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**Airy, Hubert. - On a distinct form of  
transient hemiopsia**

*In : Philosophical transactions  
of the Royal Society of London,  
1870, février 1870, p. 247-264 et  
planches XXV et XXVI*



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XIII. *On a distinct form of Transient Hemiopsia*\*. By HUBERT AIRY, M.A., M.D.

Communicated by the Astronomer Royal.

Received January 6,—Read February 17, 1870.

It is certainly matter of surprise that a morbid affection of the eyesight, so striking as to engage the attention of WOLLASTON, ARAGO, BREWSTER, HERSCHEL, and the present Astronomer Royal, should have received but little notice from that profession to whose province it exclusively belongs. But it must be borne in mind that the votaries of Natural Philosophy are especially qualified by their habits of accurate observation to contemplate attentively any strange apparition, without or within, and, I had almost said, are especially exposed to the risk of impairment (temporary or permanent) of the eyesight, by the severity of the eye-work and brain-work they undergo, and therefore possess especial advantages for the study of visual derangements; whereas the physician, unless personally subject to the malady, must depend, for his acquaintance with its phenomena, on the imperfect or exaggerated accounts of patients untrained to observe closely or record faithfully. The complaint cannot be a rare one; each writer on the subject, in addition to his own personal experience, has mentioned instances of the same affection among his friends. In the whole body of the medical profession there must be many who are at once liable to the disease and able to describe it. And it is not unimportant. I have seen a person, terribly subject to these attacks, shudder at the very name, and turn away in horror from a drawing of the ugly sight, quite content to bear serious illness "if only the 'half-blindness' would keep away."

I think it will appear from the various accounts to which I shall refer, and from the different instances which I shall bring forward, that there are more forms than one, of transient hemiopsia.

The characters of that form to which I wish chiefly to direct attention, as described in the latter part of this paper, are so remarkable, that it is difficult to believe that such observers as WOLLASTON, ARAGO, and BREWSTER could have failed to notice them if present, or could have refrained from recording them if noticed.

(\* Most writers have used the word 'Hemiopia' (*ἡμιωπία*), apparently relying on the analogy of 'Amblyopia' (*ἀμβλυωπία*, Hippocrates, Aphorism. III. 31). But I conceive that *ἀμβλυωπία*, from *ἀμβλυωπός*, ought in grammatical strictness to be used of the eye, not of the eyesight (compare *φαιδρωπός*, bright-eyed; *πυρωπός*, fire-eyed; *γοργωπός*, fierce-eyed), though it seems to admit of the same laxity of meaning as our word 'dull-eyed.' 'Hemiopia' would mean 'half-eyedness.' The form 'Hemiopsia' rests on the analogy of words like *αὐτοψία* and *ὑποψία*, referring purely to the eyesight.





It is hardly necessary to indicate, in the outset, the broad distinction between Transient and Permanent Hemiopsia. The latter, as the more important, has naturally received the larger share of attention from the ophthalmists, and a reference to their works will show its characters to be markedly different from those of the transient forms. In Dr. BADER'S recent work on 'The Natural and Morbid Changes of the Human Eye,' p. 447, 'Hemiopia' is clearly described as presenting three varieties, of which the first is the only one that comes into comparison with the transient forms, and the chief characteristic of that first variety is concisely stated in these words: "The line of demarcation between the sensitive and blind part of the retina is vertical and sharply defined." This fact, together with the permanency of the graver form, and its association with intra-cranial tumours, apoplexy with hemiplegia, &c., will be found to offer strong points of distinction between the permanent and the transient forms of Hemiopsia.

Most writers on the subject refer, as to a fountain-head, to Dr. WOLLASTON'S well-known paper "On Semi-decussation of the Optic Nerves" (Phil. Trans. 1824, I. p. 222), in which he gives a graphic account of two attacks of 'half-blindness,' with an interval of twenty years between them.

On comparing his account with later descriptions, I think it will be recognized that WOLLASTON, ARAGO, and BREWSTER are describing one form, while Sir JOHN HERSCHEL, Sir CHARLES WHEATSTONE, the Astronomer Royal, and Professor DUFOUR, with myself, are describing another (which had also been noticed by Dr. FOTHERGILL and Dr. PARRY). The striking facts of gradual increase, motion, form, and colour which characterize the records of the later group, could not have escaped the notice of the three earlier observers, if present; and we must conclude from their silence that these features were wanting or at least were inconspicuous.

In Dr. WOLLASTON'S paper, the passage of chief importance for comparison with other accounts is the following:—"This blindness was not so complete as to amount to absolute blackness, but was a shaded darkness without definite outline. The complaint was of short duration, and in about a quarter of an hour might be said to be wholly gone, having receded with a gradual motion from the centre of vision obliquely upwards towards the left." The author lays stress on the equal affection of both eyes, and concludes that corresponding tracts of the two retinae receive fibres from the seat of disease.

WOLLASTON'S paper attracted much attention abroad as well as at home. A full translation of it appears in the 'Annales de Chimie et de Physique' (tom. xxvii. p. 102), and the editor, M. ARAGO, appends a note in which he illustrates the subject from his own experience. There can be no doubt that ARAGO and WOLLASTON describe the same affection, but in both accounts we miss the remarkable features that characterize the particular form of hemiopsia on which I shall chiefly have to dwell.



A great part of Dr. WOLLASTON'S paper is quoted and corroborated by Dr. PRAVAZ, in the 'Archives Générales de Médecine' (tom. viii. p. 76, 1<sup>ère</sup> série).

From Sir DAVID BREWSTER'S interesting paper "On Hemiopsy, or Half-vision" (published in the Edinburgh Transactions, vol. xxiv. part i., and also in the Philosophical Magazine for 1865, vol. xxix. p. 503), I must quote one or two passages for the sake of illustration.

"The blindness," he says, "or insensibility to distinct impressions, exists chiefly in a small portion of the retina to the right or left hand of the *foramen centrale*\*, and extends itself irregularly to other parts of the retina on the same side, in the neighbourhood of which the vision is uninjured."

"In the case of ordinary hemiopsy, as observed by myself, there is neither darkness nor obscurity, the portion of the paper from which the letters disappear being as bright as those upon which they are seen. Now this is a remarkable condition of the retina. While it is sensible to luminous impressions, it is insensible to the lines and shades of the pictures which it receives of external objects; or, in other words, the retina is in certain parts of it in such a state that the light which falls upon it is irradiated, or passes into the dark lines or shades of the pictures upon it, and obliterates them."

"The parts which are in these cases affected extend irregularly from the *foramen centrale* to the margin of the retina, as if they were related to the distribution of its blood-vessels, and hence it was probable that the paralysis of the corresponding parts of the retina was produced by their pressure. This opinion might have long remained merely a reasonable explanation of hemiopsy, had not a phenomenon presented itself to me which places it beyond a doubt. When I had a rather severe attack, which never took place unless I had been reading for a long time the small print of the 'Times' newspaper, and which was never accompanied either with headache or gastric irritation, I went accidentally into a dark room, when I was surprised to observe that all the parts of the retina which were affected were slightly luminous, an effect invariably produced by pressure upon that membrane. If these views be correct, hemiopsy cannot be regarded as a case of amaurosis, or in any way connected, as has been supposed, with cerebral disturbance."

