſee whether the oxygen gas would

* Theſe experiments would be more concluſive had not the author added mould in the boxes into which he put the rubbiſh. It is well known that mould contains a great quantity of carbon, exactly in the ſtate which renders it fit for the nutrition of vegetables.

Mr. A. Young, on the other hand, aſſerts, that plants grow exceedingly ill in charcoal: and this obſervation agrees more with the others, and with the reaſoning, which induces us to believe that carbon muſt be diſſolved to enter into combination with the other principles of vegetables. As plants grow exceedingly well in pure water till a certain period, it would appear that they ought to grow equally well in watered charcoal.

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not be diſengaged in ſuch a manner as to produce ſome effect on plants. At firſt he obtained no effect; but having watered this box with diluted ſulphuric acid, he remarked that the barley viſibly grew faſter in this box than in thoſe not watered in the ſame manner *.

Of all the mixtures which he tried for ſowing, none appeared to him better than that of equal parts of charcoal, mould, and ſand, moiſtened with water filled with infuſion animals, which may be eaſily obtained by ſteeping flax in the water deſtined for that purpoſe. He obſerves, on this occaſion, that, of all the ſubſtances he tried, flax is that which furniſhes the moſt of theſe animalculæ. An incredible multitude of them are found in the water in which women dip their fingers when they are employed in ſpinning. The water put into a veſſel for that uſe in the morning, is found filled with them in the evening. The author aſcribes to theſe ſmall animals a much greater influence on vegetation than has hitherto been believed.

Haſſenfratz relates, that he could not make plants vegetate well in ſimple earths. The author aſſerts, that he had great ſucceſs when he reared them in pure ſilex, quartzy ſand thrice waſhed, fine ſand from the ſea-ſhore, &c. But theſe plants continued ſtunted and pale, and their roots were twice as long as the whole of the part above the earth. In charcoal, on the other hand, the parts were large and vigorous; they were of an exceedingly dark colour, and their roots were not a ſixth part of the length of the plant itſelf †.

Coal-aſhes, on which the German and Engliſh farmers beſtow ſuch praiſe, deſtroy the plants if the ſoil contains an eighth part of that admixture. The leaves become faded, as

* The ſulphuric acid cold does not diſengage the oxygen of the oxyd of manganeſe: beſides, according to the experiments of Ingenhous, this acid alone, in ſmall quantity, ſeems to have the property of rendering vegetation more active.

† The firſt reſults are perfectly ſimilar to thoſe obtained by C. Haſſenfratz. In regard to the ſecond, they depend on the purity of the charcoal employed, which may contain wood undecompoſed, and conſequently diſpoſed to putrify, and to yield a liquid which may hold the carbon in ſolution.

if ſcorched, at the end of from fifteen to twenty days, and the plants themſelves die at the end of four or five weeks.

No ſeed germinates in oil. A ſingle grain of common ſalt in two hundred grains of water is ſufficient to retard the vegetation of plants, and may even kill them if they are watered with that ſaline liquor *.

Shavings of horn, next to infuſion animals, are the moſt favourable to vegetation: charcoal holds the third rank.

V. *On the Aſſaying of Iron Ores and Iron-Stones by Fuſion.* *By Mr.* DAVID MUSHET, *of the Clyde Iron Works* †.

IT will eaſily be conceived, from the mode of operation which I have adopted, that, in order to procure accurate reſults, the proportion of flux muſt be varied according to the mixtures in the iron-ſtones or ores; and that no univerſal ſolvent can be uſed as capable of aſſaying *all* ores.

As the gradation of mixtures in the ores is almoſt imperceptible, there are, in fact, no fixed limits by which Nature has diſtinguiſhed the various claſſes: we find all the varieties diminiſhing their predominant earth, and aſſuming, in equal proportions, thoſe of each other, thus conſtituting the claſs of equaliſed mixtures; yet, here, the variety of combination ceaſes not, the predominating earth gradually becomes the minor part of the mixture, and that which only held a ſecond rank, as to quantity, is now the chief component earth; the permutation goes round, till the earth, which exiſted in the moſt ſparing quantity, now predominates to exceſs.

* C. Sylveſtore obtained a reſult abſolutely ſimilar, by employing marine ſalt as manure.

† The preſent is a part of the communication from Mr. Muſhet which appeared in our Number for July laſt, (Vol. IV. p. 178,) but by an overſight of the Editor was omitted in its place. It contains the table of proportions alluded to in our Number for September laſt (Vol. IV. p. 380.) requiſite for the obtaining from all the various iron-ſtones an accurate aſſay, and ſhould have immediately followed Mr. Muſhet's article given in our July number.

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