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Reprinted from Vol. XV of the 'Ophthalmological Society's Transactions.']

Ophthalmia nodosa.

By J. B. Lawford.

In presenting a communication to the Society on this subject I propose to read notes of a case which has been under my care, and which forms the text of my paper, and afterwards to place before you, to the best of my ability, a word-picture of the disease in its clinical aspects. Subsequently, if time permits, I shall endeavour to discuss briefly some of the many knotty points in the pathology and pathogenesis of this peculiar and little-known affection.

Notes of case.—W. H. C—, æt. 16, a schoolboy, came to see me on September 27th, 1894. Two weeks previously, while in the country (South Wales), a caterpillar had been thrown at him by a playmate, and had struck his right eye. He picked up the caterpillar and examined it, and subsequently the skin of his hand became irritable and slightly sore, and a number of small white spots appeared. These and the smarting and itching soon disappeared.

The right eye became at once painful and photophobic, and soon afterwards congested. The inflammatory symptoms continued and increased, except the pain, which disappeared in a few days. The lad was seen by a medical man, who advised that the eye should be protected by dark goggles, and gave a lotion for local application.

September 27th.—Right eye: slight œdema of lids; severe photophobia and much lacrimation on exposure of the eye to light. General congestion. Cornea not well seen on account of photophobia. Pupil contracted but circular. Upper lid could not be everted. No foreign body detected in lower cul-de-sac. No conjunctival

discharge. No pain except on exposure. Ordered Ung. Atropinæ et Cocainæ 1 per cent. t. d. to R. Right eye to be well shaded. Left eye normal.

29th.—Right pupil well dilated and circular. Congestion much less, but eye still very photophobic. Cornea clear. On eversion of upper lid, beyond some congestion of palpebral conjunctiva, nothing abnormal was detected. Lower palpebral conjunctiva much congested, thickened, and with a somewhat granular surface. A few pale papular elevations visible in the conjunctiva. Ointment continued. Ordered Gutt. Zinci Chloridi et Cocainæ Hydrochlor. to right.

October 2nd.—Right improving; photophobia and spasm less, examination much more easy. Cornea clear. Iris looks fairly healthy. No synechiæ; no nodules. In lower palpebral conjunctiva three (? more) minute black points can be seen with a magnifying lens. Two of these are in the papular elevations previously mentioned.

4th.—Right quieter. Ocular congestion much diminished. Lower palpebral conjunctiva still thickened, especially in retro-tarsal part. It is slightly œdematous, and shows soft smooth elevations in addition to the whitish papules before described. Two hairs removed from conjunctiva of lower lid; their ends could be seen with the aid of a lens, and they were easily displaced by a needle and picked up with forceps; no others could be found. Although thickened the conjunctiva was not very vascular, *i.e.* it did not bleed very readily when pricked with a needle.

8th.—Right improving. Ocular congestion very slight. Conjunctiva of lower lid still thickened and filling up lower cul-de-sac. Near the free border are several small quite white hard nodules, smaller and more pyramidal than those in which the hairs were found.

12th.—Improvement continues, though photophobia persists. Cornea and iris normal; pupil atropised. No more hairs found. Lower palpebral conjunctiva remains thickened, slightly œdematous in appearance, and with small whitish papular elevations near free border of lid. Eye remains photophobic, but is almost free from conges-

tion. Patient went back to the country, and was advised to continue treatment under the care of a medical man.

December 17th.—Came again. The eye has slowly improved since last visit, and seventeen days ago the atropine and other applications were omitted. Patient wearing smoked glasses. No photophobia. Slight injection of right eye, with noticeable dilatation of large episcleral vessels. Cornea clear; pupil circular and active, but smaller than its fellow. Conjunctiva of globe not thickened appreciably, but at lower outer border of cornea one small translucent papular elevation. Lower palpebral conjunctiva still tumefied and thick, but translucent-looking. No nodules or hairs visible. No conjunctival discharge. Examination with the ophthalmoscope revealed nothing abnormal in media or fundus. V. with correction of My. as. = $\frac{6}{8}$ partly.