"The two great facts of hemiopsy in both eyes, and of what is called single vision with two eyes, do not require the hypothesis of semidecussation to explain them. If hemiopsy is produced by the distended blood-vessels of the retina, these vessels must be similarly distributed in each eye, and similarly affected by any change in the system; and consequently must produce the same effect upon each retina, and upon the same part of it."

\* Under this term BREWSTER appears to have confounded what are now called the "optic disk" and the "yellow spot." For when he localizes the first beginning of the affection "to the right or left hand of the *foramen centrale*," he certainly means the centre of vision, as also below when he speaks of vision being perfect at the *foramen centrale*: yet when he afterwards speaks of the parts affected extending from the *foramen centrale* to the margin of the retina, "as if they were related to the distribution of its blood-vessels," he is certainly thinking of the optic disk, the punctum cæcum, whence the vessels radiate over the retina.



It is quite inconceivable that the blood-vessels of one retina should be disposed in perfect unsymmetrical correspondence with those of the other (the left side of one agreeing with the left side of the other, and the right with the right); and in fact they are not so disposed. And even if they were, and if the phenomenon were due to their disturbance, its spread would be ruled by geometrical radiation from the punctum cæcum, where nerve and vessels enter the eye, not from the 'yellow spot' at the centre of vision; and we should have two unconformable spectra, one on each side of the centre, perhaps overlapping, but certainly not coinciding, since the puncta cæca are not corresponding points in vision.

Sir DAVID BREWSTER'S experience seems to differ a little from Dr. WOLLASTON'S, the "shaded darkness" of the latter contrasting with the words "neither darkness nor obscurity" of the former; yet I think they are describing the same affection. The difference was probably due to the different circumstances of light &c. under which the observations were made. WOLLASTON was in the full light of the open air; BREWSTER speaks of his severe attacks as brought on by reading the 'Times,' probably therefore in his study, or at least indoors.

I believe BREWSTER'S is the earliest mention (except Dr. PARRY'S) of the self-luminous state of the parts affected, when observed in a dark room, and of the sensibility to general impressions of light which they retain.

Sir DAVID BREWSTER'S paper in the Philosophical Magazine gave occasion to another paper in the same Journal (Phil. Mag. July 1865, vol. xxx. p. 19) by the Astronomer Royal, who adds many particulars of great interest, and gives us a vivid picture in place of the imperfect sketches of previous writers. Indeed it is difficult to avoid the belief that we are dealing here with a new form of the disease. The outward spread of the cloud, its arched shape, its serrated outline, with smaller teeth at one end than at the other, its remarkable tremor, greater where the teeth are greater, its "boiling," its tinge of scarlet, and its sequel of partial aphasia and loss of memory, are all new features, not mentioned by any previous observer, but most important for the identification of the complaint\*. This form of hemiopsia is the one to which I desire chiefly to direct attention, the one which I am able to illustrate from my own experience.

A translation of Professor AIRY'S paper appeared in 'Les Mondes' (April 16, 1868), and not long afterwards he received a letter (April 24, 1868) from Professor DUFOUR, of Lausanne, from which I extract the following:—

"C'est avec un intérêt particulièrement vif, que j'ai lu cet article: car j'ai été plusieurs fois atteint de l'affection optique que vous décrivez. Jusqu'ici, j'en avais parlé à deux médecins qui n'ont pas paru connaître ce cas curieux, et je me figurais qu'il s'agissait d'un accident auquel seul j'étais sujet. Votre description de l'hémiopsie décrit si exacte-

\*I am able to add, from later information, that in my father's case the phenomenon exhibits conspicuous luminosity in a dark room.



*ment et si parfaitement* ce que je ressens, qu'il ne peut y avoir aucun doute. Permettez-moi de vous signaler les observations suivantes que j'ai faites sur moi-même à l'endroit de cette maladie.

"1. L'attaque commence très brusquement et toujours vers le *centre* du champ de la vision. Je cesse de voir les points que je fixe, conservant très bien, à ce premier moment, la vision latérale.

"2. Les lignes avec zig-zags se produisent alors bientôt; mais, dans les premières minutes, les zig-zags me semblent plus petits. Ils deviennent plus grands ensuite.

"3. Je crois que, chez moi, les deux yeux sont affectés en même temps; mais dans l'un l'affection optique est généralement plus intense.

"4. L'attaque dure toujours une demi-heure environ.

"5. Je n'ai pas remarqué que durant l'attaque j'éprouvais plus de peine à parler. Il m'est arrivé de terminer une leçon après avoir été atteint; je continuais à parler, mais je n'ai pu tracer des lignes sur le tableau noir.

"6. Ces attaques se sont produites à intervalles irrégulières et sans que je puisse en soupçonner la cause immédiate, depuis une dizaine d'années. J'en ai eu, en somme, une douzaine.

"7. Autrefois, l'attaque était *invariablement* suivie d'un très violent mal de tête, qui me rendait très souffrant durant plusieurs heures. J'ai eu le bonheur de trouver un moyen qui neutralise, presque tout-à-fait, cette suite pénible, et c'est surtout pour vous indiquer ce moyen que j'ai pris la liberté de vous écrire à ce sujet. Dès que l'attaque a commencé, je me mouille abondamment le front, les tempes, la nuque, les yeux avec *de l'eau froide*, plus froide et mieux. Je répète cette opération plusieurs fois pendant que le phénomène optique dure, et je tâche d'ailleurs de demeurer tranquille avec les yeux fermés. J'ai pratiqué cet abondant lavage à l'eau froide, pour la première fois, il y a quatre ans: l'accident s'est passé sans mal de tête. La seconde fois, même opération et même succès. La troisième fois, j'ai été atteint loin de chez moi et dans des circonstances où je n'ai pu avoir de l'eau: le mal de tête est arrivé comme jadis avec toute sa violence. Enfin, à ma dernière attaque, il y a quelques mois, j'ai pu de nouveau employer l'eau, et le mal de tête n'a pas paru d'une façon pénible."

Thus far we notice that the several records to which I have referred hang together by an interesting chain of historical succession. WOLLASTON'S memoir seems to have led to those of ARAGO and BREWSTER, BREWSTER'S gave occasion to Professor AIRY'S, and Professor AIRY'S in turn evoked the orderly evidence of Professor DUFOUR.

The next account I have to quote is wholly independent of all earlier descriptions. It is Sir JOHN HERSCHEL'S, and is to be found in his 'Familiar Lectures on Scientific Subjects,' p. 406, in Lecture IX. "On Sensorial Vision" (delivered before the Philosophical and Literary Society of Leeds, Sept. 30th, 1858).

"I was sitting one morning very quietly at my breakfast-table, doing nothing and



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thinking of nothing, when I was startled by a singular shadowy appearance at the outside corner of the field of vision of the left eye. It gradually advanced into the field of view, and then appeared to be a pattern in straight-lined-angular forms, very much in general aspect like the drawing of a fortification, with salient and re-entering angles, bastions, and ravelins, with some suspicion of faint lines of colour between the dark lines. The impression was very strong, equally so with the eyes open or closed, and it appeared to advance slowly from out of the corner till it spread all over the visual area, and passed across to the right side, where it disappeared. I cannot say how long it lasted, but it must have been a minute or two. I was a little alarmed, looking on it as the precursor of some disorder of the eyes, but no ill consequence followed. Several years afterwards the same thing occurred again, and I recognized, not indeed the same precise form, but the same general character—the fortification outline, the dark and bright lines, and the steady progressive advance from left to right. I have mentioned this to several persons, but have only met with one to whom it has occurred. This was a lady of my acquaintance, who assured me that she had often experienced a similar affection, and that it was always followed by a violent headache, which was not the case with me. In this case the regularity of the pattern was not great, but the lines were quite straight and the angles sharp and well defined. Had it remained stationary, it might be assumed that the retina had a structure corresponding to the figure, and that some undue pressure might render that structure visible. But such an hypothesis is precluded by the gradual transit of the lines over every part of the visual area.”

