

better devised than this; though we could have wished to see some hint as to the propriety of attending Dispensary as well as Hospital practice. Those readers who recollect the admirable remarks of Rust, on Clinical Instruction, which we gave on a former occasion (*MED. GAZ.* vol. xx. pp. 160, et seq.), will see the full force of this recommendation. That great practitioner sets forth, with the impartiality of a consummate judge, the advantages respecting attending on a general hospital, a *clinique* (or ward containing selected cases), and a dispensary. Each has its peculiar merits, so that the student not limited in time should imbibe instruction from each. However, we rather throw this out as a hint to the young physician than mention it as a serious omission in the Regulations; especially as the College merely sketches the outlines of the candidate's education, and leaves him to insert the details.

Practitioners who have attained the age of forty may present themselves for examination, if their testimonials are satisfactory, without having gone through the education above described. We have no doubt but that these Regulations will satisfy all reasonable persons, or that if any discontented are left, they will be found either among the professors of parchment-mongering universities or among incurable carpenters, who would grumble were it only that there is nothing left to grumble at:—

“Vixque tenet lachrymas, quod nil lachrymabile cernit!”

ROYAL INSTITUTION.

Friday, 25th January, 1889.

Mr. Woodward's Demonstration of the laws of Polarised Light.—Anticipation of M. Daguerra's Discovery.

MR. WOODWARD, whose researches into the nature of light are well known and highly appreciated, gratified a numerous

assembly with a display of several beautiful experiments, illustrating the laws which regulate the phenomena emanating from polarised light.

The lecturer has adopted the hypothesis of Huyghens, who supposed light to be produced in the same manner with sound, by the annunciation of a vibrating motion from the luminous body to a highly elastic ether, which he imagined as filling all space, and interposing itself between the ultimate particles of all bodies. He illustrated, by models and diagrams, the motion of these ethereal undulations, which he supposes to tremble laterally. These waves proceed through the elastic medium, and are transmitted through or reflected from bodies, according as they excite vibrations or not in the interstitial ether of those bodies. In the phenomenon of double refraction, Huyghens supposed such a constitution of ethereal medium within the crystals as should enable it to convey an impulse faster in one direction than in another.

Some remarkable facts accompanying the double refraction of Iceland spar led Newton to conceive that a ray of light, after its conveyance from such a crystal, acquires the property of *sides*, which it carries with it through its entire subsequent course, and occasions all the curious and complicated phenomena now associated under the name of polarised light.

Mr. Woodward supposes the vibration of ether to take place in two planes at right angles to each other; and the different effects produced by the agency of different bodies upon a beam of light, depend upon their aptitude at receiving vibrations from these undulations.

The lecturer employed a bright white light, produced by directing a jet of flame of the mixed gases upon lime. This light was concentrated by a powerful lens, and polarised by *tourmalin* plates, of about the thirtieth part of an inch in thickness. These plates are particularly fine, and cost Mr. Woodward 20*l.* each. Unless they are perfectly good, they do not answer the purpose. With this elegant apparatus he repeated several of the experiments of Brewster, Herschel, and Arago.

A prismatic crystal of transparent brown *tourmalin* being cut parallel to the axis of the prism, of the thickness already stated, with the surface polished, and being placed across the beam of light, perpendicular to it, and then revolved on the axis of the beam, no change is effected on the light transmitted through it. But if this plate be secured in a fixed position, and another plate be placed beyond it, parallel to the first, and turned round in its plane, a remarkable change is observed in the nature of the light; for the image on