The patient went home to the country, and I did not see him again till January 25th, 1895, when he came with a history of a recurrence of all his symptoms a few days after his last visit. He had been under treatment, and had had the eye tied up with a moist compress and bandage, and various local applications had been used. The condition of the eye was as follows:—Considerable photophobia, ciliary congestion, pupil contracted but circular, iris discoloured; no nodules visible, cornea apparently clear, but not well seen; lower palpebral conjunctiva red and slightly tumefied; some soreness of lid margins, very little pain. He was ordered to substitute a shade for the compress, and atropine and cocain drops were used.

January 26th, 1895.—Mr. Nettleship saw the patient in consultation; the eye was less congested, pupil half dilated and circular, photophobia rather less, cornea clear, good fundus reflex, but careful ophthalmoscopic examination impracticable.

28th.—Sent to a nursing home, where he remained till March 15th. From the date of his admission till February 28th, *i. e.* a period of four weeks, there was but little change in the condition of the eye, although the sym-

ptoms varied a good deal in intensity. On several occasions the photophobia and lacrimation almost disappeared, the congestion became much less, the pupil reacted better to mydriatics, and the iris became brighter; but such improvement lasted only for a day or two, and was followed regularly by an exacerbation of all the signs and symptoms. Pain was never a prominent symptom, but there were several short attacks of severe neuralgic pain in and about the eye. The tension of the eye varied but little; at times it was slightly lower than that of its fellow. The treatment consisted in keeping the eye carefully shaded, applying a mydriatic (hyoscine and cocain in ointment were generally used) regularly three or more times a day, and occasionally leeching or blistering the temple. An ointment of equal parts of Ung. Hydrargyri and lanolin was rubbed into the skin of the brow every evening for the last two weeks. Strychnia and phosphates were administered internally.

From February 28th, 1895, the condition of the eye steadily improved, and on March 15th the patient was again sent home. The vision on that date was—

R. (the affected eye) $\left\{ \begin{matrix} - \ 3{\cdot}0 \text{ D.cyl.} - \\ + \ 0{\cdot}5 \text{ sph.} \end{matrix} \right\} = \frac{6}{18}$ partly.

L. $-$ 3 D.cyl. $-$ $= \frac{6}{8}$.

The media of right were clear, fundus well seen and apparently quite normal.

April 30th, 1895.—Patient seen again. No recurrence of inflammation. The right lids are not open so widely as left, but there is no photophobia, no congestion of ocular conjunctiva. Cornea and iris normal. Fundus normal. The lower palpebral conjunctiva on the right side is still somewhat thickened and irregular on the surface, but shows no nodular elevations.

V.: R. $-$ 2·5 cyl. $= \frac{6}{6}$ partly. L. $-$ 3 D.cyl. $= \frac{6}{8}$. Together $\frac{6}{5}$ partly and 1 J.

Soon after the patient first came under treatment I sent him to the Natural History Museum at South Kensington, asking him to look among the caterpillars until

he found one the same as that which had been thrown at him. He did so, and picked out the *Bombyx rubi* without hesitation. As he was an intelligent lad with natural-history tendencies, this evidence is, I think, reliable.

I have found in medical literature of the last twelve years reports of eight cases of ophthalmia nodosa which seem reliable, and of one doubtful case. One writer (Hillemanns) refers to five cases in addition to the one he publishes, which were met with in the clinique to which he is attached, during the last few years. The name "ophthalmia nodosa" was suggested by Saemisch after seeing three or four instances of the affection at the Bonn clinique in the years 1890—1892. The cases occurring previously, in which the true causation of the disease had been established, were published under various titles.* The earliest was one brought forward by Pagenstecher at the Ophthalmological Congress at Heidelberg in 1883; this was followed by one by L. Weiss in 1889; Wagenmann in 1890 reported one case, Krüger in 1891–2 described three examples, Becker in 1892 one case, and Hillemanns in 1894 published one case. The case I bring forward this evening, and which is, so far as I know, the first reported instance of the disease in this country (though probably not the first which has occurred), brings the number up to nine.†

All these cases had certain features in common, and in all the diagnosis was established by removal of hairs or portions of hairs from the ocular or palpebral conjunctiva, sclera, cornea, or iris.

