ties only; that the early growth of the plants may be promoted, without excessive, and consequently injurious, luxuriance being given. For transplanted peas, I should prefer a poor and light soil; so that the roots might be led, as they would be under such circumstances, to confine themselves to narrow limits: and the plants consequently be brought to an early maturity.

Note by the Secretary.

In a letter received from Mr. Knight, dated the 27th of June, he mentions that he had then seen the full result of his experiment on the mode of raising early peas, above described. The plants so treated had produced a very abundant crop at least twelve days earlier than those sown at the same time in the usual way, and with a much more rapid succession of produce.

On the Mineral History of Gold, and the separation of it from Earthy and Stony Bodies, by Water, Mercury, &c. By the late WILLIAM LEWIS, M. D.

(Continued from p. 81.)

There are sundry European rivers which roll particles of gold with their sands in no great quantity, yet such, that the neighbouring inhabitants, at certain seasons, find their account in collecting them. M. de Reaumur, in an essay in the French Memoirs for 1718, drawn up from materials furnished by the intendants of the several provinces, in pursuance of the orders of the Duke of Orleans, gives an account of ten rivers or rivulets in the territories of France, that have gold mixed with their sands in certain parts of their course: the Rhine, from Brisac down to Strasburg, sparingly; from thence to Philipsburg, more abundantly; and most of all so between Fort Louis and Germesheim. The Rhone, in the Pais de Gex, from the conflux of the Arve, from which it is supposed to receive its gold, to about five leagues lower down: the rivulets of Ferriet and Benagues, which rise from the heights on the left hand of the descent from Vailhere to Palmiers: the Ariege, *aurigera*, about Palmiers, below where it receives the two foregoing rivulets: the Garonne, some leagues from Toulouse, below where it receives the Ariege: the Salat, which rises, as the Ariege, in the Pyrennees: the Ceze and Gardon, which come from the Cevennes, and the Doux, in the Franche-Compte. The last of these rivers is the poorest, the gold having hitherto been collected from it rather in the way of curiosity than with a lucrative view: the greatest quantities are obtained from the Rhine, not that this is really the richest, but on account of its sands being the most industriously searched; for some of the others, particularly the Ceze and Gardon, appear to be at least equal to it in richness. The quantity got from the Rhine, in an account of near two leagues below Strasburg, is said to amount to no more than four or five ounces in a year: this is the quantity brought to the magistrates of Strasburg, who farm out the right of col-

lecting it, on condition of its being sold to them, at a price considerably under its value; so that it may be presumed that a part is otherwise disposed of, and that the quantity really obtained, is considerably greater.

There are many other rivers reported to yield gold; as the Tagus, the Danube, the Elbe, the Oder, the Inn, the Sala, &c. The Schwartz, in the county of Schwartzburg, in Upper Saxony, is said to be rich in this metal, and its sands to be worked with great profit: Stahl mentions a piece found in it, as broad as a middling bean, though not so thick, and supposes that the Sala receives all its gold from this river; the gold of the Sala being found only below where the Schwartz enters it, and being less plentiful, and in smaller grains. It is generally reckoned that the gold particles, in all auriferous rivers, are washed out by the stream from such rich beds, and afterwards rest or settle where the current is languid, or in places where they escape its force: from what particular sources the gold in different rivers proceeds, does not seem to have been examined.

The richest parts of rivers, within the extent in which they roll gold, are those where their course is slow and uninterrupted, where they widen or change their direction: the most favourable season is when the water has subsided after a flood. The appearance of the sand affords a useful mark of distinguishing the richest spots; the gold being always most plentiful where the sand is reddish or blackish, or of a colour somewhat different from what it is seen elsewhere; not that the red or black sands have any natural connexion with the gold, but on account of their being more ponderous than the white; so that the same cause which determines the particles of gold, determines these also, to subside. The black sand abounds with iron, being vigorously attracted by the magnet; the red, viewed in a microscope, appears, as Reaumur observes, a beautiful congeries of coloured crystals, imitating all the gems known to the jeweller, among which, those of the ruby and hyacinth tints are the most common; whence the reddish colour of the sand to the naked eye: the particles of gold are of irregular figures, but constantly flat, smooth, and with the edges rounded off.

Some gold has been discovered in Britain at different times, though, hitherto, in little quantity. Instances are mentioned in Houghton's Collections, from Camden, Sibbald, and Gerard de Malines, of gold found in Scotland, about the head of the Clyde, in Crawford-moor; and Boyle says, he had from some part of Scotland, divers large grains of gold, taken up near the surface of the earth, over a lead mine; one of which, clear from spar, weighed two hundred and one grains. Mr. Boyle had also an English tin ore, wherein there lay, in little cells, a number of small leaves or chips of gold: he observes, that, though the tinmen, unable to separate them to profit, usually melted both metals together, yet he was assured, that one person advantageously employed his children to pick out the gold from the ore, skilfully broken. Some earlier writers also mention gold found in the tin ores of Cornwall; and about the beginning of the present century (1700) a patent is said to have been obtained "for separating gold and silver