the tablet vanishes and reappears alternately at every quarter of the circle revolved, varying through all degrees of brightness down to total or nearly total evanescence, and then increasing again as it had before decreased. These appearances depend upon the relative position of the plate. When the longitudinal sections are parallel, the brightness of the image is at its maximum, and when they cross at right angles it vanishes. The light, in passing through the first or *polarising* plate of tourmalin, has acquired a property different from the direct light. The direct ray would penetrate the second or *analysing* plate in all directions; whereas the refracted ray penetrates it in certain positions only, and in others it is wholly obstructed. Thus the second plate of tourmalin is a test of the polarisation of the ray. If we look at the two images produced by the Iceland spar through a plate of tourmalin, it will be found as the tourmalin revolves the images vary in their brightness; one increases in intensity till it arrives at a maximum, whilst the other diminishes till it vanishes, and so on alternately at each quarter of a circle, shewing that both images are polarised in opposite directions, for in one position the tourmalin transmits the ordinary ray and reflects the extraordinary, and after revolving 90° , the extraordinary ray is transmitted and the ordinary ray is reflected.

If, at the period when the image has evanesced, a film of mica or sulphate of lime is interposed between the two plates perpendicular to the polarised ray, it will be found, on turning this plate upon its axis, that the image disappears and reappears at each quarter of a circle—that is, in certain positions it *depolarises* the ray. A plate of unannealed glass will have the same effect. If the polarised image is now viewed through a plate of tourmalin with the plate of mica interposed, a succession of beautiful colours appear in certain positions of the mica, depending upon the thickness of the plate. These colours succeed each other in definite order, and are *complementary* to each other.

Mr. Woodward, by means of his beautiful tourmalin plates, demonstrated the structure of various crystallized bodies, by shewing their affections under polarised light; and the phenomena of colour produced by the action of these crystallized bodies were truly splendid. The lecturer first repeated the experiment of Huyghens upon the Iceland spar. The polarised ray being transmitted through mica, the analysing plate was revolved from a position where no colour is seen. The colour *red* was at a maximum at the angles of revolution 45° , 135° , 225° , 315° ; while it disappears altogether at the angles 0° , 90° ,

180° , 270° . If the plate of mica be fixed at the angle where it produces the brightest *red*, and the analysing plate be revolved (the point where the plate begins to move being supposed to be 0°), the brightness of the *red* will gradually diminish till the plate has turned round 45° , when it disappears. Beyond 45° a faint *green* appears, and gradually increases in intensity till it reaches the maximum brightness at 90° . Beyond 90° the *green* becomes paler, till it vanishes at 135° , where the *red* again comes in view, and reaches its maximum brightness at 180° . The same changes are repeated between 180° and 360° .

Mr. Woodward subjected to experiment various crystallized bodies, as rock crystal, Iceland spar, selenite, Arragonite, nitrate of potass, sugar, and various fluids; and the resulting phenomena were truly magnificent, and perfectly justified the assertions of Herschel, "that the characters afforded by the use of polarised light as an instrument of experimental inquiry, are so marked and intimate, that they may be said to furnish us with a kind of intellectual sense, by which we are enabled to scrutinize the internal arrangement of those wonderful structures which nature builds up by her refined and invisible architecture, with a delicacy eluding our conception, yet with a symmetry and beauty which we are never weary of admiring." In France, polarised light is now very generally employed as a test of the purity of various fluids.

Mr. Woodward introduced to the notice of the meeting a microscope invented by Goddard, and constructed by Ross, in which plates of glass placed at an angle of 57° were employed as the means of polarising light, instead of the first tourmalin plate; and plates of mica were used instead of the second analysing tourmalin. Instead of a lens, the reflector invented by Mr. Goadby was employed, and the jet of ignited gas was directed on an upright cylinder of lime, which was made to move on its longitudinal axis by means of mechanism concealed from view. This apparatus has the great advantage of being cheap, and in Mr. Woodward's hands it proved certainly as perfect a means of exhibiting the properties of polarised light, as the more expensive tourmalin apparatus of Mr. Woodward.

After Mr. Woodward concluded his demonstrations, Mr. Faraday invited the attention of the members to some *photogenic* drawings exhibited in the library, and which had been made some years since by Mr. Talbot, who has completely anticipated M. Daguerre in arresting the fugitive pictures of the camera obscura.

