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SCIENTIFIC AMERICAN SUPPLEMENT

No. 959.

For the Week Ending May 19, 1894.

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AN ASTRONOMER HONORED.

The Royal Astronomical Society has sent a gold medal to Mr. S. W. Burnham in recognition of his discovery and measurement of double stars. Upon the presentation of the medal, Captain W. De W. Abney, D.C.L., F.R.S., president of the society, delivered an address, in which he reviewed Mr. Burnham's astronomical work.

Like so many of his *confreres* in astronomical research, Mr. Burnham began as an amateur. He discovered his first 81 pairs of double stars with a 6 inch telescope in Chicago, between 1870 and 1872. He had then no micrometer, and in his first catalogue his distances are not exact measurements, but only estimates. Mr. Burnham has added catalogue after catalogue to his first list of double stars, so that he has published nineteen, containing 1,274 pairs, and another list is now in press.

A remarkable characteristic of Mr. Burnham is that his eye is so acute that he detects a deviation of an infinitesimal quantity from the circular in the disk of a star. Before he began his work, astronomers were not trying to add to the old catalogues of Herschel and the Struves, but his eye saw so much he could not help but make note of these double stars; indeed, he has catalogued a new class, viz., naked-eye stars which have faint companions. Of the whole number he has published, 197 are naked-eye stars not before known to be double.

Since his early discoveries, Mr. Burnham has had the use of the 15½ inch refractor at the Dearborn Observatory at Chicago, and later he had a position in the Lick Observatory, where he has made some of his most valuable observations.

Mr. Burnham has done able critical work in correcting errors, and his contributions to scientific journals have been of a high order.

He now holds the chair of Professor of Practical Astronomy in the Chicago University, and rumor says that he is to be at the head of the Yerkes Observatory when the great 40-inch telescope is in place under its dome.

DANGERS INCIDENT TO ELECTRIC CURRENT DISTRIBUTION.

We have already had occasion to describe the electrolytic corrosion of gas and water mains by the return current of trolley railroad systems. The universal method in vogue with these railroads is to utilize the rails as a part of the return circuit. The car motors are connected in multiple between the trolley wire and rails. An underground return cable connected to all the rails is often used. The motor circuit is completed through the wheels.

When a number of paths are open to the electric current it does not choose the best, but distributes itself proportionately to the resistance among all. Accordingly, the return trolley circuit is not limited to the rails and return cable, but diverges through the soil and utilizes water mains and gas mains and everything that it can get at as part of its path. This establishes potential differences between different portions of the pipes and mains, electrolytic action is produced, and the metal rapidly succumbs.

Several papers on this subject have recently been presented before electrical societies, which show how serious a trouble electrolytic corrosion has become. Samples of corroded pipes were exhibited and various suggestions for overcoming the trouble were suggested or discussed. It has been found that in many cases a current would pass through a wire connecting a couple of pipes, perhaps in a house far removed from the trolley line, and a perceptible spark could be obtained on breaking the circuit. It is said that many residents on the lines of electric roads utilize these currents in their houses, something which, at the least, suggests playing with fire, where an electric potential difference of 500 volts is involved. In one case a gas and a water pipe were found running close together. A neighboring elevator jarred them so frequently that the gas pipe, by mechanical abrasion, perhaps re-enforced by electric action, was nearly worn through. The fact that electric action existed was shown by a spark which formed at every break of contact. In some way the pipes became charged with electricity and at different potentials. It was merely a question of time when the gas main would become completely worn through, the gas would escape, the spark would light it and a conflagration, "cause unknown," would have been the result. Such a disaster might occur in a building that had no electric service within it.