The following extract from a letter from Sir JOHN HERSCHEL to myself (May 4, 1868) will show that in his later experience the affection has begun near the centre of vision.

“It is very strange, and I am sure more than a coincidence, that two or three hours after I had read your letter, and while in the act of reading a printed book, I caught the impression of the commencement of an attack in the obliteration of one or two letters a little to the left and below the point of vision. Soon after, further out to the left in a wavy course, the printed letters ran into large angular black zigzags, and then I knew what was coming, and shutting my eyes I watched the development of the luminous bastions, &c. It was, however, by no means so well developed or striking an instance as I *have* had, but it is its recurrence evidently as a *consequence* of the mind dwelling on its description that I look on as worth notice.”

Sir JOHN HERSCHEL has very kindly communicated to me his latest experience in a letter dated Nov. 17, 1869.

“Since I wrote to you I have been very frequently visited with the phenomenon—in a greater or less degree,—never, however, with the extreme vividness of colour and distinctness of form as heretofore; and it has assumed some new features, viz. patches of a kind of coloured chequer work in some of the corners of the fortification forms.

“It always now begins with a small glimmer *near* the middle of the field of view, and



spreads out. I am now most distinctly able to say that it sometimes opens out from left to right, and sometimes from right to left.

“Here is what I find recorded in a memorandum of June 22 ult.—‘The fortification pattern twice in my eyes today. The first was turned *leftwards*. Colours red and black, or red, yellow and black with little blue, and at moments only black and white. Also a sort of chequer worked filling in, in (?) rectangular patches, and a carpet-work pattern over the rest of the [internal] visual area.

“‘The second and far the brightest and most beautiful in colouring was turned to the right. Colours very vivid. Red, blue, yellow, black. Not sure of any green.’

“I have sometimes had an impression that *one eye only* was affected—the right eye being affected with the right-handed and the left with the left-handed spectrum; but I never could devise any means of coming to a conclusion as to this point, and on the whole I lean to the opinion that both eyes are concerned in either case.”

Very recently (1870, Jan 15) I have become acquainted, through the kindness of Professor STOKES, with the following description by Sir C. WHEATSTONE of a form of hemiopia differing from my own in nothing but the total absence of colour. With the writer’s permission I insert the whole.

“I will here subjoin the note I made at the time I was first attacked with this affection.

“‘Sept. 30th, 1849.—This evening I had a curious affection of vision. Whilst I was writing, characters near the centre of vision became invisible. Thus fixing my eyes on the figure 6 in the group 4 $\frac{9}{10}$ , 4 and 7 were completely obliterated. On closing each eye alternately, I found precisely the same result. This did not arise from an ocular spectrum, for neither a black nor a coloured spot was projected on the paper, the disappearance was exactly that of an object when placed in the projection of the entrance of the optic nerve. After a short time the spot became larger, spreading towards the left in both eyes until it occupied a large oval space; objects at and near the centre of vision reappeared, but nearly the left half of each retina was blinded. The phenomenon in its later stages was accompanied by an effect like the motion of a luminous liquid. At the time the luminous mist entirely passed away, about half an hour after its commencement, a slight fainting sensation came over me.’

“I have frequently, though generally at very distant intervals, been subject to this affection. It has usually occurred whilst reading. It has always commenced near the centre of the retina, and ordinarily expanded towards the left. The zigzag luminous lines which border the spectrum externally do not commence until it has received some expansion, and they become brighter as it enlarges; before it disappears vision is restored to the central part of the retina, and when the zigzag lines arrive at the limit of the field of view, the entire vision becomes clear. On one occasion I drew with a pen the outline of the spot, a short time after its first development, as it appeared to each eye separately projected on the paper; both outlines exactly corresponded. I have never suffered any

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inconvenience after these attacks, and my vision, although I have at times tried my eyes severely with optical experiments, is I believe as good as ever, though I have been subject occasionally to this affection for more than twenty years. The only difference between the phenomena as they appear to me and as they are described by Dr. AIRY is, that in my case they are always unaccompanied with colour”\*.

This case, though clearly belonging to the later group (p. 248), yet in absence of colour shows a step towards the earlier, and suggests that all the forms of transient hemiopia are but varieties of one and the same affection, differing only in degree of prominence of their different features. We must look for more connecting links before we can be satisfied that it is so.

Hitherto I have quoted only from non-medical authorities, and I think no one can fail to be struck by the amount of attention that this obscure malady has received from so many writers of such high scientific attainments.

Most medical works that I have consulted give but little information concerning Transient Hemiopia. The fullest notice of the subject that I have met with is in Tyrrell's 'Diseases of the Eye' (vol. ii. p. 231), under the head of "Functional Amaurosis from Cerebral Disturbance."

But very lately (April 7, 1870) my attention has been drawn to two passages in the writings of earlier authors in which the disease in question is plainly to be recognized. The first is to be found in the works of Dr. FOTHERGILL, "Remarks on the Sick Headach" (a paper read before the Select Society of Licentiates, Dec. 14, 1778). Speaking of butter as an article of diet, he says, "Nothing more speedily and effectually gives the sick-headach, and sometimes within a very few hours. After breakfast, if much toast and butter has been used, it begins with a singular kind of glimmering in the sight; objects swiftly changing their apparent position, *surrounded with luminous angles, like those of a fortification*. Giddiness comes on, headach, and sickness. An emetic, and warm water soon wash off the offending matter, and remove these disorders."

The other passage to which I refer occurs at pages 557, 558 of the first volume of 'Collections from the unpublished medical writings of the late CALEB HILLIER PARRY, of Bath, 1825.'

"After violent fatigue, more especially when accompanied with fasting eight or ten hours, which has often happened to me, and now, Sept. 26, 1808, I have frequently experienced a sudden failure of sight. The general sight did not appear affected; but when I looked at any particular object, it seemed as if something brown, and more or less opaque, was interposed between my eyes and it, so that I saw it indistinctly or sometimes not at all. Most generally it seemed to be exactly in the middle of the object, while what my sight comprehended all round it, was as distinct and clear as usual, in

\* SIR CHARLES WHEATSTONE had seen my description before the paper was finally presented.



consequence of which, if I wished to see anything, I was obliged to look on one side. At other times, though much more rarely, the cloud was on one side of the direct line of vision. After it had continued a few minutes, the upper or lower edge, I think always the upper, appeared *bounded by an edging of light of a zigzag shape*, and coruscating nearly at right angles to its length. The coruscation always seemed to be in one eye; but both it and the cloud existed equally, whether I looked at an object with one or both eyes open. When I shut both eyes, covering them with my hand so as to exclude all rays of light, the coruscation was still perceptible in the same place, and what had been a semi-opaque cloud appeared lighter than the rest. When I raised or lowered the axes of my eyes, or squinted, the cloud and coruscation, though it moved its place, still bore the same relation to the object at which I looked. In this way they would remain from twenty minutes sometimes to half an hour, the cloud lessening as the coruscation continued, and the latter sometimes rather suddenly going off. They were in me never followed by headach, but seemed evidently connected with the state of the stomach; for though they sometimes occurred without any feeling of indisposition at the time, either there or elsewhere, they generally went off with a movement in the stomach, producing eructation; and anything which produced a glow in the stomach, with eructation, and perhaps without it, such as brandy, hot water, &c., always hasten their departure."

