[FROM SCIENCE GOSSIP.]

NOTE ON MELICERTA RINGENS.

BY W. H. DALLINGER, LL.D., F.R.S., F.R.M.S., ETC.

This small and beautiful denizen of our ponds has become so familiar an object to the amateur, and has so long commanded the interest and close observation of the student, that it may fairly be supposed nothing short of prolonged and systematic study could tell us more concerning it than from so many contributors is now known. Apart from the beautiful results obtained by the insight and patient researches of Gosse⁽¹⁾ confirmed

FIG. 2.—*M. ringens*, showing the ciliated lobes, the chin, CH, the pellet in its mould, PM, and antennæ, AN. Copied by Dr. Dallinger from figure by Dr. Hudson.

ed and enriched by scores of subsequent observers, it may be doubted if anything more thorough could be done than that by Mr. Charles Cubitt⁽²⁾ and Judge Bedwell⁽³⁾, on the characteristic and really wonderful features of this rotifer, all of which has been carefully considered and analyzed by the chief authority on this subject, Dr. C. T. Hudson⁽⁴⁾.

Nor is there any claim in this note for the addition of any fact to our previous knowledge; it is simply a demonstration of the manner in which a detail familiarly known to be constantly carried out is accomplished.

No greater perplexity presented itself to the earlier microscopists in the study of this and similar forms than the extreme limits of space involved in the use of objectives of considerable magnifying power.

For many years the habits and activities of *Melicerta ringens* have afforded me the keenest pleasure and interest, and to many of these I have applied with admirable results the advantageous properties of the apochromatic system; and there is one point in which it has yielded an interesting result.

In the summers of 1893 and 1894 I was fortunate enough to come upon an exceedingly abundant supply of these organisms, and they were not only very plentiful, but extremely vigorous; moreover, many of them were evidently of greater age than those I had usually seen. This was manifest in the great comparative length of some of their tubes, and the remarkably graduated sizes the pellets presented from the base to the top edge; also in the confluence or "weathering" of these in the lower and middle rings, and in the numerous growths of algæ, diatoms, conferva, and other things upon the tubes.

An average one drawn from life is shown in Fig. 1. The intense and rapid action of the cilia arrested even an eye familiar with the object; and the lobes assumed a great variety of soft and beautiful curves, not unusual but never so frequently seen before. A very common one of these is shown in the illustration.

It is not too much to assume that the readers of this journal are familiar with all the actions of this beautiful rotifer as a brick maker and a tube builder. It is familiar to all that by the cilia about the edge and upon the bosom of her petal-like lobes she obtains a vertical stream of particles which are with wonderful delicacy separated into material serving for food and material serving for the manufacture of the pellets, which are afterward used as "bricks" to build her tube in a succession of rings. We may perhaps be pardoned none the less for borrowing a figure from Dr. Hudson (Fig. 2) which shows the ciliated lobes, the "chin" (CH), the pellet in its mould or cup (PM), and the antennæ (AN).

Mr. P. H. Gosse says: "Below the larger petals (that is, on the ventral side) there is a projecting angular chin (CH, Fig. 2) which is ciliated; and immediately below this is the little cup-like organ, . . . a small hemispherical cavity. . . . On my mixing carmine with the water the course of the ciliary current was readily traced, and formed a fine spectacle. The particles are hurled round the margin of the disk until they pass off in front through a great sinus between the larger petals. . . . If the atoms befew, we see them swiftly glide along the facial surface, following the irregularities of outline with beautiful precision, dash round the projecting chin (CH, Fig. 2) like a fleet of boats doubling a bold headland, and lodge themselves one after another in the little cup-shaped receptacle beneath (PM, Fig. 2). . . . The contents of the cup are whirled round with great rapidity"⁽⁵⁾, and become the bricks or pellets with which the tube is built. Now the fact that these pellets or "bricks"

were deposited in rings, constituting the familiar tube, is a mere commonplace of the natural history of minute life. In his first and most original paper, Mr. Gosse, having seen the brick produced, says: "I now watched the animal with eager expectation, and presently had the satisfaction of seeing it bend forward its head, as I had expected, and after a second or two raise it again, when I saw that the little cup had lost its contents. . . . This process I saw repeated many times in succession, until a goodly array of pellets were laid, . . . but very irregularly"⁽⁶⁾.

