solar or extra-solar. The sun's surface is covered with granulations, which are called various names, but which are perfectly familiar to any practised observer. These become modified near the sun spots, and the latter (independently of the penumbra, which rarely is absent, especially about round spots) are surrounded with circular faculæ which almost invariably throw out appendages. A body in motion, interposed between the eye and the solar surface, should produce a succession of eclipses of the granulations, covering those toward which it progresses, and uncovering others behind it. This phenomenon of emersion and immersion is the most decisive test during a rapid observation. It requires, it is true, a good instrument of ample enlarging power; but observations made with small instruments are in any case doubtful, as they cannot include all the true characteristics of the phenomenon.

Photography nowadays gives us such perfect solar images that it may best be used in work requiring great precision. The photograph of a transit, if made with a proper instrument, carries with it the stamp of authenticity, and is better than the most perfect observation of the ablest astronomer. In order to search for Vulcan by photography, a succession of pictures of the sun will have to be taken so rapidly that no time, sufficient for a transit to take place, will elapse between any two. A revolving apparatus using dry plates and working automatically, so as to take a photograph once an hour, would answer all requirements best, especially as the astronomer, by using dry plates, can afterwards develope his images at his leisure, or need not concern himself with photographic manipulations at all. A certain number of such instruments, says M. Janssen, distributed systematically over the globe and kept going for a few years, would explore the solar regions so thoroughly as to settle all question as to whether an intra-Mercurial planet does or does not exist.

THE CENTENNIAL AWARDS.

Viewing its work as a whole, the Centennial Commission has done wonders, it has made the Exposition a grand success, it deserves the hearty thanks of the people, and will get them. But its action in respect to the awards will, we fear, give considerable dissatisfaction.

It was decided to make supplementary awards, and there upon a board of judges of appeal was constituted. Had this board proceeded to review cases where injustice and oversight was charged, and to issue favorable reports when the facts warranted, signed by its particular members, all would be well; but probably incited by exhibitors who would not abate their demands one jot, and who wanted just exactly as valuable a report as their competitors had received in the first instance, and nothing else, the Commission concluded to render all reports equal by erasing the names of all the judges on all the reports, and substituting therefor the signatures of Director General Goshorn and Secretary Campbell.

The action, we learn, has been taken in the face of the opposition of General Walker, the Chief of the Bureau of Awards, and of prominent members of the Commission.

THE RETURN OF THE BRITISH ARCTIC EXPEDITION.

The British arctic expedition under Captain Nares, comprising the steamers Alert and Discovery, has returned, the Alert having arrived at Valentia, Newfoundland, on October 27. The ships left England on May 30, 1875, and entered the ice off Cape Sable, on July 29. After a severe struggle, the north side of Lady Franklin Bay was reached, and here the Discovery was left in winter quarters. The Alert pushed on up to latitude 82° 27′, and there wintered. At this point the sun was invisible for 142 days, and the lowest temperature ever recorded was experienced. The mercury fell to 59° below zero, and remained so for a fortnight, and at one period reached 104° below zero. Sledge parties were fitted out, one of which traveled 220 miles to the eastward, and the other went to the north, proceeding on land up to 83° 07′, and thence on the ice to 83° 21′. Further on, nothing but ice could be seen, which was so rugged that scarcely a mile of advance could be accomplished daily. The floes in some places measured 150 feet in thickness. Four men died from the effects of the cold. Finally, becoming convinced that it was impossible to get any nearer to the pole, and seeing that his men were succumbing under the hardships, while the Alert herself had been much damaged by the ice, Captain Nares started homeward, leaving Smith Sound on September 9 last.

This expedition, it will be remembered, was fitted out with every aid to polar exploration which Science could devise or the experience of the oldest arctic explorers could suggest. That it has failed to reach the pole is proof of the enormous difficulties to be overcome in that undertaking, rather than of any inadequacy to the task of those who attempted it. Indeed, we may believe that, after latitude 82° is reached, the obstacles augment in some compound ratio. The results which have been obtained are, however, of considerable importance. Captain Nares has reached the highest northern point ever attained, latitude 83° 21′. The Austrian expedition, which sailed, in 1872, toward Spitzbergen, only reached Cape Fligely in 82° 5′, and sighted Cape Vienna in 83°. It is remarkable, however, that the Polaris, ill equipped as she was, reached 82° 16′, and wintered in 81° 38′, while Hall, with a sledging party, pushed onward to 82° 30′. Captain Nares has, therefore, advanced 51 geographical miles further north than the American explorer, and has approached within 400 miles of the pole.