My own experience of Hemiopsia dates from 1854. I was so much struck by the first attack that I made a record of it at the time, which I allow myself to transcribe here as an authentic and independent, though very incomplete, account.

"Friday, Oct. 6th.—This morning (the last before the Michaelmas Holidays) I had an attack of that half-blindness to which — is subject; she had one yesterday. It came on while I was with Mr. DREW\*, and I noticed it first by being unable to see the 't' in "tan A" when I looked at the top. At first it looked just like the spot which you see after having looked at the sun or some bright object; I thought it might be an eyelash in the way, or something of that sort, but I was soon undeceived when it began to increase. I then bethought me that it must be the same thing that — suffered from, so I let it alone, knowing that it would go off in time, which it did, leaving a most terrible headache behind it, which is the worst part of it, the blindness itself giving no pain whatever. When it was in its height it seemed like a fortified town with bastions all round it, these bastions being coloured most gorgeously. If I put my pen into the space where there was this dimness, I could not see it at all, I could not even distinguish the colour of the ink at the end. All the interior of the fortification, so to speak, was boiling and rolling about in a most wonderful manner as if it was some thick liquid all alive. It did not belong only to one eye, but to both, the right eye having the most."

\* Now Professor of Mathematics at King's College, London, formerly Vice-Principal of the Blackheath Proprietary School.



This account of my first attack may very well stand for a description of my last, about a month ago. The type has remained unaltered from that time to this. It is not stated, and I cannot remember, whether that first attack was on the right side or on the left: from the last words I should think it was the former.

Since then I have very frequently been revisited by this affection, perhaps as often as a hundred times, possibly much oftener, sometimes at intervals of a month or two, or a week or two, or a day or two, sometimes on successive days, sometimes twice in the same day, sometimes twice in the same hour, the second attack beginning before the first had quite passed away. The circumstances and features of the complaint have varied somewhat in different attacks. I will first describe its usual course, and then refer to varieties.

Usually after two or three hours' close reading, especially if I have had insufficient exercise, I become aware that part of the letter I am looking at, or a word at some little distance from the sight-point\* (in most cases, below, to the left), is eclipsed by a dim cloud-spot that would not be noticed except for this obliteration. Even at this very earliest stage, the tremor, that is so characteristic of the developed disease, can be detected, and as the cloud enlarges, it begins to assume its proper zigzag outline, enriched with tinges of colour.

At this early stage the spot is but faintly luminous in a dark room, or with the eyes shut and shaded, and scarcely shows at all against a bright sky. Its shape and colours are best seen by looking at a shady part of the ceiling or a neutral-tinted wall.

When this blind spot makes its appearance close to the centre of vision, as soon as it begins to spread, and shows a serrated margin, it at once presents the irregular horse-shoe shape, with one arm adherent to the sight-point, and the other receding from it outward. The teeth of the adherent arm are small and fine, those of the receding arm grow larger and larger (Plate XXV. figs. 1-4).

But when the blind spot takes origin at some distance from the centre of vision, as it spreads it preserves its contour unbroken, stellate, nearly circular, until its margin nears the centre of vision; then the serration at the point nearest the centre shows irregularity, and a breach appears in the outline: one branch of the incomplete circle takes a smaller pattern of zigzag, and attaches itself to the centre of vision, the other branch takes a larger pattern of zigzag and recedes (Plate XXV. figs. 5-8).

The enlargement is slow at first, and gradually quickens.

Almost from the very first it may be noticed that parts of the faint cloud have a slow rolling heaving swaying motion to and fro, by which the outline is altered from time to time and again restored in the gradual outward spread; and superadded to this slow rolling there is rapid flickering tremor (about five vibrations per second) of the marginal rays, affecting especially such parts as are rolling at the same time.

\* I have employed indifferently the expressions "sight-point," "point of sight," "centre of vision," "centre of the field of view," to signify the point on which the eyes are fixed.



These three orders of motion, (1) gradual outward spread of the whole, (2) slow rolling of parts, (3) rapid tremor of the margin, are especially characteristic of this affection.

As the cloud extends its borders, its central region begins to fade, and clear vision begins to return in the concavity of the seething crescent. As fast as the trembling rolling jagged margin encroaches on the clear field outside, so fast the power of the enemy is waning and the faculty of sight is reasserting itself in the rear of his advance (Plate XXV. figs. 4 & 8).

The sight of both eyes is affected exactly in the same manner and in the same degree (though naturally that eye *seems* most affected which corresponds to the obliterated side of the field of view, because the nasal half of the field of view of either eye is more limited, and vision there is less distinct than on the temporal side). Whether the one eye, or the other, or both, be open, the same strange sight is seen—no mere general resemblance, but absolute identity, indubitable, unmistakable. Every angle of the outline, every gleam of colour, is still there, in its place,—survives the ordeal of alternate closure of the eyes, unaltered except by its own gradual outward spread.

When the eyes rest on a printed page, the cloud is seen as a faint shade of horseshoe shape, with serrated margin, bright-lined in some places, and varied with changing gleams of red and blue and yellow and green and orange, in order of frequency, now one colour, now another, slowly waxing and waning in harmony with the unrest around. All words and letters covered by this strange intruder are completely blotted out; those immediately adjoining the margin seem smeared into it, not cut off sharp; while inside the horseshoe there is gradual transition from the unseen to the seen, again. The tremor and rolling are plainly recognized.

Looking at any surface of uniform colour, as a green wall-paper, or a red table-cover, or a mahogany table, the cloud is scarcely to be seen at all: it partakes of the general hue of the field on which it lies, and only reveals itself by the bright lines and gleams of colour at the margin, by the tremor and rolling that belong to them, and by the obliteration of the grain of the wood and minor markings.

Looking at the bright sky, the affected portion of the field of view appears as a faint shadowy curved cloud. The bright lines at its margin are not conspicuous, except when they show gleams of gay colours. The boiling and tremor are well seen.

Looking at a white ceiling in shade, the display is seen perhaps most favourably. The bright lines of the margin contrast with dark lines behind them; the space immediately within the margin is seen to be partly broken up into wedges and angular figures of faint light and shade, especially towards the larger end of the curved cloud, which is receding from the centre of sight and shows a larger pattern in every respect,—larger zigzags, larger wedges, larger boiling, and stronger tremor. Any gleams of colour are well seen.

When the eyes are so directed that part of the cloud is seen against the sky, and part against the dark wall, it may be noticed that the jagged arch appears faintly dark against the sky, and faintly light against the wall; but the part seen against sky is de-



cidedly brighter than the part seen against wall. At the junction between the two, I find great difficulty in recognizing the transition from lighter to darker.

The eyesight thus affected, though wholly blind to boundaries of light and shade, is not disqualified for the reception of light, in quantity. The light is seen, almost unimpaired, though all definition is blurred and blotted out.