There has generally, but not always, been a history of injury to the eye by a caterpillar, which in most instances has been playfully thrown at the patient; in the absence of this history there is one of sudden onset of symptoms in one eye, consisting of pain—not as a rule very severe,—

* See abstracts of published cases in Appendix.

† This does not include one of Krüger's cases in which the diagnosis was doubtful, nor those cases referred to but not published by Hillemanns.

much photophobia, and lacrimation. These symptoms tend to subside after a short but varying duration, but do not wholly disappear; in the course of a few weeks an exacerbation of the symptoms occurs, and then but not till then in most instances, the patient comes under observation. In only one of the hitherto recorded cases (Krüger, Case 2) was the interval between the onset of the disease and the date on which the patient was first seen by an ophthalmic surgeon less than two months. My patient, however, came under observation two weeks after the injury.

On examination the eye is usually found to be much congested, the congestion being patchy, and both conjunctival and episcleral in type. The cornea is more or less infiltrated, sometimes vascular. There are the ordinary signs of iritis or irido-cyclitis, often with numerous posterior synechiæ, and in some instances with exclusion or occlusion of pupil; occasionally diminished tension, opacities in the vitreous, and in one case (a doubtful case of ophthalmia nodosa) detachment of retina. The most noteworthy feature, however, consists in the presence of nodules in the conjunctiva, episcleral tissue, and iris; the favourite site appears to be the ocular conjunctiva between the lower border of the cornea and the fornix, but they are found also in the palpebral conjunctiva, the retrotarsal folds, and in the deeper tissues; they are multiple, occasionally grouped, and have varied in number from three to twenty-six. These nodules are round or oval, flattened, grey or yellowish, and semi-translucent in appearance, firm when touched with the finger, and generally less vascular than the surrounding conjunctiva if in this coat. Their size has been variously given as that of millet seeds, pins' heads, or more accurately 1 to 2 mm. in diameter. When situated in the iris they are said to be rather larger than when in the conjunctiva.

Becker, one of those who has written upon the subject, says that these nodules or tubercles do not develop in man till three months after the injury to the eye; this, however, is not strictly correct: in one case (Krüger, Case 2)

a plentiful supply of well-developed nodules was observed two and a half months after the injury, and in my patient nodules were visible three weeks after the accident.

The subsequent history of a case is one of repeated remissions and exacerbations of the signs and symptoms; this is well exemplified in my case, as the eye became so much quieter about two weeks after treatment was begun that the lad went home, and for some weeks was so free from pain or lacrimation that it was hoped the attack had passed off permanently. In all the recorded cases, including my own, a period of at least six months has elapsed before the symptoms entirely disappeared, and in one instance (Krüger, Case 4) recurrent attacks of inflammation were noted for two and a half years.

The nodules when not excised are said to shrink, and eventually disappear; if in the deeper tissues, *e. g.* iris, permanent deformity (scarring) may result, and, as mentioned earlier, the pupil may become wholly or partially blocked by inflammatory exudation. Herein there is, of course, no great difference between this and other forms of iritis. Ulceration, either of the nodules or of the tissues in which they are situated, has never been observed.

The nodules, which form one of the chief characteristics of the disease, have on several occasions been removed, and microscopic sections of them examined. In fact, it was this procedure which first led to the determination of the true nature of the affection. Their histological characters very closely resembled those of tubercle, and only the section of hair in the centre of the nodule, prevented them being looked upon as such; their naked-eye appearances had strongly suggested a clinical diagnosis of tubercle. The minute structure of one of these nodules is well depicted in the plate which accompanies Krüger's paper, and which I now show.