Again, in regard to a young *melicerta*, "A pellet was quickly formed and instantly deposited at the foot; the same operation was repeated with energy and industry, so that in a few minutes a row of pellets were seen forming a portion of a circle around its foot base"⁽⁷⁾.

Again, the pellet having been formed, "Suddenly now we see the animal bend itself forward, till the cup is brought into contact with the upper edge of the case, it remains so bent for an instant, and then as quickly resumes its upright position. The cup, however, is now empty; for the consolidated pellet . . . has been left on the edge of the case"⁽⁸⁾.

In the same way that most careful and acute observer, Judge Bedwell, tells us in regard to the deposit of the "brick," that "it does it so quickly, that before you have got over the agitation and surprise which its unexpected and rapid change of position causes you, the act, like a conjuring trick, is over, and

FIG. 3.—*M. ringens*, in act of placing pellet, $\times 210$. Drawn from nature by Dr. Dallinger.

the animal is in its old position again, with an empty pellet organ hard at work at a new brick"⁽⁹⁾.

It will of course be clear, and is fully known to every observer, that it must be a matter of difficulty to see distinctly what are the details of this bricklaying, effected, as it is, so rapidly. The prime elements of success are sharpness of definition, with sufficient magnification, and ample room for the activities of the rotifer.

With plenty of vigorous specimens in full activity, and by happy incidence, one well placed and building, taking a 240 mm. objective, we may commence with the initial magnification of the lens (105 times), and we may go on to 250 or more diameters without change of focus or disturbance of the object; and by patience and repeated observation, we may at last observe all the simple details of the placing of the brick.

Judge Bedwell made the observation that a small pimple-like protuberance armed with setæ and lying between two hooks, on the opposite side of the cup in which the brick is made, possibly determines the place in which the brick is to be deposited; for "when the pellet is ready the animal turns round and deposits it at the spot with which this pimple . . . was in contact at the moment before the animal began to turn"⁽¹⁰⁾.

This is undoubtedly true; in the cases observed by him it may have been always true, but in the many observations made through two summers I found that it was never so with the first brick of a new ring, but with the exception of three instances was always the case with every other pellet of the ring. What happened is shown in Fig. 3. The brick was ready, being always formed in from three to four minutes, then the rotifer twisted swiftly round about half the circumference of her tube, pressed the side of her body against the side of the tube she had just turned herself from, arched her body over, laid her antennæ parallel with each other and near enough to each other to form a sort of double rail or frame, down which the pellet could roll or slide, and guiding it to the exact spot to which it was destined to go. Then with the end of her "chin" she pressed it into position, much as, with a

finger, we may press an electric knob, and then instantly rose, mostly turned rapidly to its former position, and again proceeded to the construction of another pellet.

When we remember that the dot of an "i" in this type will probably more than represent the superficial area occupied by the organism, all these refinements of operation must surely awake interest in the mind, and cause the least thoughtful to perceive that size is merely a finite mental concept and in no way affects the perfection of the adaptations with which a living organism is endowed.

REFERENCES TO WORKS QUOTED IN THIS ARTICLE.

(¹) Trans. Micros. Soc., vol. iii, 1852, p. 58; Quart. Journ. Micros. Soc., vol. i, 1853, p. 71; Pop. Sci. Rev., vol. i, 1862, p. 474. (²) Month. Micro. Journ., vol. iii, pp. 240-1; *ibid.*, vol. v, 1871, p. 205; *ibid.*, vol. viii, 1872, p. 8. (³) Month. Micro. Journ., vol. xviii, 1877, p. 214; J. R. M. Soc., vol. i, p. 245. (⁴) J. R. M. Soc., vol. ii, 1879, p. 6; "The Rotifer," by C. T. Hudson and P. H. Gosse, two vols., 1886. (⁵) Tenby, pp. 314-315. (⁶) Trans. Micro. Soc., vol. iii, 1852, p. 62. (⁷) Quart. Journ. Micros. Sci., vol. i, 1853, p. 75. (⁸) Popular Sci. Rev., vol. i, 1862, p. 485. (⁹) Month. Micros. Journ., vol. xviii, 1877, p. 221. (¹⁰) Month. Micros. Journ., vol. xviii, 1877, p. 221.

The Vesicating Constituent of Croton Oil.

