VII. Observations on the spots of the sun, and the nature of the light of that luminary

M. Von Hahn

To cite this article: M. Von Hahn (1801) VII. Observations on the spots of the sun, and the nature of the light of that luminary , Philosophical Magazine Series 1, 11:41, 39-44, DOI: [10.1080/14786440108675953](https://doi.org/10.1080/14786440108675953)

To link to this article: <http://dx.doi.org/10.1080/14786440108675953>

Published online: 18 May 2009.

Submit your article to this journal [↗](#)

Article views: 2

View related articles [↗](#)

motion, in consequence of having wheels of different diameters, and for covering the rider from the sun, may seem to resemble some of our present carriages more nearly than has been supposed, yet do not so strikingly differ from those which were common among the ancients as to excite much surprise. But the latter appear, indeed, extraordinary: they possessed all the advantages, as it should seem, of the *chariot way-wiser*, which has been believed to have been first invented by some members of our Royal Society about the year 1662; and of the *pedometer*, which is at present manufactured, I think, under a patent.

I am, Sir,

Your obedient servant,

R. HERON.

London,
October 8, 1801.

VII. *Observations on the Spots of the Sun, and the Nature of the Light of that Luminary.* By M. VON HAHN *.

OUR experience of the various effects produced by the sun's rays, and particularly the doctrine of latent heat and specific heat, seem to confirm the opinion that light is an actual body which streams forth from the sun, and which is connected, in a variety of ways, with the bodies of our earth. The determination of the following question, which belongs peculiarly to chemistry, "Whether the sun be actually a burning body, or only attracts the illuminating matter from the surrounding expanse of the universe?" may receive some illustration from continued observations made on the body of that luminary.

One great difficulty here is, that the sun has a peculiar light, and we are accustomed only to consider objects which almost continually receive their light from without, and which commonly produce shadows more or less perceptible according to the different directions and strength of the light which falls upon them. Now our eyes, being accustomed to shadows and projecting images, by beholding an uncommon kind of illumination are thrown into embarrassment, and cannot bring the images in harmony with sensation, the basis of all perspicuity.

One may observe the sun a long time without discovering any other spots than those which are common. The first view, therefore, of the so called solar faculæ produces an

* From *Professor Bode's Astronomical Almanac for the Year 1796.*

agreeable surprise, as it exhibits something very different from what we see in those parts of surrounding nature which are nearest to us. With a Herschel's telescope of seven feet, one beholds with astonishment, and very distinctly, in those spots in the middle of the sun's orb, parts beset with little hills separated by valleys, and single mountains, of a proportional height, which project strong shadows. It is worthy of remark, that these objects have as diminished an appearance as when one looks at things from a great height. The cause of this is to be sought for in the situation of the light which falls on them, and belongs to those optical deceptions that must occur so frequently in observing the sun, and on a knowledge of them depends the whole secret of forming a proper judgment respecting the solar bodies.

The fineness of the delineation, the scenic appearance, and the regularity of these objects, induce one to believe that solar landscapes are here actually represented; and totally destroy the idea of the sun being a flaming body; for it is impossible that the irregular movement of flame could ever produce such scenes. These parts are, at times, of a more whitish colour; but it ought to be particularly remarked that they have a somewhat dimmer light than the rest of the sun's orbit, which is every where luminous. If the division of the lights and shadows, the kind of illumination, and the gradation of the shades, be accurately observed and examined, we shall be obliged to admit that these faculæ in the sun are landscapes.

The most important observation here is, that when there are a group of such landscapes the shadows are almost always projected to one side, and are sharp-pointed. This circumstance serves to render clear to the eye a confused mixture of spots.

Let one search out, in the neighbourhood of such groups, small, single, insulated spots, and observe whether there is seen near them a weak gradation of shade, or a luminous vapour which is very familiar to us, and which shows that the light illuminates an eminence on all sides, but not with equal strength. If the eye is once accustomed to the effect that hence arises, it can with great ease convert an often exceedingly compound mixture of dark parts and luminous spots into well arranged images.