The treatment adopted in the reported cases has been in the main symptomatic; no one drug has been hitherto recommended as specifically useful. The local remedies employed have been those generally in vogue in iritis,—

mydriatics, local depletion, and counter-irritation and application of heat. In my patient one of the peculiarities was the defective reaction of the iris to atropine or other mydriatic, the drug having to be applied very frequently in order to keep the pupil even moderately dilated. This has also been noted by Wagenmann in his case. Mercury has been administered in several cases, but without striking results. Operative treatment has been limited to iridectomy to combat the results of the iritic inflammation, *e. g.* blocking of pupil or secondary glaucoma, and for the removal of nodules and portions of hairs, and the excision of nodules in the conjunctiva or episcleral tissue.

The prognosis in ophthalmia nodosa, judging from a study of the cases hitherto recorded, must be guarded; and the opinion given will necessarily depend upon the severity of the case, the extent of structural change present, and the date at which the patient comes under observation. It would seem from the history of my case, which I might here remark was in some respects less severe than any previously recorded, that the deep penetration of the hairs does not appear to have much influence on the duration of the disease.

In no case has sight in the affected eye been destroyed, although in several (Krüger, Becker, Hillemanns) it has been seriously damaged.

As to diagnosis, the chief and perhaps the only ocular lesion with which ophthalmia nodosa is liable to be mistaken is a tubercular iritis; and the difficulty is not likely to be insurmountable. Excision and examination of the nodules will in a doubtful case determine the nature of the disease, should the clinical features not be sufficiently distinctive.

Turning our attention now to some more general facts in connection with this disease, I may point out that, as it is natural to expect, all the reported cases have occurred among the rural population. No case has occurred in a town dweller. The penetration by the caterpillar hairs

must occur during a limited period of the year, that is to say, when the caterpillars are in active existence. In one of the reported cases the date was definitely stated to be in the month of June. In all the others the date of injury, so far as it could be fixed, was in August, September, or October.

It is popular knowledge that the hairs of certain caterpillars give rise to a kind of urticaria of the skin, with redness, itching, and burning sensation; and among entomologists those possessing this objectionable quality are known as urticating caterpillars.

Inflammation of the conjunctiva of a comparatively mild type, and occurring as a localised epidemic affection, has been traced to the irritation of the conjunctiva by hairs of the caterpillar of *Cnethocampa processionea.* Wagenmann (see Appendix) refers to a number of cases of this kind occurring at Eisleben coincidently with the invasion of the town park by these larvæ; and Baas* reports two similar cases in workmen employed in destroying these caterpillars in a wood which they had infested.†

The determination of the kind of caterpillar by which the more severe disease we are now discussing is caused is seldom easy, and occasionally impossible. In Pagenstecher's case the kind could not be determined. In Weiss's case it was probably, but not certainly, *Lasiocampa pini*; in Wagenmann's case probably *Lasiocampa pini.* In Krüger's first case it was certainly *Lasiocampa rubi,* or, as usually called, *Bombyx rubi,* and in his other two cases probably the same. In Becker's case it was *Bombyx rubi* or *pini.* In Hillemann's case it was the caterpillar known in Germany by the popular name "Bärenraupe," and which is the *Bombyx rubi.* In my case it was with scarcely a doubt *Bombyx rubi.*

Thus in all the cases in which the kind of caterpillar

* Zehender, 'Klin. Monatsbl.,' 1888, vol. xxvi.

† See also a paper by Landon, "Observations on the Procession Caterpillar and the Etiology of Epidemic Urticaria," 'Virchow's Archiv,' 1891, Heft 2, s. 220.

could be determined even with probability it was one of the family Bombycidæ: the *Lasiocampa pini*, or larval form of the Pine-moth, is not found in this country, but is apparently common in some parts of Germany. Some of the German writers mention that workmen protect their hands against this caterpillar by wearing gloves. The *Bombyx rubi*, the caterpillar of the Fox-moth, is common in this country, and probably many here are familiar not only with the moth, but with its larval form. Both of these I am able to show in a dried state, and, thanks to the courtesy of the Rev. Canon Fowler, one of the secretaries of the Entomological Society, I have been allowed to borrow from the Society's library vol. iii of Buckler's 'Larvæ of British Butterflies,' which contains probably the best existing plate of this particular caterpillar.