from tin, by precipitation in a reverberatory furnace, with some peculiar fluxes:" what success this scheme met with, I have not learnt. Mr. Borlase, in his natural history of Cornwall, gives an account of some tin ore, abounding with a yellow matter, which was taken by the workmen for mundic: some bits of the yellow matter, one of which was a vein, as large as a goose quill, included in a stone, the size of a walnut, produced on being melted an ounce of pure gold: he mentions several other pieces of considerable bulk, and gives a figure of one found in 1756, weighing three hundred and seventy-six grains. It is supposed to be chiefly the stream tin, (that is, the tin ore found in detached pieces on the sides of hills,) which contains gold; that all of this sort contains more or less of it; and that both the gold and tin ore have been brought from elsewhere by torrents of water, and deposited where they are now found, like the gold sands of rivers.

Boyle conjectures that, besides the grains of gold which lie detached among sands, there may be many particles so minute, and closely fixed to the sand, as not to be perceivable by the eye, or separable by the common methods of washing or picking; that many small portions of the metal may be incorporated also with the body of the sand, and that by skilful management they might be extracted. Experiments, he says, confirmed him in this persuasion: later experiments have verified it, and shown the existence of gold in sands, to be even more extensive than he seems to have apprehended. Many of the common sands, particularly the yellow, red, black, and those of a black colour inclining to violet, appear to be rich in gold: Becher and Cramer presume that there is no sand in nature entirely free from it. Hellot relates, that in eleven assays of one kind of sand, made by M. Lieberrecht, by a process described in the sequel, the yield of noble metal turned out constantly from 840 to 844 grains on the quintal, or 921, 600 grains, exclusive of what remained in the scorix, which were still found to be rich; that different parcels of sand, taken up at no great distance from one another, differed in degree of richness, some having afforded above 1000 grains, others only 350, and others yielding none by the treatment which had succeeded so well for the rest; and that of the metal thus obtained from sands, two-thirds are commonly gold, and the rest silver. Yet, notwithstanding the great richness of these sands, no means have hitherto been discovered of availing ourselves of the metal they contain, or of extracting it to advantage in the large way. Becher, indeed, undertook to obtain gold with profit from the common sea sands, and entered into engagements with the states of Holland, for establishing a mineral work on this foundation; but though experiments made on little quantities, promised very considerable gain, and though on trial in the large, is likewise said to have proved successful, yet, as he communicated the whole process to the commissioners appointed to examine the affair, and, as he has shown, that such a work might be carried on more advantageously in Holland than in other parts of Europe, its never having been prosecuted in Holland, affords a strong presumption of its not being sufficiently lucrative. The existence of gold in sands, is, nevertheless, an interesting

fact, at least to the philosopher; and further examination may, perhaps, find means of making it turn to account.

Though gold has been but lately discovered, or expected in these minerals, in which it is so common and so plentiful, their unpromising appearance having given little encouragement to examine them, there are others, whose flattering colour has raised great expectations, but which have not been found, upon experiment, to yield any gold. The yellow pyritæ, or marcasites, and other minerals of a golden colour, or containing gold-coloured specks, have, by some, been regarded as ores or matrices of gold, and accordingly submitted to operations as fruitless as expensive: their losing their colour in the fire, or changing it to a yellow, soon discovers that their tinging matter is not gold, but sulphur, or a ferruginous calx. There are, indeed, pyritæ which contain gold, and in quantity sufficient to deserve notice. Henckel, in the 12th chapter of his *pyritologia*, gives an account of some assays of minerals of this kind, brought from the Hungarian mines, one of which yielded on the centner, or 1600 ounces, half an ounce of noble metal, of which one-fifth was gold, and the rest silver: from the same quantity of another, he obtained no less than sixty ounces of silver, and eight ounces and a half of gold: but the gold, as he observes, is by no means proper to the pyrites, or an essential part of its composition, having been only casually intermixed, as it is in stones and other minerals, in the gold mines.

Many have been deceived also, by some of the talcs: of which there is one species, naturally of a gray colour, which in a moderately strong fire, changes to a gold yellow; and another, naturally of a glittering gold colour, which receives no change from moderate fire: both these bodies have a further resemblance to gold, in imparting a deep yellow tincture to strong *aqua-regia*. By repeated digestion in fresh *aqua-regis* all the colouring matter may be extracted, and the earthy part left white; but the solution yields no gold, and is found to be no other than a solution of iron. Reaumur observes, that spangles of the yellow talc are frequent in the sands of some rivers, and that they may readily be distinguished from gold, which they have often been taken for, by viewing them with a magnifying glass; the gold particles found in rivers being constantly smooth, with the edges rounded, while the talky ones, are rugged and sharp-edged.

[TO BE CONTINUED.]

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ESSAYS ON BLEACHING.

By JAMES RENNIE, A. M. Lecturer on Philosophy, &c. &c. London.

No. I.

History of the Art.

SECTION I.

Bleaching may be defined, the art of whitening cloth, and other articles of manufacture, by depriving them of such colouring materials