SCIENCE

FRIDAY, JANUARY 11, 1901.

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MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Professor J. McKeen Cattell, Garrison-on-Hudson, N. Y.

A NOTABLE OFFICIAL REPORT.

IN our last issue we pointed out the urgency of an authoritative reply from the Naval Observatory to the criticisms on its management which have been uttered by parties entitled to the highest respect. We return to the subject to mention another point on which it is equally urgent that certain unfavorable impressions likely to be given by the annual report of the Observatory should be corrected. Precision and accuracy of statement are always expected in an official document, and there is no department of the government in whose reports this quality is more confidently looked for than in that of the Navy. If a report is circulated by this department containing statements likely to be misconstrued, an earnest desire that public confidence in the Navy shall not be impaired will lead us to call attention to the statements and ask that they be supported, or so changed as not to give rise to misconstruction. Especially is this the case with a paper from which astronomers the world over will draw conclusions as to the degree of precision aimed at in describing the operations of one of our scientific departments. We shall quote the passages we have in

mind and show wherein they seem to need strengthening.

"All the astronomical instruments of the Observatory have been steadily and continuously in use during the year on every clear night and day."

So comprehensive a statement as this can be made by no other observatory; and the importance assigned it is shown by the prominence of its position, and its being repeated by the Bureau in its report direct to the Secretary of the Navy. But in other passages of the report we find that the 9-in. transit circle was out of use undergoing repairs more than half the year, that little use was made of the 6-in. circle except to take the place of the 9-in., and that observations with the latter and with the photoheliograph were suspended because the observers were engaged in making preparations for the total eclipse of the sun. We find also that the total number of separate observations with the prime vertical transit was 164, less than one-half the number of nights in the year, while those with the altazimuth, used as a zenith telescope, numbered a little more than the days in the year. At the international geodetic stations the observers are expected to make about 16 double observations on every clear night. We confess to some difficulty in interpreting and reconciling these statements.

"The board chooses to assume that the salary of every professor of mathematics in the Navy, active or retired, except two at the Naval Academy, is chargeable to the expenses of the Observatory. It therefore charges in its exhibit the salaries of officers on the retired list, and the salary of one officer still on the active list whose connection with the Observatory has long since definitely ceased for cause. By such flimsy expedients as this the expense column is easily swelled."

The law provides for twelve professors on the active list. The exact number on the retired list we do not know, but certainly six, still living, have been retired from the Observatory and the Nautical Almanac Office, making a total of not less than eighteen. All but two of these would number sixteen. We find by reference to the passage alluded to in the report of the board, that five active professors with estimated salaries of $15,000 are charged to the Observatory, while the salaries of the professors retired from active duty there are estimated in the total at $10,000. The salaries of the senior ones are $3,500. We do not know whether the $8,000 estimated is or is not more than that of the three others; but it does not seem that it could be much in excess. We are therefore unable to see what ground there can be for the statement we have quoted which implies that the salaries of sixteen professors were charged to the Observatory.

In explanation of delay in publishing observations the report says:

"The delays in building, the labor of dismounting and remounting the instruments, the repairs and alterations of the same and their subsequent installation, the removal of the records and Observatory property, and generally the labor involved in settling in the new place, absorbed the entire time of the whole very limited working force of the Observatory for several years. * * * The force of the astronomical staff, sufficient for current work in settled times, was totally inadequate to bring up back work when the work had fallen behind. It was simply a physical impossibility to keep up the publications, to make the current observations and do the necessary work of removal at the same time. * * * It might have reasonably been shown that during the whole of this transition period current work was practically uninterrupted and that

the number of observations made at the old and new Observatories kept pace with those made at Greenwich. * * * The facts were laid before the board and ignored by it. They would have shown to the credit of the Observatory."

In the Observatory report for 1892 scarcely any astronomical observations are reported, except with the old equatorial, and in the report for 1893 it is still reported that few were made, 'as all the principal instruments were undergoing repairs.'

The absorption of the entire time of the working force, for several years in the manner stated; the impossibility of keeping up observations and their uninterrupted continuance, during this whole transition period on such a scale as to keep pace with Greenwich, are facts which seem to need elucidation to make them consistent. That the board of visitors ignored them is true, —the implication that it did so because they would have shown to the credit of the Observatory we leave the men concerned to answer.

"A determined effort was made by the board to prevent, if possible, the appointment of new men to fill the vacancies created by the retirement of the older professors of mathematics at the Observatory. * * * Notwithstanding the efforts of the board to prevent it, these vacancies have all been filled in line with the traditional policy of the Observatory, which has always been to take for its staff young men of promise whose career was before them, in contrast with the plan, recommended by the board, of appointing at once to high office men whose scientific reputation was already established, and whose prejudices and animosities were mature and confirmed."

We find nothing in the report of the visitors implying that 'prejudices and animosities' were to be considered as necessary qualifications for the offices to be created. It would therefore seem that, in the opinion of the head of our Observatory, astronomers whose scientific reputation is established are, as a class, 'men whose prejudices and animosities are mature and confirmed.' We can only regret that his experience should have been such as to lead to this conclusion.

A word about Leverrier and the Paris Observatory may serve to introduce a statement found in the papers appended to the 'Report of the Board of Visitors.' During the first half of the century the Paris Observatory had fallen to so low an ebb that a radical reorganization was decided upon, and Leverrier was chosen as the man to effect the desired reform.