The Fox-moth caterpillar feeds on heath, heather, grass, hazel, sallow, bramble, willow, and other plants, and does not appear till the month of August: I am unable to say the earliest time at which the Pine-moth larva appears, but if Weiss's patient's statement is correct, it must be at least two months earlier in the year than the former kind. No instances of serious eye disease, the causation of which has been traced to caterpillars other than these Bombycidæ, have been recorded; but there are numerous other varieties which are known to have an "urticating" effect upon the skin, and which would, in all probability, induce ocular lesions if the hairs penetrated the tissues of the eye. This affection, ophthalmia nodosa, must, under ordinary conditions, be rare, and we might venture to hope that if it becomes common knowledge that inflammation which seriously endangers sight may be set up by caterpillar hairs, people will cease to use these larvæ as missiles to throw at their friends, or even at their enemies.

The explanation of the penetration of the hairs into the tissues, not only on the surface, but deep in the eye, demands more than a passing notice, and it seems reasonable to suppose that there is something in the construction

of the hair which at least partially accounts for their power of burrowing, if I may use the term. They are doubtless assisted by the rubbing of the eye by the patient to relieve the irritation which immediately follows the injury.

The hairs of some caterpillars are known to have a surface layer of cells arranged like the tiles on a roof, and such an arrangement on a sharp-pointed hair would seem admirably adapted to assist the migration of the hair in the tissues.

Lord Walsingham kindly sent me (through the Rev. Canon Fowler) a note on the hairs of the *Cnethocampa processionea* larva, which reads as follows :—" The larva of *Cnethocampa processionea* is armed along the back with short brushes of hairs surrounded by longer hairs. These short brushes are easily detached, and should they rest on the hand or face and be accidentally rubbed into the flesh they produce a strong urticating effect. Each of these hairs will be found under the microscope to be armed with short points, arranged in the form of a screw ; and as the base of the hair is pointed as well as the apex, they are easily made to penetrate the skin. It is not the point of the hair which works in or causes much irritation, but the base, and it is believed that there must be a gland at the base of these tufts which secretes some strongly irritating acid. *Porthesia chrysorrhœa* and other Bombycidæ among our English species produce the same effect in a minor degree. *Bombyx rubi* has also a bad reputation, but I have handled it frequently without inconvenience by touching it delicately, so as not to rub off the hair at the base."

In the hairs removed from my patient (shown in the next room), when highly magnified, there are indications of a notched or corrugated surface near the tip of the hair, which is very sharp-pointed. The proximal end of both the hairs shows an irregular fracture where it has been broken off.

I have hitherto been unable to learn much as to the

structure and shape of the hairs of the particular Bombycidæ in question, but I hope by a further search among entomological literature to discover more detailed description of them. So far as I have ascertained by inquiry it does not seem possible to determine with certainty the species of caterpillar by microscopic examination of the hairs.

The sole remaining point I wish to discuss concerns the exact way in which the pernicious effects of the penetration of these hairs is brought about. Are the structural changes induced simply the result of the mechanical irritation of the tissues by the sharp notched hairs, or is there, in addition, a poisoning of the tissues by material contained in the hairs or resulting from their disintegration in the tissue in which they become embedded? Careful consideration of the clinical aspects of the already recorded cases, and of the case I have brought before you to-night, has led me to the opinion that the lesions are mainly, though probably not wholly, the result of a specific poison contained in the hairs. This is the view held by several of the previous writers, and seems to me the only one which will at all adequately explain the severity, long duration, and relapsing character of the inflammation. My case seems of some value in the elucidation of this point, for it differed from those previously reported in that there was no evidence of penetration of hairs deeper than the conjunctiva, and yet definite and prolonged affection of the iris and probably of the ciliary body resulted. In all the other cases nodules were seen in the iris, and therefore, presumably, hairs had become embedded therein.