The details of the other accomplishments of the expedition which have reached us are very meager, but indicate that Captain Nares' forthcoming report will be of considerable value. President Land, usually marked on arctic maps, has no existence. Lady Franklin's Strait is really a bay; and from the fact that travel was conducted on the ice to the highest point reached, it would seem that no open polar sea was encountered. The northernmost point seen in Greenland, was in latitude 82° 57°. Excellent coal was found near the place where the Discovery wintered, and a number of valuable scientific collections and observations were made.

The Pandora is still in the ice, and was met by the Alert on October 16 (where, not stated), when she signaled "all well."

THE NEW YORK AQUARIUM.

The new aquarium at the corner of Broadway and Thirty-fifth street promises to be a positive and genuine addition to the city's resources for instructive entertainment. It is a pity it could not have been placed, as first proposed, in Central Park, and made a part of the valuable zoölogical exhibition already so popular there; but as that was impossible, we are thankful that Mr. Coup has had the courage to undertake it as a private venture. Unless we greatly misjudge the interest which most intelligent people take in such things, the enterprise cannot fail to command its full meed of recognition and reward.

At present, however, the aquarium labors under serious disadvantages as an exhibition. The water in the tanks is still almost turbid with decomposing vegetable and animal matter, making it difficult to see the objects exhibited, and even more difficult to keep them alive and well; while the work of stocking has been seriously hindered by the bursting of tanks and the death of many rare and valuable fish and aquatic animals. Nearly all the first supplies, including two white whales, were lost before the tanks were in proper working order; and many objects which might otherwise have been saved were killed in consequence of the absorption by the water of poisonous vapors from the freshly painted and varnished interior of the main hall.

All these obstacles and mishaps, it is to be hoped, will soon be corrected and overcome; the water will be freed of organic matter by aeration; new objects of interest will be added, and in a little while we may expect to see an exhibition of aquatic life such as will compare favorably with those which have proved so popular and instructive abroad.

Already the collection contains representatives of many of our principal salt and fresh water fishes, with a few that are rare and curious, besides turtles, alligators, seals, a young whale, and a considerable number of the lower forms of marine life. In capacity the building compares favorably with the more important aquaria abroad: not so large as those of Manchester and Brighton, but fully equal in tankage to many of the most useful and successful. The main tank, which has a front of 65 feet. is the second in size, it is said, in the world. Here, at present, are numerous dog fish, a regular shark of considerable size, a gigantic sturgeon, several large sea turtles, and a number of skates and rays. In the center of the pavilion is a raised circular tank 30 feet in diameter, now occupied with a white whale calf from the Gulf of St. Lawrence. In front is a depressed pool of equal dimensions, where three active and clever seals have already made themselves the pets of numerous visitors. Back of the whale tank, and occupying the larger part of the western end of the pavilion, are the sea lions' pools, surrounded by an attractive rockery, and spanned by a rustic bridge from which a good view is to be had of the entire exhibition hall.

The northern side is devoted to a row of large tanks, lined with rockwork and tenanted at present with numerous representatives of our principal lake, river, and sea fish, besides crabs, lobsters, anemones, and the like. Four of these tanks present a crystal frontage of 8 feet by 10 feet each; and a dozen smaller ones have 4 by 5 feet fronts. On the southern side are twenty-five or thirty table tanks, glazed on all sides, for the exhibition of the smaller fish, crustaceans, etc.; a large tank for trout and allied species; and—one of the most valuable features of the aquarium—Mr. Mather's tank for fish hatching, now occupied in part by an interesting lot of California salmon eggs in process of development.

The arrangements for securing a constant circulation of water through the tanks, for aerating the water when it enters the tanks, and again when it is on its return course to the main reservoirs, and for hastening the oxidation of the organic matter originally in the water and constantly being added to it by its inhabitants, are ingenious and satisfactory. By these means only the loss by evaporation and leakage has to be replaced, the original supply of water being used over and over again, as in Nature, while undergoing a perpetual process of purification.

Specially to be commended are the educational features of this new enterprise, particularly those designed to assist practical students of marine life in the prosecution of their researches. As an adjunct to the aquarium, it is proposed to have a free scientific reading room, and a laboratory, provided with experimental tanks, dissecting tables, microscopes, and other appliances for the critical study of aquatic life and the anatomy of aquatic forms. This department, for which pleasant rooms have been provided over the main entrance, is under the direction of Professor W. S. Ward at whose suggestion it was established. It is proposed to admit to its privileges all such teachers and students as may desire to avail themselves of the opportunity thus offered for the practical pursuit of zoölogical studies.