But, besides being open to general impressions of light and shade from without, the clouded patch on the field of view has an inherent luminosity of its own. If the observer shuts his eyes and carefully shades them, or (better) retires into a dark room with his eyes open, he sees a faintly luminous curved figure in the dark, brilliantly edged along its serrated outline,—the bright margin supported by a trench of black, and in different places gleaming with red and blue and other colours. The tremor and boiling are beautifully seen (Plate XXV. figs. 1-9).

Meanwhile the disease extends with gradually increasing rapidity, and spreading outwards invades the more distant parts of the field of vision. Still the small end of the curve points ever to an imaginary cynosure at the centre of sight, the rest of the arch sweeping away into outer regions, where the mind has great difficulty in watching its form. Towards the outer extremity, where the zigzag pattern is much larger and less defined, and where the cloud dies away confusedly, as the disease attains its height, the turbulence of motion becomes greatly exalted; the outskirts of the visual area seem to be boiling over with tumultuous light, that may be seen at times to collect itself in a rallying-point here and there, and presently to stream away again along the shore of the seething sea, splendid with large gleams of blue and red and green.

The climax is generally reached in twenty or twenty-five minutes from the first beginning. Then the large arm, having overspread the margin of the field, begins to fade and leave the lower part to recover slowly from the storm. The small arm is the last to perish; it remains in strength while the large arm is dying away; but soon the outward spread carries it in turn to the upper margin of the field, and it there exhibits the same fervour that characterized the career of the larger end. The whole duration of the phenomenon is just half an hour, often with curious exactness.

When the disease is about halfway advanced, I generally observe the rudiments of a fresh attack, beginning nearly where the first began, and sometimes advancing so far as to exhibit its bastioned margin, with rolling and tremor, as though the performance were to be rehearsed from beginning to end (Plate XXV. fig. 9, *δ*). But there it stops and fades away, unless it arise on the opposite side, when I have known a second attack develop itself immediately after the first.

The sight feels somewhat dazed for ten or fifteen minutes after the final disappearance of the phenomenon.

Throughout the earlier part of this visual derangement I feel no discomfort at all; my faculties are free to observe the phenomena closely and carefully. It is not till near the end, when the boiling is at its height, that the eyes feel oppressed, and the head has a presage that it is going to ache. The headache comes on gradually: it is not



localized in any particular part: it lasts for five or six hours or more, accompanied with slight nausea.

Such is the normal course of an attack of transient Hemiopsia in my case. I will presently mention such abnormal forms as seem to have interest.

Reviewing the nomenclature of the disease, I think we must recognize the inaccuracy and insufficiency of the name 'Hemiopsia' or 'Hemiopia,' used by BREWSTER and others, especially as the same name has been given, appropriately, to the graver and more permanent half-blindness, in which "the line of demarcation between the sensitive and blind part of the retina is vertical and sharply defined" (BADER, p. 447). I am tempted to look for a single word which shall express the most striking feature of the morbid vision. In Sir JOHN HERSCHEL'S account (above, p. 251), it will be seen that he was much struck by the resemblance to a fortified wall "with salient and re-entering angles, bastions, and ravelins;" and writing last year, he speaks of the visual phenomenon as "the 'Fortification Pattern.'" Dr. FOTHERGILL'S words (above, p. 254) are, "surrounded with luminous angles, *like those of a fortification.*" Other persons also have habitually used this expression in describing their own experience. I think this similitude may furnish me with the word I seek, and I venture to propose the name 'Teichopsia' (*τείχος*, town-wall, *ὄψις*, vision) to represent the bastioned form of transient Hemiopsia which I have been describing, not without a reminiscence of some words of TENNYSON'S:

"..... as yonder walls  
Rose slowly to a music slowly breathed,  
A cloud that gathered shape."

Various particulars, which would have burdened the description, I have reserved for consideration here.

*Circumstances of the attack.*—Want of exercise, sedentary employment, close reading and writing, are the usual antecedents of Teichopsia. It generally comes on while the eyes are engaged with toilsome reading. Several times I have believed the attack to be favoured by bad windy weather, for the reason that different members of my family have been affected on the same day, in such weather, though unaware of the synchronism till afterwards. I am careful to add this last caution, because I have thought (and by reference to the quotation above, page 252, it will be seen that Sir JOHN HERSCHEL entertained the same idea) that an attack might be induced by the mind dwelling on the description or imagination of the thing.

Sudden change of air and living have sometimes seemed to be the exciting cause. On one occasion, some years ago, on going into the country for a winter holiday, I had three or four attacks in the first two days.

Over exercise may bring it on, I believe. It has come on after a long walk before breakfast. It will be remembered that Dr. WOLLASTON attributes his first attack to a similar cause.



I have been attacked when I have been called early after insufficient sleep. Sometimes the attack has been nocturnal, mingling with a dream, from which I wake and find the spectacle in full fervour. Sometimes, I believe, I have passed through it without waking, for I have been half aware of it in my sleep, and have found the dull headache on me in the morning.

Not unfrequently I have found it impossible to assign any cause for the attack.

*Position in the field.*—The first spot of blindness never springs up (with me) *exactly* in the centre of vision. Even when most central, it is recognized as lying a very little to one side or the other; and this slight excentricity determines the side of the field which the disease will occupy in its development. With me, the left side is affected more frequently than the right. The most usual position of origin is  $3^{\circ}$  or  $4^{\circ}$  to the left of, and  $3^{\circ}$  or  $4^{\circ}$  below, the centre. I remember one case in which the attack began at a much greater distance in the same direction; but I have never had any experience of such a course of the cloud as Sir J. HERSCHEL describes in his paper quoted above (p. 251), coming into view at the extreme left, and gradually extending to the right over the whole field.

*Anomalies in the course of the Disease.*—In one or two cases, after reaching a certain point of development, the phenomenon has died away without ripening; it has suffered breach of continuity in its walls opposite the natural gap, and then each part has faded separately (Plate XXVI. fig. 3). In one of these cases the disease began at the beginning of a walk before breakfast in summer, and died prematurely as I walked briskly on. In the case above alluded to as having taken origin at an unusual distance below and to the left of the sight-point, the cloud preserved its contour unbroken for an unusual length of time, and took a marked oval shape, until the gradual approach of its wall towards the centre led to an opening on that side, with adhesion of one arm (small-toothed) to the centre, and retreat of the other (large-toothed) towards the periphery of the field. In only one instance have I noticed the small end of the curve refusing allegiance to the centre of sight, and then the course of the phenomenon corresponded to that given in the diagram that accompanies Professor AIRY's paper on Hemiopsy.

I believe the small end of the curve is always the upper of the two. It is so in all the cases of which I have kept any record, and I cannot remember any instance of the reverse\*.

The shape of the curve has varied considerably in different instances. Sometimes it has been as flat as is represented in Professor AIRY's diagram, when the phenomenon has not been well developed in other respects; but in far the greater number of cases it assumes a full horseshoe shape.

When a second attack has followed close upon the first, I have noticed that, besides the flattening of the curve, the salient angles of the margin have been less defined, and the marginal lines of light less clear.

\* Since writing these words (1870, Jan. 23) I have had an attack of dextral teichopsia, in which the *lower* arm had the smaller pattern, and offered rather distant allegiance to the sight-point.