Further support of the view that the changes are induced by a poison is furnished by Leydig's* observations on the skin and skin-glands of the larva of *Bombyx rubi*. An excerpt from his paper is given by Weiss in the 'Archiv f. Augenheilkunde,' with a woodcut of the

* 'Müller's Archiv,' 1855, p. 389, "Zum feineren Bau der Arthropoden."

hair and glands from this caterpillar. Karsten has also made similar observations.

Becker and Krüger made some experiments on rabbits by rubbing caterpillars (*Bombyx rubi*) against the eyeball; the hairs or fragments of them penetrated the conjunctiva and cornea, and were found in the latter tissue three months afterwards. Although the cornea became infiltrated in places, no nodules formed, and no giant-cells were discovered on examination, nor were any nodules or hairs found in the iris. Becker found that the effect upon the rabbit's eye when a dead caterpillar was used was much less than that produced by a live one.

The nature of the poison contained in these glands and hairs is a matter of conjecture; Landon (loc. cit.), in reference to the larva of *Cnethocampa processionea*, suggests that it is formic acid.

We may perhaps conclude, from the almost invariable history in these cases, that the symptoms which immediately follow the contact of the caterpillar with the eye are due to mechanical irritation by the hairs, and that these early symptoms pass off in a comparatively short time as the hairs become buried. After an interval which varies, but is usually some weeks, and during which there is little irritation, the effects of the poison become manifest, and continue with varying severity for a period of several months.

In conclusion I wish to express my indebtedness to Messrs. Waterhouse and Kirby, of the Natural History Museum, and to the Rev. Canon Fowler of Lincoln, and Lord Walsingham for their kindness in assisting me in my search for information concerning caterpillars.

(*June 13th*, 1895.)

Mr. Hartridge suggested that the prolonged irritation might more probably be due to the migration of the buried caterpillar hairs than to the introduction of a poison at the time of the initial lesion.

Mr. Donald Gunn referred to a report, for the truth of

which he could not personally vouch, that our troops in India were liable to inflammation of the eyes supposed to be due to the smooth-skinned green caterpillar crawling over the surface of the eyeballs while the men were asleep.

Mr. Lawford, in reply, said the migration of the hairs appeared to take place only during a short period of time after their penetration. They then became surrounded by a collection of cells which chiefly formed the little nodules referred to, and there they appeared to remain until they underwent disintegration of some kind. He was inclined to think that the wandering of the hairs would scarcely explain the exacerbation of the symptoms. Then, again, in his own case the important symptoms appertained to the iris and ciliary body, and yet there was no evidence that the hairs had reached the iris, no nodules having developed, and the inflammation not being of a plastic type, as it had been in the cases in which the hairs were definitely embedded in the iris tissue: nevertheless the characteristic symptoms and signs waxed and waned for some months. He was not cognizant of the affection alluded to by Mr. Donald Gunn as occurring among the troops in India; that affection must, however, differ materially from the disease under discussion, since in the latter the penetration of hairs into the eye was an essential factor in its causation.

Abstracts of Published Cases.

1. Pagenstecher.—*Bericht d. Ophth. Gesellsch.*, Heidelberg, 1883. *Zehender's klin. Monatsbl.*, vol. xxi. Case published under the heading "*Interesting preparations from an eye, caused by the penetration of fine caterpillar hairs into the conjunctiva and iris, with the development of nodules like tubercles.*"

Female child æt. 10 came under observation at the end of February, 1883. History meagre: five or six months previously, after playing in the sand, slight in-

flammation of the right eye ensued, but soon passed off. Present attack said to have begun four weeks ago.

On admission.—Right: in ocular conjunctiva small nodules, size of millet seeds, firm greyish-yellow colour, in some places grouped, in others discrete. Most numerous in fornix down and in. Twenty-six nodules counted. Some small grey nodules in iris. Conjunctival nodules removed, cut with freezing microtome, and examined. They showed exactly the structure of tubercles, exactly that in the middle of each was a section of a hair.