Sir Humphry Davy, in an early volume

of the Quarterly Journal of the Royal Institution, has pointed out the practicability of producing a chemical substance upon which the rays of light should act, so as to render the light and shade permanent, and thus perpetuate the drawing made by the pencil of nature. IDIOS.

[In the notice of Mr. Palmer's new electrical machine, in our last report, we omitted to state that it was provided with two cushions; by which arrangement the power is greatly increased, and the spark acquires that peculiar pungency and intensity which is observed in the spark of the new plate machine.—ED. GAZ.]

PHYSICAL SOCIETY, GUY'S HOSPITAL.

Jan. 26, 1839.

BRANSBY B. COOPER, Esq. F.R.S.
IN THE CHAIR.

DR. HUGHES read an essay—

On the Existence of Fibrous Concretions in the Heart prior to Death.

Dr. Babington, in reply to objections made by Dr. Hughes against an article written by him for the Cyclopædia of Anatomy and Physiology, on the morbid condition of the blood, said, that before writing that article he had carefully examined the literature of the profession in reference to this point, and had endeavoured to give the result historically, without prejudice either way. He had no evidence to prove that clots could exist in the cavities of the heart for any length of time before death; indeed, it seemed impossible to imagine that life could continue with such formations. There was nothing in the nature of coagula found in the heart which might not be accounted for on the explanation that they are the result of a postem mortem, or moribund state. It was difficult to obtain direct proof in man; but he had seen several horses killed, and had opened their hearts immediately, but had never met with one of these concretions. He had been informed by a knacker, who had been engaged in that business twenty-eight years, and had slaughtered many thousand horses, that he had never found a fibrinous clot in the heart; but when the animals die a natural death, such were constantly met with. With regard to the organization of these clots, Dr. Babington said, if there be inflammation or lesion of the lining membrane, doubtless effusion may take place at the spot, and acquire organization from the vasa vasorum of the original structure; but he deemed it contrary to the laws of the living body that

clots formed from the mass of the circulating fluid, as Dr. Hughes had described, should ever become vascular and organized.

Dr. Bossy had great deference for the authority of Dr. Babington, but considered it nevertheless proved, both that clots were capable of injection, and that they occasionally existed in the heart before death. The latter was directly inferred from the circumstance that pus had been found by some writers within the substance of the globular concretions in the cavities of the heart.

In answer to a question put by Mr. Greenwood,

Dr. Hughes said, clots were undoubtedly found in most hearts as the result of post-mortem coagulation; but this was not the subject of his paper: his object was to shew that fibrin was occasionally deposited from the circulating blood, in the cavities of the heart, before death; and that these were susceptible of organization under certain circumstances, as evidenced by the fact of injection of air, size, and mercury, into them, and by osseous deposits having been described in them by Burns and others. With regard to what Dr. Babington had said, he quite agreed that life could not endure in a heart full of coagula; but the clots of which he spoke did not occupy the whole cavity: there was usually some aneurismal dilatation or sinus in which the mass lay, without interrupting the course of the circulation. It was indeed his belief that they were probably at all times the result of a moribund state, but a moribund state might be one of long continuance, sometimes extending to weeks. That sudden death occasionally resulted from these concretions he also believed: a case was mentioned by Mr. Key, where a lad was found dead on the water-closet. On examination the only pathological appearance discovered was, a mass of fibrine blocking up the auriculo-ventricular passage. He quite agreed with Dr. Babington, that whenever they acquired vascularity it must be derived from the vasa vasorum; he did not believe that coagula could originate their own vessels, (though Andral appeared to think so,) but this was no real objection to his views. With regard to Dr. Bossy's statement of pus being found in clots within the heart, he did not regard this as pus, but merely a softening or breaking down of the interior, and this occurred not in adherent coagula, but in globular masses that were loose within the cavities: he did not consider this any proof of organization.

Dr. Addison doubted the possibility of clots of blood becoming organized under any circumstances. Examine the layers