There are certainly cases in observing the sun when draughtsmen and painters only could be able to arrange properly the mixture of faint spots, and to obviate the deception which arises from half shadows. When an eminence, for example, is so strongly enlightened by the luminous matter near it,
that

that one side of it has the same brightness as the solar light itself, we then no longer see an eminence, but only a faint spot produced by the half shadow on the other side. But if the direction of the strongest half shadows towards any part of the sun's disk be once known, we may then venture to examine the greatest collection of luminous faculæ, and distinguish them with the best success. They then lose their strange appearance; and the eye becomes convinced that an assemblage of eminences and plains could exhibit such an appearance only by a light proceeding from different sides, though with various degrees of strength. Besides, it may sometimes be the case that the light may be higher, nearer, or at a greater distance in one district than another; and therefore it is difficult, under all these circumstances, to form a right judgment of an object in the sun.

The sun, therefore, must be inclosed in a luminous covering, or surrounded by an atmosphere of light—an idea first started by Mr. Bode; but the peculiar quality of it remains to be more fully investigated. A globular covering of boiling light seems to be too moveable to produce the above phænomena. The irregular spreading of the surrounding flame would every moment change the scene; as a mixture of luminous matter with the solar atmosphere would give it an obscure appearance, and be contrary to the smoothness of that line by which the solar disk is bounded.

The sun may be considered as an opaque body of itself, and surrounded by an atmosphere almost similar to ours; but the luminous matter as an uncommonly fine fluid, which, like liquid naphtha, floats on this atmosphere, and, on account of its great lightness, can never sink down under any circumstances whatever.

The atmosphere of the sun, by his rotation, being raised higher under the equator, will be depressed towards the polar regions. The luminous matter is attracted from the celestial expanse; and this hypothesis, which has been adopted by many, appears to be the true one, because the phænomena on the surface of the sun can be best explained by it. It must however be premised, that no more luminous matter is attracted than may be necessary to form almost a total covering to the sun; and that, on account of the continual influx towards the poles, it must often happen that the quantity there will be diminished. This is a consequence of the thing itself; for, if it be admitted that the separation of the luminous matter is performed by a chemical affinity, the effect of which is facilitated by the sun's rotation, the attraction will cease when the solar atmosphere has imbibed a sufficient quantity.

quantity. By observing the sun, we perceive not only the luminous matter, but the light reflected, in a lively manner, from the sun's body; and at such a distance they cannot be distinguished from each other. Through a deception of our senses, we often take the effect for the cause, and seek for the object in the light, and then again for the light in the object.

But as the atmosphere, greatly expanded at the equator, must sink down somewhere from well known causes, the luminous matter flies off on all sides towards the lower parts, and illuminates the parts it left, no longer from above, but laterally. Here we discover the solar faculæ; and if in those parts there be inequalities, there arise then half shadows, which are almost lost in the tint of the ground. If the observer fails in his judgment of the angle of inflection, he sees only a mixture of faint spots, and no landscapes.

It will now be easier to explain the proper spots in the sun, as they are called. They are parts of the sun lying under full shadows, which must naturally arise when the illuminating fluid draws itself so far back from the horizon of that neighbourhood, that no more rays can reach its centre. The contrast with the rest of the dazzling disk of the sun increases their blackness, and gives them the appearance of a burnt coal, or cinder. We shall be readily convinced that some parts of the sun's surface may lie in a full shadow, when we reflect on the great size of these spots, and consider the height of the luminous fluid to be small, or equal to about the distance of our highest clouds from the earth. It cannot be higher, else no perceptible half shadows would be occasioned, because the shadows of bodies become smaller in proportion to the height of the illuminating point. The irregularity of the spots arises partly from the different situations of the luminous matter, and partly also from the inequality of the bottom. That remarkable vapour by which they are surrounded is occasioned by a kind of crepusculum, by which the side light is conveyed to the most distant part from the centre of the shadow. As the luminous matter now appears to be more sparingly divided in the solar atmosphere, a place may be totally deprived of light by its retiring: but near the boundary of the light it is directed towards the bottom, though somewhat weakened by the refraction and reflection of the rays, as is the case in our morning and evening crepuscula; and the spots by these means obtain their conical form. If we consider this vapour more attentively, the before-mentioned landscapes can be clearly distinguished according to the above method; and if the full shadows have
considerable