In a communication made to the Royal Society, Mr. Wyndham R. Dunstan, M.A., F.R.S., and Miss L. E. Boole, Lecturer on Chemistry in the London School of Medicine for Women, record the results of an experimental inquiry into the nature of the vesicating constituent of croton oil. According to the research of Buchheim, and more recently of Kobert and Hirscheydt, the vesicating action of croton oil is due to an acid closely allied to oleic acid, which has been given the name of crotonoleic acid, and which is now prepared for medical purposes on a large scale in Germany. The process consists, broadly, in the formation first of barium crotonoleate, and the subsequent decomposition of this with dilute sulphuric acid, and extraction of the liberated crotonoleic acid as a viscid oil with ether. By a series of operations in which alcoholic extraction and separation by means of lead oxide were made use of, a resinous substance having extraordinary power as a vesicant. The composition of this resin is expressed by the empirical formula $C_{15}H_{18}O_4$. All attempts to crystallize or to obtain crystalline derivatives failed. It is a hard, pale yellow, brittle resin, nearly insoluble in water, light petroleum, and benzene, but readily dissolved in alcohol, ether, and chloroform. In regard to its constitution it is concluded that the vesicating constituent of croton oil is a lactone or an anhydride of complicated structure.

FIG. 4.—*Melicerta ringens*, $\times 100$. Drawn from nature by Dr. Dallinger.

Photographing the Heavenly Bodies by an Ordinary Camera.

We first of all desire to disabuse the mind of the average photographer that, in order to practice celestial photography, one must necessarily be possessed of very costly instruments, such as elaborate and large astronomical telescopes, and equally elaborate equatorial stands, with clockwork for driving the same, which are undoubtedly necessary in the observatory in which it is desirable to get out of the heavens all that they contain. But our desire is at present to point out how a vast amount of real pleasure is to be obtained by practicing celestial photography with such a camera, lens, and stand as all photographers are supposed to possess.

The dimensions of camera in which we have found the balance of advantages to reside is that for 5 by 4 plates, the lens used in conjunction with it being a portrait one, which works with great rapidity of action, covering the above named plate without any diaphragm. When we state it to be the well known No. 2B of Dallmeyer, our readers will at once realize that its aperture is two and three-quarters inches and its intensity great.

From our experiments on the moon with this lens, we find the concentration of light so great as to permit of an instantaneous exposure being given. As every one knows, the moon sails across the heavens with an apparent quick motion, a motion that will be more readily appreciated if it be examined by a telescope fixed on a stand. With a lens such as that just mentioned, and on a clear night, an exposure of such short duration may be given as to enable a well exposed negative to be secured—one which, when examined under a compound microscope, shall show, in a well marked manner, all the salient features of our satellite. This cannot be obtained if the exposure be prolonged, in consequence of the lunar motion, owing to which any departure from instantaneity will give an elliptical instead of a circular shape.

It need scarcely be remarked that by employing a lens of longer focus than the one mentioned a larger image will be obtained; but, unless the angular aperture of the objective be equal to the shorter one, this will be at the expense of rapidity, unless, of course, the camera be mounted on an equatorial stand, when the exposure may be prolonged to any necessary extent.

We have spoken of a high class equatorial stand as being expensive. So it is for observatory work, but for ordinary photography it need not be so. It is quite possible to construct one of a somewhat rude appearance for a few shillings, but which will be capable of doing good work. We will describe one of this class, which we had made some time since.

The legs are hinged to a very strong table, on which are two spirit levels standing at right angles to each other. Raised up at a slope from the table is a strong tube, which is fixed very securely. The angle at which it is raised must be equal to the latitude of the place where operations are to be performed. This can easily be ascertained from any good map, in which the lines of latitudes will be found given at the right and left sides. For example: At Kirkwall it would be found to be 58° 59'; at Edinburgh, 56° 56'; at London, 51° 31', and so on. The tube, when thus erected, forms the polar axis, for it must always point to the pole star, and it must be supported in a steady position by a strong strut. We may here note that the pole star is not absolutely stationary in the north, but it is quite near enough to serve our present purpose.

A rod, which carries the table for the camera, is fitted to pass smoothly into the upright tube spoken of, so as to allow the camera to revolve. The table on which the camera sits, and to which it is attached by a thumbscrew, is folded, and is hinged at the front, so as to be capable of being directed up or down and pointed to any object in the heavens. When this is done, a pinching screw secures the hinged part, to which the camera is attached, at the angle found necessary.

