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Contents.

(Illustrated articles are marked with an asterisk.)

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TABLE OF CONTENTS.

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IF our own experience is any evidence of improvement in the times—and we believe it is—there is a vast change for the better, over last year. Our patrons have never renewed their subscriptions at the commencement of a year more promptly; and we have never had so large an accession of new subscribers as have come to us since the 1st of January. Notwithstanding the provision we had made for a large increase in our circulation, by printing several thousands extra of the first ten numbers of the year, we find some of the editions are already exhausted, which will prevent our sending complete sets of back numbers from the commencement of the volume. The first six numbers can be supplied, and some of the subsequent issues, but, we regret, not all. If persons, when remitting their subscriptions, express a wish for such back numbers as we can supply, those not out of print will be sent: otherwise, the subscriptions will commence from date of their receipt.

MIND IN PLANTS.

"'Tis my faith that every flower
Enjoys the air it breathes."

So wrote Wordsworth long ago, and very often the poet's propbetic spirit anticipates results which slowly demonstrating Science arrives at only after many years of patient observation and logical deduction. Is it possible that Wordsworth's faith in the capacity of vegetation to enjoy was really such an anticipation, that the consciousness which enjoyment presupposes is in any degree a function of plants?

There is certainly a growing disposition on the part of scientific men to accept such a position, and the evidence in support of it has already become too abundant to be overlooked or despised.

As Dr. Forbes Winslow has remarked, vegetable life is so universally assumed to be, as a matter of course, unconscious that it appears to many a mere folly to express a doubt of the correctness of the assumption. But, he continues, let a close observer and admirer of flowers watch carefully their proceedings on the assumption that they not only feel but enjoy life, and he will be struck with the immense array of facts which may be adduced in support of it. Endow them hypothetically with consciousness, and they appear in a new and altogether different aspect. His conclusion is that they are undoubtedly in the same category in this respect with the lower forms of animal life, respecting which it is impossible to determine whether they have consciousness or not.

Dr. Lander Lindsay goes further, and regards mind and all its essential or concomitant phenomena as common in various senses to plants, the lower animals, and man; and he backs his belief with a cogent array of evidence, which, while it fails to demonstrate absolutely his position, shows very clearly the drift of scientific opinion.

Dr. Asa Gray, after speaking of the transmission of the excitability of sensitive plants from one part of the plant to another, the renewal of excitability by repose, and the power which the organs of plants have to surmount obstacles to positions favorable to the proper exercise of their functions, goes on to say that, when we consider in this connection the still more striking cases of spontaneous motion which the lower algæ exhibit, and that all these motions are arrested by narcotic or other poisons—the narcotic and acid poisons producing effects upon vegetables respectively analogous to their effects upon the animal economy—we cannot avoid attributing to plants a vitality and a power of making movements toward a determinate end, not differing in nature, perhaps, from those of the lower animals. Probably, he adds with characteristic cautiousness, life is essentially the same in the two kingdoms; and to vegetable life faculties are superadded in the lower animals, some of which are here and there indistinctly foreshadowed in plants.

Darwin has observed in the *drosera rotundifolia* a faculty for selecting its food, which in animals would certainly be attributed to volition. Mrs. Treat has described the same trait in the plant. On being deceived by means of a piece of chalk, the drosera curved its stalk glands towards it, but, immediately discovering its mistake, withdrew them. The plant would bend toward a fly held within reach, enfold it, and suck its juices; but would disregard the bait if out of reach, showing not only purposive movement (or a refusal to move, as the case might warrant), but also a certain power of estimating distance.

Again, Darwin has shown that the more perfect tendril bearers among climbing plants bend toward or from the light, or disregard it, as may be most advantageous. Also, that the tendrils of various climbers frequently attached themselves to objects presented to them experimentally, but soon withdrew on finding the support unsuitable. He says of the *bignonia capreolata* that its tendrils "soon recoiled, with what I can only call *disgust*," from a glass tube or a zinc plate, and straightened themselves. Of another bignonia, he says that the terminal part of the tendril exhibits an odd habit, which in an animal would be called an instinct, for it continually searches for any little dark hole in which to insert itself. The same tendril would frequently withdraw from one hole and insert its point in another. In like manner, spirally twining plants seem to search for proper supports, rejecting those not suitable.

Speaking of phenomena of this sort, Dr. Lindsay makes this strong remark: "In carnivorous and climbing plants, there is a choice or alternative between action or inaction, acceptance or refusal; and the choice made is not always judicious. There may be an error, and the error may be corrected; but in order to such correction, there must surely be some kind of consciousness or perception that a mistake has been committed: an exercise of will in making further efforts at success, and a knowledge of means to an end, with their proper adaptation or application."

According to Professor Laycock, organic memory is common to both animals and plants, and certain *lianas* seem to exhibit it in a marked degree in their antipathy to certain trees. The botanist Brown has remarked that the trees which the lianas refuse to coil round are physically incapable of supporting the climbers.

And not only do many plants act, as one might say, reasonably, but some exhibit the opposite quality. In his "Vegetable Physiology," Professor Lawson speaks of the eccentric movements of the side leaflets of *hedysarum gyrans*, which make it appear as though the whole plant were actuated by a feeling of caprice.