I cannot remember any instance in which the cloud, springing up and spreading on one side of the field, has ever transgressed the vertical median line. I believe it has never done so, but I cannot speak positively on the point. (In Sir JOHN HERSCHEL'S case it is distinctly stated that the shadowy intruder swept over the whole field from left to right; and TYRRELL speaks of instances in which the blindness "increases so as to extend over the whole field of vision.")

*Colour.*—When viewed in the dark, the general hue of the self-luminous cloud is yellowish-white. The casual gleams with which it is adorned are, in order of frequency, red and blue, yellow, green, orange. They seem to belong to the bright lines of the margin, but are less definite, and appear sometimes to spread over a wider space; but it is by no means easy to determine the exact relations of the various tracts of light and shade in the turbulence and trembling that prevail; especially when it is borne in mind that in order to do so the attention must leave the centre of sight and by effort of will transfer itself to a point  $20^{\circ}$  or  $30^{\circ}$  or  $40^{\circ}$  removed from the centre.

*Sequelæ.*—The headache has been very slight in some cases; but generally is very oppressive, with some degree of "eyeball pain." The nausea, usually slight, was sufficient to produce vomiting on one occasion. I have never experienced any affection of speech with or after these attacks. But lately they have been followed by a slight disturbance of hearing, in which external sounds gave rise to a momentary 'rumbling' in my ears.

I have once or twice tried to relieve the headache by the plan which M. DUFOUR recommends—abundant application of cold water to head and face,—but without success. The action of an emetic in no way prevented the cephalalgia. Indeed I have little reason to regard any gastric derangement as the cause of the affection in my case; and though the stomach is secondarily affected, yet the primary disease is not easily reached by simply acting on the stomach.

In one case (among my friends) with which I am well acquainted, these attacks have been very frequent from an early age till middle life. The bastioned outline is a striking feature in this case; but I am not able to say whether the blindness does or does not transgress the median vertical line of the field of view. It is always spoken of as 'half-blindness.' Formerly the attendant headache used to be very severe, accompanied with prolonged vomiting. Latterly the visual affection has been more oppressive than the headache, and its advent greatly dreaded. Sometimes the speech is affected, and the memory at the same time; on one occasion the mouth was seen to be drawn to one side. The cause has been easily recognized in previous anxiety and mental distress, troublesome letter-writing, and the like.

In another case the phenomena are much less definite. The first sign of the approach of an attack is a half-puzzled suspicion that the eye does not see all it ought, and it requires some gazing at surrounding objects to settle the doubt. Once it began with



singular minuteness; the eyes and hands were engaged in scaling-off a certain distance from a fine linear mark, and in bringing the zero of the scale to coincide with the linear mark the zero became invisible just at the moment when the two lines were on the point of coinciding. Again and again the trial was made, ineffectually, till the nature of the failure was recognized in the gradual development of the blindness. The spot of origin must have been exactly central. In this case there is no definite serrated margin, no colour, no curve, nothing of which a picture can be made. The obscurity gathers like a cloudy film or gauze over the field, oppressive to the eyes, and accompanied with headache and nausea, and passes away after a doubtful period, leaving the impression that it is caused by disorder of the stomach. To this case the name Teichopsia is quite inapplicable; but the spread of the blindness from a small central spot, its extension over a great part of the field, and its final disappearance, establish it as a distinct variety of the same affection.

In yet a third case which I have recently met with, the blindness is sometimes brought on by looking at a striped wall-paper or a striped dress. The appearance before the eyes is described as zigzag, wavy, quivering, without colour. The first attack, in adult age, was followed by partial paralysis of one side; and later attacks have almost always had a sequel of defective speech, and tingling at the tip of the tongue, at the tip of the nose, and in the fingers and thumb.

I think I have accumulated evidence enough in the foregoing pages to establish the fact that there is a distinct form of transient hemiopsia, presenting the following main characteristics:—

1. Dependence on mental anxiety, bodily exhaustion, overwork to the eyes, gastric derangement, want of exercise.
2. Origin from a small spot near the centre of vision.
3. Orderly outward spread from the original spot.
4. Blindness to boundaries, but not to general impressions of light and colour.
5. Luminosity in the dark.
6. Bright bastioned margin, with gleams of various colours.
7. Tremor and 'boiling.'
8. Gradual occupation of one (lateral) half of the field of view.
9. Gradual recovery of clear vision in rear of the outward-spreading cloud.
10. Disappearance of the phenomenon after about half an hour.
11. Sequelæ: headache and nausea, and sometimes affection of speech and hearing, and even an approach to hemiplegia.

As to the actual seat of the visual derangement, all the facts of the case are in support



of Dr. WOLLASTON'S conclusion, that it is in the brain. The point that most distinctly bears upon this question is the exact agreement of the two eyes in the nature, extent, and degree of their affection.

Closing either eye, the scope of the other eye is blurred by the selfsame bastioned cloud\*; and the effort of the will is powerless to disregard it and see through it.

The sight of both eyes being thus equally affected, we must conclude, assuming the semidecussation of the optic nerves at the chiasma, that the seat of the affection must lie at some point behind the chiasma of these nerves.

The main division (that seems to offer itself) into dextral and sinistral teichopsia will correspond then to the distinction between right and left permanent hemiopsia, and will depend upon temporary affection of the *left* or *right* optic tract, or its origin in the corresponding optic thalamus.