The general aspect of the main pavilion, with its rustic work, and foliage is quite pleasing, and we have no doubt but that it will soon become a place of great resort. Its popularity and its profitableness as well, we think, would be increased by a large reduction of the admission fee; but that is a matter which the proprietors will have to demonstrate for themselves. It is to be feared, too, that an unfavorable impression of its value will be gained by many who visit it just now, for the collection is comparatively meager; and though containing much that is curious and interesting, it falls so far short of what one might expect from the bombastic advertisement that it is really disappointing, for the money. As a beginning, however, considering the difficulties to be overcome in starting an enterprise so largely experimental in character, it is worthy of every encouragement.

DETOXICATED TOBACCO.

A correspondent, referring to our recent article "A Cigar Scientifically Dissected," asks whether there be not some method whereby tobacco can be rendered innocuous and yet have its agreeable aroma preserved. The fact that numerous attempts in this direction have been made, and yet there is no substitute for tobacco and no de-nicotinized tobacco in general use, is in itself a sufficient answer to the question. It is the combination of poisons which we enumerated which produce the agreeable taste and smell, and to remove any of the ingredients seems simply to render the tobacco unpalatable.

Upon many persons coffee exercises a very deleterious influence; but they can, and often do, drink a chicory infusion, which tastes very like that of the Arabian berry, though totally destitute of all the aroma of coffee. Similarly it is possible that there may be some vegetable which is sufficiently near in savor to tobacco to render it valuable as a substitute or as an adulterant for the genuine leaf; and it might be well for botanists and chemists to undertake researches with a view to discovering the same. Meanwhile the most successful efforts to render tobacco less hurtful have been those involving mechanical means. The Turkish nargileh or water pipe, in which the smoke is drawn through water, is probably the least harmful method of smoking practised, a fact proved by the thick dark scum of oil which appears on the water after use. A nargileh is easily made out of a wide-mouthed bottle. The tube attached to the pipe bowl is led down beneath the surface of the water which half fills the vessel, and the smoke is withdrawn through another tube which enters the empty space above the water. Numerous pipes have been patented in which the smoke is filtered through cotton or sponge, or led into a little chamber where the oil is deposited, and thence withdrawn Attempts have been made to treat the smoke chemically during its passage through the filter. M. Ferrier soaks the cotton in a solution of tannin, and dries it in the air. The tannin, he claims, retains the nicotine in chemical combination. French chemists who have tested this plan are widely at variance. Cahours confirms Ferrier's experimental results, and says that the nicotine is wholly removed. Barral objects that nicotine is not capable of uniting with tannin, and that the latter substance is not less injurious than nicotine. We do not find many records of investigation in this branch of the subject, and researches here also might be valuable.

After the water pipe, the safest way of using tobacco is to smoke a mild quality in a pipe made of meerschaum, charcoal, or porous unglazed clay. The pipe bowl then absorbs the oils to a considerable extent, as the coloring of pure white meerschaum plainly shows; and the impurities should be frequently burned out, or new bowls substituted, in order to keep the absorbent qualities unimpaired. The most hurtful method of smoking is the Cuban paper cigarette, where the deleterious fumes of burning paper are added to those of the exceedingly strong tobacco enveloped.

It may be justly considered that in most cases the use of tobacco is an abuse; but it is equally true that devotees of the weed have lived to the most advanced ages, and that thousands habitually smoke without being able to appreciate any deleterious results. There is no standard, therefore, whereby the evil effects of the habit can be gaged for everybody. Dr. Smith, some years ago, read a paper before the British Association, in which he adduced experiments showing that, while tobacco smoking causes a large increase in the rate of pulsation of some persons, in others no increase whatever occurs: and hence he demonstrated a marked diversity in the mode of action of tobacco on different systems. A typical experiment cited is that of a person who began smoking a pipe with the pulse at 74·5 beats a minute. In nineteen minutes the rate rose to 110, then to 112. Finally, at the end of half an hour after the commencement of the smoking, it was at 88·9. For more than two hours it remained above the natural average of frequency and force. In a person of full habit, such acceleration of the heart leads to apoplexy. It is clear that, if in one individual tobacco is able to produce conditions favorable to a disease which may kill at any moment, and in another is practically inert, it is useless to argue either that is generally highly dangerous, or, on the other hand, destitute of dangerous effects. As we said in our previous article, the ingredients of tobacco are separately poisonous; the probabilities are that they are collectively so in every case. But some systems are strong enough to withstand their effects either wholly or in part; and for every individual to discover whether his particular constitution belongs to this last class, involves in all cases a course of experiment in learning to smoke which is universally admitted to be one of the most unnatural, nauseous, and disagreeable experiences of the human existence.

EQUAL parts of tin and copper form a white speculum metal as hard as steel.

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