Four weeks later child again brought to the clinique. The right iris was now swollen, and showed several nodules very plainly. Lower and inner portion of iris removed, and on examination the nodules exhibited exactly the same structure as those from the conjunctiva. The condition of the eye slowly improved, and the nodules, which had not been removed, disappeared.

2. Leopold Weiss.—*Archiv f. Augenheilk.*, xx, 1889, p. 341: "*A case of severe inflammation of the iris the result of penetration of caterpillar hairs.*"

A man æt. 51 came to the clinique, December 3rd, 1888, with a history that on June 16th, 1888, a hairy caterpillar fell into his left eye. Severe inflammation ensued, but subsided under treatment in a few days. In October, after exposure to cold, inflammation again supervened and continued, but with remissions.

On admission, left severe inflammation, cornea streaky, iris much thickened with nodules in it, numerous posterior synechiæ; changes in the iris most marked in lower part, where four or five fine hairs could be seen embedded in the iris tissue with one end free in the anterior chamber.

Under treatment the conditions underwent some improvement; pupil dilated irregularly: some hairs removed from cornea.

On January 3rd, 1889, iridectomy down and out, followed on third day by some recurrence of iritis. In March a second iridectomy, and sight subsequently im-

proved. Portion of iris removed at first operation, hardened and sections made. At pupillary border very little change. Near this iris much thickened, and in thickened part hairs seen cut across. Microscopic appearances of nodules in which hairs were situated closely resembled those of tubercle. Caterpillar was determined to be the Pine-moth caterpillar (*Gastropacha pini*). The hairs of this are known to be irritating to the skin, and (in Germany) labourers protect their hands with gloves. This caterpillar is said to be very abundant in Germany.

3. Aug. Wagenmann.—*Archiv f. Ophthal.* vol. xxxvi, 1, p. 126, 1890 : "*Pseudo-tubercular inflammation of the conjunctiva and iris from caterpillar hairs.*"

This case, occurring in a boy æt. 9, was observed in Leber's clinique in Göttingen in 1886. Patient came 20th January, 1886, with a history that the right eye became inflamed four months previously, after being struck by a dark brown hairy caterpillar thrown at him by a playmate.

On admission, right circumcorneal injection, especially on nasal side, where there are two or three small flattened yellowish nodules. Cornea clear. Two posterior synechiæ. Below lower pupillary border a fine pointed prominence the same colour as iris is visible on surface of iris, and at lower inner part a similar but less distinct projection. Good fundus reflex; no details visible on account of photophobia. The nodules at nasal border of cornea were excised and examined. The pupil reacted badly to repeated atropine drops. The eye eventually recovered with good vision.

Microscopic examination of the portion of tissue removed showed structure closely resembling tubercle, with numerous giant-cells ; each nodule contained as its centre a section of a hair. Staining for tubercle bacilli gave negative results.

The caterpillar in this case was probably, but not certainly, *Gastropacha pini.*

4. E. Krüger.—*Arch. f. Augenheilkunde,* Bde. xxiv and xxv, 1891–2. *Archives of Ophthal.,* vol. xxii, 1893: "*Ophthalmia nodosa caused by penetrating caterpillar hairs.*"

Notes of four cases occurring at the Bonn Clinique, and called by Saemisch "ophthalmia nodosa," characterised by multiple small nodules in conjunctiva, sclera, and iris, with severe irido-cyclitis and keratitis. (Case No. 3 is omitted, as no hairs were found, and it is open to doubt whether it properly belonged to this class.)

Case 1.—Peasant woman, æt. 23, came to hospital January 6th, 1891. Left eye inflamed since September, 1890, after being struck by a caterpillar thrown at her.

On admission.—Left eye much pericorneal injection. Greyish-red nodules in lower part of anterior cornea, and several yellow-grey nodules in iris, which was hyperæmic and discoloured. Severe pain. Some days later another nodule developed in the iris, and ten yellowish-white nodules in the ocular conjunctiva below, and two on nasal side.

Some of these nodules, removed and examined, showed structure closely resembling tubercle, and containing a central hair in transverse section.