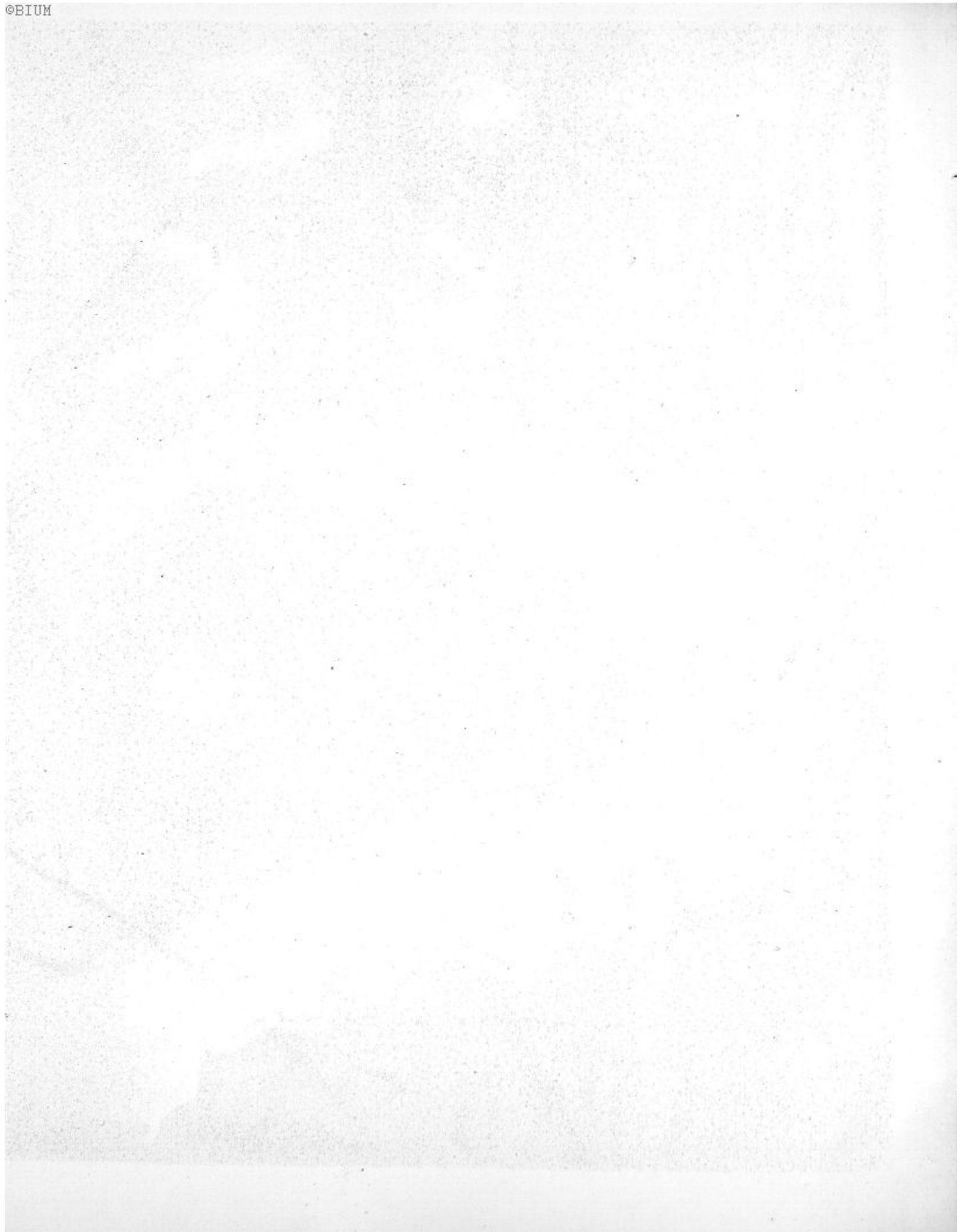
The circumstances which determine the attack, whether those of bodily exhaustion, or mental fatigue and distress, or gastric derangement, all seem to me more likely to affect the inner integral parts of the brain than such outlying dependencies as the optic tracts, and lead me to suppose that the affection is in the former rather than in the latter. The partial paralysis, the loss of speech and of memory, and the derangement of hearing, that sometimes follow an attack of teichopsia, all point to the same conclusion. But, in truth, the radical connexions of the optic tracts seem to be so wide, that it is impossible at present to do more than guess at the locus morbi. Such cases as Sir JOHN HERSCHEL'S, where the cloud passed over the whole field from left to right, can only be explained by supposing the disturbance to lie in some region of the brain where the opposite halves are in contact.

Finally, as to the nature of the local mischief:—Is it a temporary suspension of function, propagated by contiguity, among the nerve-cells of the visual sensorium (wherever that may be), due to vascular congestion, and relieved by the relief of that congestion? Does the headache, following close upon the departure of the morbid vision, tell of the further propagation of the nervous disturbance into parts of the brain where disturbance is ache, as in the visual tract disturbance is abnormal sensation of light? And the detriment to speech and hearing that has occasionally been noticed, does it mean extension of the same disturbance still further into the regions of brain-substance appropriate to those functions?

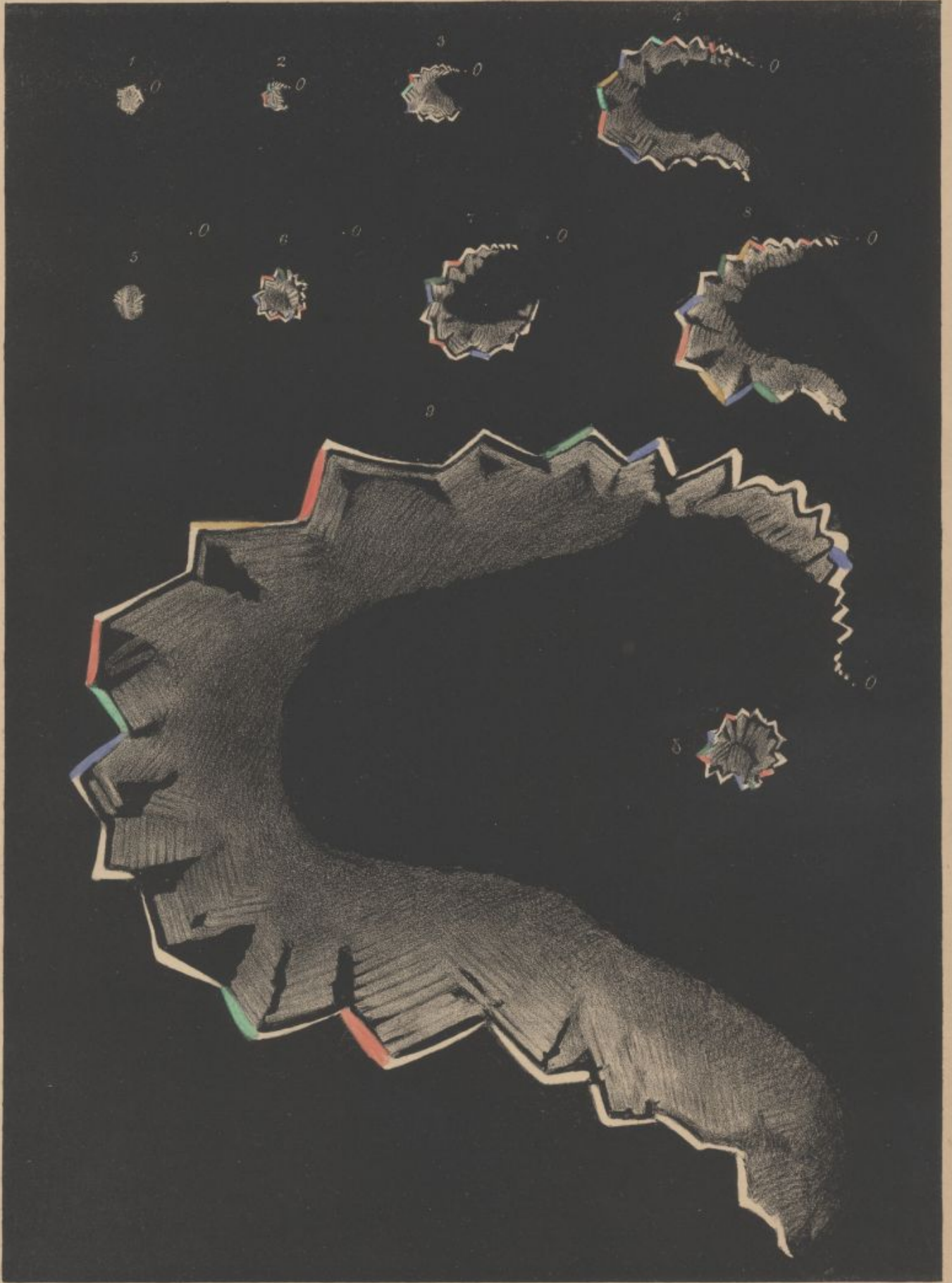
The phenomena are so definite and so localized, and their course is so regular, that we can hardly avoid the conviction that their cause is equally definite and equally localized; and it is difficult to admit so vague an agent as nervous sympathy with gastric derangement, except as acting through the medium of some secondary local manifestation in the brain.