No other adjustment is needed for that particular object, which may be the moon, a constellation, or planet. By rotating the camera slowly on its axis, a celestial body may be kept motionless on the sensitive plate for a protracted period. When the lower end of the polar axis terminates in a fine point fitting into a socket, and friction is thus diminished, it is surprising with what ease a heavy camera is made to revolve even by such a flimsy motor as one of those round lever clocks which are sold everywhere at two to three shillings.

To give the proper motion to the camera is a matter of the utmost importance. One way in which we had an equatorial camera stand made, and by which the camera could be made to rotate by hand with a wonderful degree of exactness for a brief period, was by having attached to, and projecting from, its side a segment of a finely toothed wheel, into which geared an "endless screw" terminating in a handle, one revolution of which caused the segment of the wheel to revolve to the extent of one tooth, the camera being, of

course, carried forward in a corresponding degree. It is important that a powerful little telescope be mounted on the same stand as the camera. In the eyepiece of this must be fixed cross hairs, and the eye and hand of the operator must be so tutored that, when the image of, say, the moon is seen on the cross hairs, it must be kept in exactly the same spot by the rotating of the handle of the endless screw referred to.

A very pretty negative of a constellation, suitable for employing as a lantern slide, may be taken instantaneously by the portrait lens already alluded to, or one possessing similar characteristics. In this case a stand, although convenient, is not an absolute necessity. The first thing one will notice is that, whereas with an instantaneous exposure the principal stars of a constellation will only appear in the negative, yet, if the exposure be prolonged, the number of those photographed will be increased; while, by prolonging the exposure still more, stars so remote and weak as to be incapable of being seen by the eye at all will be visible in the photograph. This, as we have formerly pointed out, is the principle underlying the new astronomy.

When the subject is wanted to be magnified to a considerable extent, a tele-photo lens will be found to be an improvement upon the ordinary photographic lens.—Br. Jour.

CROTON BUGS INJURIOUS TO OFFICE PAPERS.

ANSWER BY PROF. C. V. RILEY.

The somewhat mutilated and compressed specimens sent for identification by Mr. H. C. Stoddard, of Villisca, Iowa, are recently hatched specimens of the well known Croton bug (*Ectobia germanica*). It is not at all surprising that he did not recognize them, as at this stage they look sufficiently unlike the adult bugs, being of a pale color, with the thighs of the legs more swollen relatively. This is one of the cockroaches which is most frequently found in offices, libraries, etc., where it is well known to do very considerable damage. It is a European species, and derives its common name in this country from the fact that

The Croton Bug, or German Cockroach (*Phyllodromia germanica*); a, first stage; b, second stage; c, third stage; d, fourth stage; e, adult; f, adult female with egg case; g, egg case, enlarged; h, adult with wings spread. All natural size, except g. (After Riley.)

it first made its appearance in numbers about the time of the completion of the Croton system of water works in New York City. The insect is fond of moist places, and is often carried by pressure through water pipes without injury. It is very prolific, and, owing to its small size, can hide and breed in drawers and in cracks and crevices where the larger American cockroaches are rarely found. At maturity its color, while varying somewhat, is of a rather light brown, with two darker longitudinal stripes on the thorax. Like other cockroaches, it is nearly omnivorous, but prefers animal to vegetable matter.

In the city of Washington and further south, the croton bug eats everything that contains paste and is particularly injurious to books which are bound in cloth, on account of the large amount of paste used in making the cloth covers. But wall paper, photographs, and all sorts of stationery material suffers from its injuries. I have given an account (*Insect Life*, Vol. I, p. 67) of the severe injury done to important files in the Treasury Department and in the United States Coast and Geodetic Survey, where the insects had become an intolerable nuisance by eating off the surface and particularly the red and blue paint from drawings of important maps. From this article I quote the following as to remedies:

"Without condemning other useful measures or remedies like borax, I would repeat here what I have already urged in these columns, viz., that in the free and persistent use of California buhach, or some other fresh and reliable brand of Pyrethrum or Persian insect powder, we have the most satisfactory means of dealing with this and the other roaches mentioned.

