amphitheater of City Hospital and demonstrated during the first hour the gross morbid anatomy of several fairly typical heart lesions. Recitation was then conducted by a student on the normal physiology of circulation. This was followed immediately by students' demonstrations of the effects in dogs of hydropericardium, of acute myocardial degeneration, of aortic stenosis and of aortic insufficiency. In line with the student's discussion of the normal functions of heart muscle Dr. Scott presented and discussed a few electrocardiographic tracings. After a brief rest the students then under Dr. Scott's direction examined three living patients exhibiting murmurs, thrills and cardiac arrhythmia.

It is hoped that as the experiment in progressive education is more widely applied to pathology the results will be improved, but even with the experience now at hand there is little doubt that this method has an application in pathology and that in so far as it has been attempted it has been proven to be eminently successful. Certainly, the idea is practicable and its success will depend upon the teacher's interest in the educational side of his subject, his willingness to grant as large a measure of freedom as possible to the students' own effort, his keenness in careful supervision and his confidence in the propriety of the idea.

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A NOVEL MAGNETO-OPTICAL EFFECT

(Further Investigations)

In the former account of this novel effect, it was pointed out that a microscopic examination of the iron arc smoke deposited on a glass surface gave evidence of the existence of fine particles of iron compound arranged in short chain sections of bead-like relation.

It is now thought that this peculiar formation may have its origin in the outer envelope of the arc flame where the particles are formed, and where they are lined up around the arc stream by the circular magnetism surrounding the current conducted by the hot vapor stream of the arc. The particles, being magnetic, would tend to form chains or rings surrounding the arc. These would not be stable, however, but would float away as they became shattered by gas currents, and remain only as short lengths of particles held together. To throw light on this possibility, a small vertical, hollow cylinder of plaster of Paris open above was arranged with iron electrodes (for forming an arc) passing through its sides and meeting in its center. By passing the current of a storage battery giving about 50 volts through them in contact and separating them, an iron arc could be produced at will within the plaster cylinder. The dimensions of the cylinder were such that a microscope slide 3″ x 1″ could rest across the open upper end of the plaster cylinder, only partly closing it, the slide lying horizontally above the arc electrodes at a distance of about 3 cm. Such a slide could receive a layer of smoke on its under surface when the arc was formed below it. The microscope in that case showed only a confused deposit.

When, however, there was placed above the slide a strongly excited electromagnet with its poles resting on the upper sides of the slide or close thereto, such poles being about 3 cm. apart, a smoke deposit of a remarkable character was produced. Even as examined by the unaided eye in diffused light, there was decided evidence of a structure or striation. When, however, the microscope was used, with even comparatively low powers of about 300 to 400 diameters, there was disclosed a decided striation seemingly composed of brownish particles in strings extending over the slide and following the direction of the field. There was noted a surprising regularity in the distribution or spacing of the striæ, as if the surface was covered with fibers laid on systematically side by side.

There were, however, curious objects composed of small spheres (evidently globules of iron) strung together in a line of two, three, four or more, such spheres having no uniform size. Most of these iron globule groups lay, of course, in the field direction and were very

large relatively to the particles in the striation covering the most of the surface of the slide. But each of these straight settings of globules possessed a singular appendage, generally at one end only, but sometimes at both ends. It consisted of a brush-like tail composed of the brown filamentous chains of particles like those covering the slide as noted above. They gave the appearance of tufts, suggesting a growth of beaded fibers from the end of the string of globules. By focusing, these tufts or tails could be seen as projecting outward (upward) in an inclined direction. This means that the tufts did not lie on the slide surface, but sprang outward from the globule which carried it. The globule at the other end of the short chain (generally the largest in the line) was often to be seen as having a convergence upon it of the usually parallel striæ of the other parts of the slide, indicating clearly that the globules strung together were acting as small magnets with poles at each end, towards and from which poles, the convergence and divergence of the magnetic lines was indicated by the fine striæ of particles taking their direction.

The polariscope showed that the striated smoke layer caught on the slide has the same property of scattering or diffusing light (as plane polarized light) that the smoke oriented in the air by a magnetic field has, but, of course, the slide preserves the orientation and needs, to produce the results, no magnetic field after its formation or deposition. The slide covered with the striated smoke film is, in fact, a polarizer.

Examination between crossed Nicol's prisms (dark field) discloses the fact that the tufts of fine fibers carried by the rows of globules, show as luminous spots on the black field, clearly indicating that the groups or tufts have a polarizing effect if they are in proper relation to the rays passing through.

As was to be expected, any hollow vessel or enclosure capable of retaining the smoke from an iron arc can be used in demonstrating the original luminous phenomenon. A glass flask of from 1 to 2 liters is readily sensitized, as it were, by holding its mouth over an arc for a short time, allowing smoke from the arc to enter, and then corking the flask. It may then be used to show the effects by allowing a beam of light to traverse it while held in the field of a current-carrying coil. While this was being done, it was noticed by Dr. Hollnagel of the laboratory that when the coil was traversed by an A.-C. current of twenty cycles, the flask, when near the coil, gave the usual effect of increased luminosity of the smoke in its interior. When, however, the flask was removed from the coil a distance of several feet, the steady luminosity was replaced by a flickering which kept pace, not with the alternations of current in the coil, but with the cycles only. The flickering was, as it appeared, at the cyclic rate. This flickering was noted even at a distance of twelve feet from the coil, although the coil was but 7 inches in diameter and about 2 inches in axial direction. The flickering is a curious effect, and it is difficult to explain, especially the fact that it appears to keep time with the cycles and not the alternations of current. It points to some sort of magnetic retention or polarization of the iron particles of the smoke. They may even rotate or oscillate in obedience to the field fluctuations, but there is needed much more work of investigation as to the cause of the peculiar behavior. The experiment clearly shows that a very moderate field intensity suffices for lining up the particles in the air, and so producing the luminous effect.

Emphasis is again given to the fact of the extremely small amount of iron particles suspended in the air, capable of giving a decided effect.

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June 17, 1921

SCIENTIFIC EVENTS

THOMAS HARRIOT[1]

THE tercentenary of the death of Thomas Harriot, the mathematician and astronomer, occurred on July 2. Not only was he the most celebrated English algebraist of his time, but

[1] From *Nature*.