\* This is invariably the case with myself and with most of those who have noted these phenomena; but while preparing these pages for the press (May 12th, 1870) I have received a note from Sir JOHN HERSCHEL, with the following postscript:—"On the 16th ult., at waking, I found the 'Fortification pattern' *certainly* in my left eye *only*, and much more vivid with the eye open and looking at paper than when closed."





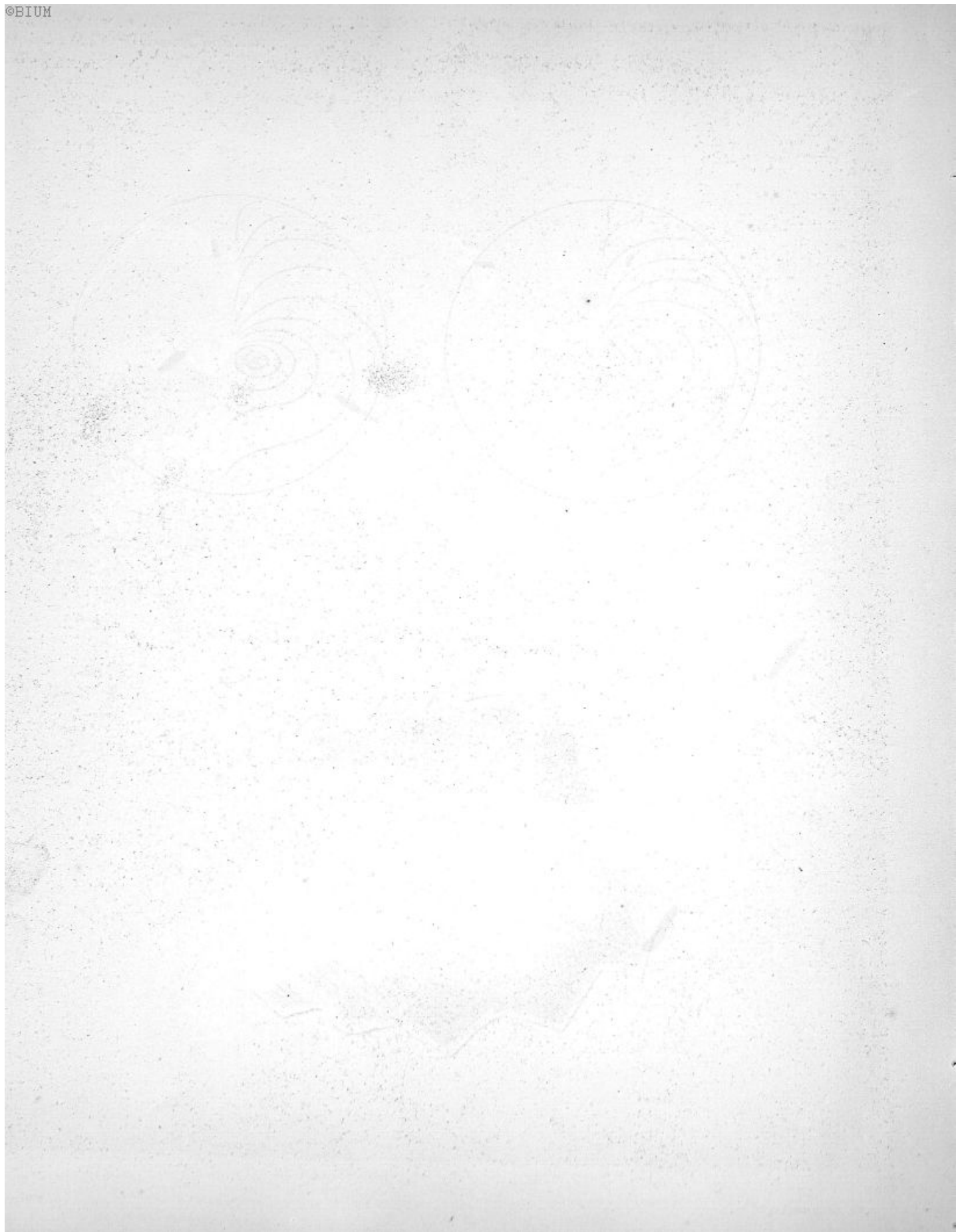




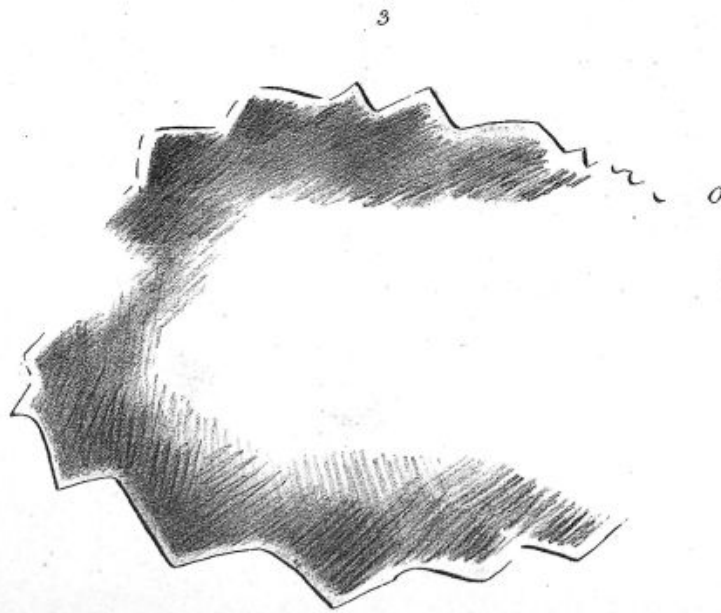
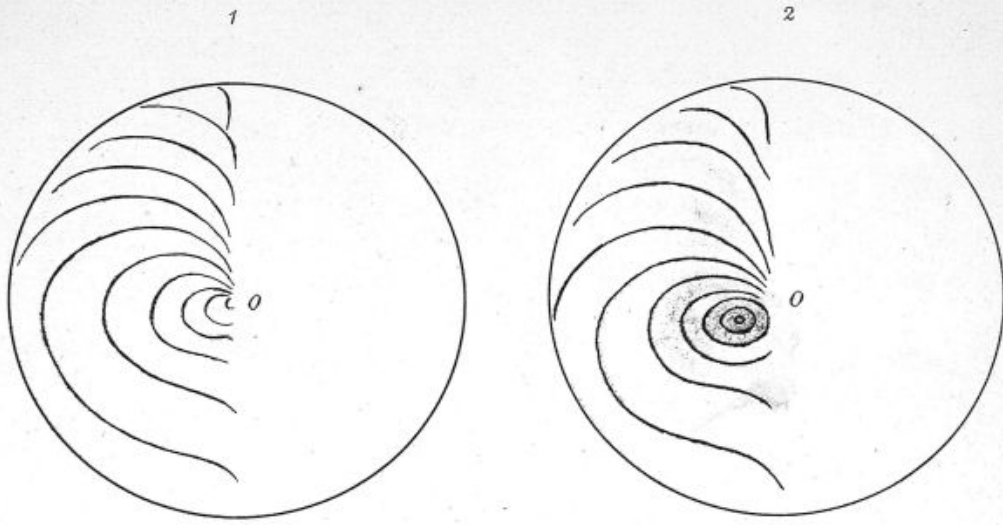
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