The National Board of Fire Underwriters have become thoroughly awakened to the danger. Their president says that within the past three months there has been plenty of evidence showing that fires caused by electricity are becoming alarmingly frequent. He calls electricity the "greatest present enemy" of the insurance interest. The result of inspections shows that many buildings are imperfectly wired, and that perfect insulation is very rare. When a safe size of wire for a current is given, nothing is more usual than for an amateur to say that he in his experience has got twice the current through the same sized wire. The professional engineer, however, has gone beyond this stage, and uses wires of ample dimensions. But the necessity for absolute insulation in view of recent troubles is very clear, and the possibility of a house without electric service suffering from imperfect street mains is a thing which must be taken into account in future street work. The electrical engineers and inventors have solved the greater problem. They know how to do their work and how to produce results in the direction of distribution of electric energy, but the distribution is at fault in being altogether too wide. The next step must be the retaining the current within the desired circuit. Much remains to be done in this direction.

"THE HARVEST OF A QUIET EYE."

The poets were the earliest observers and they have never abandoned the field. In proportion as they have studied Nature in her varying modes and phases; as they have watched men, the play of their emotions and the development of their motives into action, have they been the interpreters of Nature and of men and have sung songs which linger in the world long after their voices are still.

Tennyson wrote:

> Flower in the crannied wall,
> I pluck you out of the crannies:
> Hold you here, root and all, in my hand,
> Little flower—but if I could understand
> What you are, root and all, and all in all,
> I should know what God and man is.

Thus has the poet shown at once how close together life and its source are and how close is the kinship between the scientist and himself. Both seek for verities, and so far as they find them and hand them over to their fellows are they of use in the world.

Science has done much in breaking down superstition, and in unraveling mysteries, in saying with Scripture, "The truth shall make you free," but it has done more; it has taught men to use their eyes so well as to be slow about basing conclusions upon too few data.

Professor Huxley, in writing of his friend Tyndall, says: "That which he knew, he knew thoroughly, had turned over on all sides, and probed through and through. Whatever subject he took up he never rested till he had attained a clear conception of all the conditions and processes involved or had satisfied himself that it was not attainable. And in dealing with physical problems, I really think that he, in a manner, saw the atoms and molecules and felt their pushes and pulls." And thus do we learn that imagination is no less the servant of the scientist than of the poet.

It would be difficult to find better illustration of the fruit of quiet-eye observation than that shown in the work of Mr. Hamilton Gibson. His remarkable lectures on "Cross-fertilization of Seeds," made doubly clear and interesting by beautiful charts of his own invention, prove that he is as worthy to be named among scientists as among artists.

Time is not too precious, he has thought, for him to spend enough in concealment near a clump of milkweeds to watch the bumble-bees and learn the secret of their relation to that plant. The fertilization of the trumpet creeper had never been satisfactorily explained until Mr. Gibson discovered that it is the work of humming birds. They thrust their long bills down into the nectaries at the base of the blossom, and come out with their backs covered with pollen, which they give to another flower when they seek the same sweets there.

We have all found flies entrapped in corollas and seen birds and bees darting about among the flowers, often too intent to be frightened away by our approach; but not even botanists of fair repute in our century have been close enough lookers to find out that the blossom and the insect have been made for each other—that the perpetuation of species is secured by that drop of sweetness hidden where it cannot be reached by the insect or bird without coming in contact with the pollen.

The old Arabian proverb, "A fig tree looking on a fig tree becometh fruitful," has now an explanation. Pliny and other early writers mentioned the fact that two kinds of fig trees must grow near together if they produce fruit, but they do not account for it.

Close observers in recent times have discovered that the proverb is based not merely upon the existence of staminate and pistillate flowers, but also upon the intervention of an insect which fertilizes them.

Every seed of the fig represents a blossom. The first crop of figs appears in April. These have on them a wasp much like a gall fly; it has four gauzy wings, jet armor and a piercing poniard. When the first pistillate flowers are ripe, crowded together on their receptacle, it creeps down among them and lays an egg in the ovary. A hundred eggs may be laid on one receptacle. The ovaries nourish the embryos of the wasps; they grow there, passing through the grub and pupa states; the males die there, but the female wasps come out and are ready to make a similar attack upon the June crop. These blossoms differ from the early ones in that they have pollen. The wasps,