"Just before nightfall go into the infested rooms and puff it into all crevices, under baseboards, into the drawers and cracks of old furniture—in fact, wherever there is a crack—and in the morning the floor will be covered with dead and dying or demoralized and paralyzed roaches, which may be easily swept up or otherwise collected and burned. With cleanliness and persistency in these methods, the pest may be substantially driven out of a house, and should never be allowed to get full possession by immigrants from without.

"For no other insect have so many quack reme-

dies been urged and are so many newspaper remedies published. Many of them have their good points, but the majority are worthless. In fact, rather than put faith in half of those which have been published, it were better to rely on the recipe which T. A. Janvier gives in his charming article on 'Mexican Superstitions and Folk-lore,' published in a recent number of *Scribner's Magazine*, March, 1889, Vol. V, No. 3, p. 350), as current among the Mexicans:

"To Get Rid of Cockroaches. — Catch three and put them in a bottle, and so carry them to where two roads cross. Here hold the bottle upside down, and as they fall out repeat aloud three credos. Then all the cockroaches in the house from which these three came will go away!"

Cells.

The spectacle of energy and vigorous growth which the garden and field afford at the present time should fill every thoughtful mind with reverent wonder. Man, when he projects some complicated building filled with apparatus and conveniences for varied purposes, plans it all out with skillful care, and then by the aid of innumerable workmen, all skilled in their various departments, fashions and shapes the needful materials, and by building the fabric up piece by piece, finally triumphs in his completed work. If, however, he wants to duplicate or enlarge it, precisely the same process has to be gone through again, and the first work only aids him as a pattern.

In Nature, however, we find the most complicated fabrics apparently making themselves; and having one of these in our possession, we may, as it were, pull a brick out of the factory wall, stick it in the middle of a suitable site, and lo! it will begin splitting itself up and spreading around until we begin to see the plan of another factory developing; everything be adjusted to a nicety as the performance goes on, until finally all is complete and in full working order. Can anything be more marvelous than this? and yet it is going on all the time, and if any reader fails to grasp the fact, let him get a mirror and see such a factory in himself. These wonderful bricks are the cells; and of course in man himself the marvel is the greater that some of the cells which contribute to build him up, i. e., his brain cells, are the fathers of the inorganic fabrics which dot the world with cities and towns, and seam it all over with the beneficent mycelium of rail and road which at once engenders and fosters their extension.

In the vegetable kingdom this power of self-construction in the cell is easily studied in some of its lower forms by means of a microscope; some of the translucent water weeds especially display very clearly the delicate network of cells which constitute their comparatively simple structure. *Valisneria spiralis* does so to perfection, and the circulation of the sap from cell to cell is shown very clearly. A very simple object, showing not only how the cells multiply, but also in a small degree that inscrutable wonder of building to plan, is the prothallus of a fern, the little green scale produced by the spore. A periodical examination of one of these from the time it is a tiny dot up to that of the full-size scale, will show distinctly all the stages of self-shaping, and also the differentiation into root hairs, and the reproductive organs, which may be regarded as the machinery above alluded to. A few spores scattered on a piece of damp clay are easily handled and examined from time to time without detriment. From such a simple manifestation it becomes easier to carry the mind to the more complex cases where plants not merely build themselves up into stems, leaves, and charming flowers, but more marvelous yet, constitute themselves subtle chemical laboratories in addition, in which the deadliest poisons, beneficent medicines, or nutritious food and stimulants are all alike formed from the same goid constituents by Nature's own alchemy. The self-same family, indeed, may embrace both extremes, the deadly nightshade and the tomato to wit, or, more wonderful yet, one and the same fruit, such as a peach, may yield a store of delicious food in its flesh, while hiding the deadliest of poisons, prussic acid itself, in the kernel. Truly, when we consider these things the spectacle of a plant in full growth is one of overwhelming interest, as active evidence of the creative power of which we know so little though we see so much.—*The Gardeners' Magazine*.

The Torpedo Fish.

At the last meeting of the Academy of Science, Professor D'Arsonval, of the College de France, read an interesting paper on a series of experiments which he made lately with the torpedo fish.

A fish 30 cent. in diameter he found could give out a shock of twenty volts. Professor D'Arsonval applied some small electric lamps to the fish and they were lit by the discharge from its body. In some instances the discharge was so powerful as to carbonize the lamps.

The electric current generated by the torpedo fish is sufficiently powerful to kill small fish coming in contact with it. The electric discharge can even go as high as 120 volts.