In many cases observers are, no doubt, self-deceived, and mistake a mechanical and wholly unconscious mimicry of intelligent action for an actual exhibition of intelligence: still such men as Dr. Gray and Mr. Darwin are not apt to be deluded by mimicry or figures of speech; and however much it may run counter to popular notions of what is proper to plant life, the hypothesis that intelligence does not end with animal life seems by no means inconsistent with a multitude of trustworthy observations.

FIRE EXTINGUISHER TRIALS.

A large vacant lot in the upper part of this city was recently the scene of some remarkable experiments upon a new fire-extinguishing apparatus. The trials were devised by Mr. Joshua Rose, and were prepared on a scale of magnitude sufficiently near to a good-sized conflagration to put the invention to a test of exceptional severity. The apparatus, like most fire extinguishers, involves the use of carbonic acid gas, which, after being produced in a generator, is either mingled with water in large receptacles, or else forced under heavy pressure into a battery of six strong cylinders. The general idea is to avoid making the gas on the spot where it is used, and either to convey it thither compressed in the cylinders, whence it is allowed to escape and mingle with the hydrant stream, or else conduct it by pipes to the surface of oil tanks, for extinguishing petroleum fires.

On the experimenting ground, a large brick tank, 20 feet wide by 30 feet long, was constructed, and into this about a foot of water was placed, covered with the contents of three or four barrels of crude petroleum. Along two sides of the tank extended perforated pipes, which connected with the gas cylinders. The oil being ignited, the vapor burned with immense flame, covering the whole 600 feet of area. At the moment when the fire seemed fiercest, the gas was admitted to the pipes; and escaping therefrom it rushed out over the surface of the oil in great white clouds, cutting off the flames almost instantaneously and wholly extinguishing the blaze within five seconds. The succeeding trial consisted in igniting a bonfire of over a hundred rosin barrels packed with dry leaves, wood, and other inflammable material, the whole plentifully soaked with petroleum. In a few minutes this made a larger and even fiercer fire than did the oil. It was then attacked by streams of mingled gas and water from two seven-eighths inch fire hose nozzles. Probably not ten seconds elapsed before the flame was under control; and within four minutes from the time the streams were first applied, every vestige of fire had disappeared. A heap of dry wood was next raised, and on this were placed two full barrels of crude petroleum. With the blaze thus produced the gas and water made short work, putting it out in about two minutes. Lastly, it was shown, by practically comparing the stream delivered from the hydrant with the same stream after gas had been admitted to mingle with it, that the latter was projected to a distance of some fifty feet beyond the former.

The inventor of the apparatus is Dr. J. H. Connelly, of Pittsburgh, Pa. We expect shortly to publish a fine engraving of it, together with a complete description of its capabilities.

THE UNITED STATES METAL-TESTING BOARD.

A session of this Board was recently held at the rooms of the American Society of Civil Engineers in this city. Our readers will remember that the board was appointed by the President, under authority of an act of Congress, last spring, and the circulars of the Secretary and of the Committees of the Board have given the readers of the SCIENTIFIC AMERICAN a knowledge of the scope and the plan of its work, and have awakened an unusual degree of interest in a scheme which is of national importance. We are informed that at this meeting, the President of the Board, Colonel Laidley, reported that the great testing machine of 400 tuns capacity had been contracted for, and that a considerable amount of work had already been upon done it. It is expected to be completed and at work at the Watertown Arsenal before the close of the current fiscal year. It is the invention of A. H. Emery, but has an independent straining mechanism, fitted with a straindiagram apparatus, designed by C. E. Emery to produce diagrams somewhat like those of the autographic testing machine of Professor Thurston. It is expected to cost, including foundations and auxiliary apparatus, about $50,000. The machine is said, by those members of the Board with whom we have conversed, to be a beautifully ingenious apparatus, and it is expected to do wonderfully accurate work. The beam of a ten tun scale, made on a similar plan, has been known to turn with the weight of a nickel cent. No doubt seems to be felt of its strength and durability.

The committees reported progress in their work. The committee on wrought iron is working up an extensive series of experiments made at the Washington navy yard, under the direction of the navy department. The effect of proportion upon strength of members of wrought iron structures, the value of various sizes and qualities of metal for chains, the modification of quality by change of size, and the effects of time and the phenomenon of the elevation of the elastic limit by strain, as well as the simple determination of the strength and other qualities of iron of the various well known kinds in our markets, are all under investigation by this committee, of which Commander Beardslee is chairman.

General Gilmore, chairman of the committees on iron for armor plate and on cast iron, is engaged with his committee in collating information and planning experimental work in directions equally important. The records and experiments of the war department are extremely rich in this kind of material; and the reports of these committees will embody a vast amount of valuable practical knowledge. The distinguished officer who is directing the work will probably be able to put it in most useful and accessible form.

Chief Engineer Smith, of the U. S. Navy, gave an account of the work undertaken by the committee on steel for tools at the Washington navy yard. All of the best steels in the

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