The inflammatory signs abated and recurred during a period of six months, and then became less severe. The eye eventually became free from redness and pain, but when last examined showed posterior synechiæ, opacities in vitreous, and some choroidal atrophy. The caterpillar in this case, identified by the patient, was the *Gastropacha rubi.*

Case 2.—Man æt. 26 came to hospital November 5th, 1891. Left eye inflamed since September 14th, 1891, the attack coming on after working in a field of oats. Conditions as to conjunctiva and iris very similar to those of Case 1, and some conjunctival nodules were removed for examination. The structure of these was exactly like that in the previous case, and in each nodule a portion of hair was found. There was no history of injury by a cater-

pillar; it seemed probable that the species was the same as in the former case, viz. *Gastropacha rubi.*

Case 3.—Omitted.

Case 4.—Male æt. 13 came to hospital March 12th, 1892. Since September, 1889, liable to constantly recurring inflammation of right eye. History that when in a hay-field his brother had thrown a dark brown caterpillar at him, which had struck his eye. When seen, severe iritis, with posterior synechiæ and exudation; numerous small yellow-grey nodules in conjunctiva, one such in iris, and a hair in cornea were visible on careful examination. Conjunctival nodules removed and examined microscopically, and found to contain light yellow brown hair, judged to be from the *Gastropacha rubi.* The eye slowly recovered.

5. Becker.—*Berliner klin. Wochenschrift,* May 30th, 1892:
"A case of pseudo-tubercular ophthalmia from the penetration of caterpillar hairs."

This case occurred in a boy æt. 5, brought to the Marburg Clinique, January 2nd, 1891, on account of inflammation of left eye with a history that about three months before a hairy caterpillar had been thrown into his eye.

On admission.—Left eye, pericorneal injection; minute nodules in sclera or ocular conjunctiva, down-in; in iris several small spots like scars; posterior synechiæ; iris generally atrophic. Two conjunctival nodules removed and examined; each one contained a hair in centre, numerous spindle-cells arranged concentrically, and giant-cells. One year later nodules all gone. Pupil shows results of iritis; iris scarred, V. $= \frac{2}{10}$. The caterpillar in this case was thought to be *Gastropacha rubi* or *Gastropacha pini.*

6. Hillemanns.—*Deutsche med. Wochenschr.*, June 14th, 1894 : "*Ophthalmia nodosa*" (Saemisch).

Patient was a weakly man, with numerous scars of glandular abscesses. Came to the hospital January 15th, 1894, with a history that in August, 1893, he had been struck in the eye by a large brown caterpillar ("Bärenraupe"); this was followed by severe pain, and a few days later the eye became much inflamed. An iridectomy was subsequently performed, but with no appreciable result.

On admission.—Much congestion of the eye, which showed six small prominent nodules, three in conjunctiva and three in subconjunctival tissue. Nodules 1 to 1·5 mm., firm, their colour obscured by injected conjunctiva. Cornea diffusely infiltrated. Iris discoloured; posterior synechiæ. In iris near nasal ciliary border two small raised grey-red nodules; vascular cyclitic exudation behind iris. T. − ; V. = fingers at four feet. Two larger nodules in conjunctiva excised and hardened, and examined microscopically; they showed sclerosed hyperæmic conjunctival tissue, an area of small round cells, and among these numerous epithelioid cells often collected into heaps, and giant-cells. In addition to these appearances, which are those of tubercle, there was in each nodule a section of a hair with a brownish-yellow outside structure, and clear medullary substance. Under treatment the inflammatory conditions subsided, but a progressive diminution of vision continued.

Hillemanns only gives the popular name of the caterpillar in the above-mentioned case (Bärenraupe). He refers to others occurring in the Bonn Clinique, in which the caterpillar was determined with moderate certainty to be the *Gastropacha rubi*. Altogether six cases of ophthalmia nodosa had been met with in the Bonn Clinique in recent years.

PRINTED BY ADLARD AND SON,
BARTHOLOMEW CLOSE, E.C., AND 20, HANOVER SQUARE, W.