considerable inequalities, there arise forms of all kinds which exhibit no determined figure, until we become no more acquainted with the situation of the shadows. On the summits of such eminences may be clearly seen rows of luminous points, which, however, arise from a reflected light; but, on account of their liveliness, are taken for the luminous matter itself. They seem to be, as it were, separated portions of the solar atmosphere, which float about within the conical cavities. But on closer examination this deception vanishes.

Lastly, should we suppose an atmosphere filled with clouds, enlightened from above by the luminous matter, the great blackness of the spots, and the matter which surrounds them, would oppose such an idea. Such a continual phenomenon is founded on invariable causes, and cannot be reconciled with the changeable nature of clouds. A real solar landscape may be recognized to be the same before seen, even after some time, when the direction of the light which falls upon it has changed.

It is more than conjecture that the sun separates the luminous matter from the firmament, and partly appropriates it to itself and partly transmits it to other bodies, which, on account of their less magnitude, are unable to effect the same. As so many stars shine with their own light, it is probable that they all derive it from the same source; and that the immense space of the firmament contains this all-enlivening matter, which nature has dealt out with a sparing hand, and seems to have destined for the most important purposes.

The phenomenon of the zodiacal light may be very naturally explained according to these ideas. The separation of the light takes place more at the sun; it floats on its atmosphere in exceedingly small quantity; and, as it streams out immediately in all directions, the terrestrial bodies are secured from immoderate heat by this tendency to diverge. The attraction of the luminous matter from the firmament must extend to a considerable distance; for that set free at the sun is supplied by another quantity, which seeks for an equilibrium, and therefore forces itself towards the solar equator. It accumulates therefore in those parts; and, as it is half separated, on account of the attraction of the sun acting at that distance, this mean state produces the paleness of the zodiacal light. This conjecture seems to be confirmed by a remark of Cassini. At a time when the solar spots were invisible, no zodiacal light was to be seen. The absence of the spots shows a superabundance of the luminous matter on the sun; consequently none is separated, and these phenomena must cease. Were their seat in the solar atmosphere, they must

show themselves more strongly the more widely the light is dispersed over the body of the sun.

Posterity, perhaps, will be able to deduce the cause of the northern lights and other phænomena from these suggestions respecting the production of the luminous matter, and to answer the important question—"By what circulation is that noble matter, which diffuses light and heat throughout all nature, again conveyed back to infinite space; or whether destined and employed for the formation and maintenance of organic bodies?"

VIII. *Experiments on Platina.* By L. PROUST*.

I. *Of the foreign Bodies mixed with native or crude Platina.*

THE bodies generally mixed with platina are stony and metallic sand, pyrites, gold, and mercury. The first kind of sand consists of small rock crystals and fragments of a hyacinth colour; the second consists of ferruginous sand of two sorts: the one octaedral, and susceptible of being attracted by the magnet, among which there are some that do not possess that property till after being heated: the other sort is equally black and angular; but the angles are destroyed in such a manner, that it is not possible to determine their figure, which seems to announce that they are not so hard as the preceding. The latter are not susceptible of being attracted by the magnet, even after they are heated, and when analysed they exhibit new substances combined with iron; phænomena by which we are authorized to consider them in their union as a mineralization of a peculiar kind, as will be seen hereafter.

II. *On the Method of separating the Sand from the native or crude Platina.*

Place three or four pounds of crude platina on a large table the edges of which are somewhat raised, and at the distance of a foot from one of the sides; then spread it out, by means of a card or a rule, in such a manner as to occupy the space of about two feet, and blow upon it obliquely with a pair of hand bellows, to make the sand, which is always lighter than the gold or platina, pass to the opposite side. If this operation be repeated five or six times, taking care to

* From *Annales de Histoire Naturel*, Madrid 1799, No. 1.