He adopted the principle that his assistants must either quit the observatory or go to work. During his career he caused all the observations for fifty years back, which had lain unreduced, to be reduced by modern methods, arranged and published. He also kept up the regular reduction and publication of current work. Besides carrying on all this regular work, he published a vast collection of researches by himself and others, which forms one of the greatest astronomical enterprises ever undertaken by one man, and laid much of the foundation of exact astronomy up to the end of the 19th century.

In a letter to the Secretary of the Navy, found in Exhibit B, page 38, of the 'Report of the Board of Visitors,' this work is disposed of in the following terms:

"The most eminent astronomer that France has produced was an utter failure in the administration of the National Observatory at Paris, and was suc-

ceeded by an admiral of the navy under whose direction it was excellently administered."

The fact that the officer who succeeded Leverrier was retired from active service and had devoted his energy to astronomical work with such success that, before his appointment, he had become one of the professional astronomers of the French Academy of Sciences, was not stated in the letter.

There are several other points in which the construction placed upon the Visitors' report differs essentially from that which would be placed upon it by the ordinary reader; but we shall not stop to discuss them. One is "that the Board actually proposes to remove the affairs of the Observatory from Government control." The reader of the Visitors' report will see for himself that nothing of this sort was intended.

A charge of unfairness should, however, be noticed. A comparison of personnel, salaries and total expenses at Washington shows it to cost about 50 per cent. more than Greenwich or Harvard. In the report now under review a comparison is given limited to the scientific personnel of the three observatories, and, showing that of Washington to be less in total cost, and less than half in strength, as compared with either of the others. But this only emphasizes the extraordinary number of non-scientific employees and the magnitude of the general expenses at our Observatory.

A general remark on the Visitors' report may not be out of place. The careful reader of this paper will find it marked by a moderation of tone showing a keen appreciation of the amenities of official expression, and by an avoidance of the blunt statement of unpleasant facts suggestive of the gentle influences exerted by a hospitable reception at a great government institution. A curious feature of the situation is that the plan of reform which now comes in for such scathing criticism is the outcome of an effort on the part of the Board to devise some way of making the continued administration of the Observatory as a naval station compatible with its success as a scientific institution. The Board is now, we suppose, considered as *functus officio*, but it would be interesting to know whether its individual members would, in the light of subsequent events, change their minds as to the practicability of their plan after reading such forceful criticisms from the very authority it was intended to propitiate.

Having said so much implying dissatisfaction with the report, it is a pleasure to find a serious misapprehension corrected by it. This is the common notion, shared by the Board of Visitors, that the Astronomical Director is a dual head of the Observatory. It is now made quite clear that he is only one of seven subordinate and co-equal heads of departments. We must frankly admit that this makes the proposal to have him appointed by the President, by and with the advice and consent of the Senate at a salary of $6,000, look—if not 'preposterous'—at least a little open to question.

We conclude with two questions, an answer to which we are sure would be received by all the astronomers of the country with great respect, not to say eager interest. Granting that 'no person can now pretend to be a friend of the Observatory or of science while attacking its organization,'

then if our astronomers see a great institution for promoting their science supported by Congress on a scale of unprecedented liberality, while, owing to defects of organization, the results do not come out on a corresponding scale, what is their duty as patriots and citizens in the premises?

The other and concluding question is this: What possible object can men enjoying the high and well-earned reputation which so justly accrues to the professional abilities of the officers of our Navy have in going outside the line of their profession to enter a field in which their best efforts can have no result but to lessen public confidence in their ability and good judgment? We can assure these officers that none of our citizens admire their professional skill and achievements more heartily than do the astronomers. We do not believe there is a director of an observatory in the land who would not welcome the advent of a naval officer to relieve him of the onerous duties of administration, were such a thing compatible with efficiency. But the director knows well that no such result would be possible unless the officer would consent to be subordinate to him, just as he would be the subordinate of the officer, if he performed scientific duty on a naval vessel.

THE RECENT PROGRESS OF VERTEBRATE PALEONTOLOGY IN AMERICA. *

THE three sciences especially favored by nature in this country are astronomy, paleontology and geology. American progress in astronomy is largely due to our relatively clear and dry atmosphere, as compared with that of northern Europe, to our inventive genius in the matter of instruments and to the private and public liberality which has founded great observatories and telescopes. Paleontology is also notably an American science, not because of the superior ability of its American votaries, but because of the vast extent of the arid region of the West exposing thousands of miles of fossil-bearing strata which in a moist climate would be covered by vegetation. This branch has especially enjoyed the liberality of the national government, and two men of large wealth, Professors Marsh and Cope, have devoted their entire fortunes to it. Except by institutions west of the Mississippi it cannot be pursued with limited means because of the great distances involved, the expense of fitting out explorations, and the equally great expense of preparing the fossils when they arrive in the East.

The development of paleontology in this country has followed the forest clearing of the East and the winning of the West by stage coaches and railroads. Mastodons, great sloths, horses and cetaceans were the principal animals found in the East. Among other early observers of this Eastern fauna was President Jefferson. David Owen, as U. S. Geologist between 1847 and 1852, explored the Mississippi Valley as far west as Wisconsin, Ohio and Minnesota. Joseph Leidy, the distinguished comparative anatomist of the old school, astonished the world in the fifties by describing the ancient fauna of Dakota and Nebraska. In 1870 the line extended west into Wyoming; Leidy, Marsh and Cope were all exploring and describing the types of this Eocene region with feverish haste, so that upon the average each animal was baptized with at least three names. It is our hard lot at present to find order out of this chaos of species. 'Après moi le déluge,' apparently was the motto

* Introduction and conclusion of a popular lecture illustrated by field and museum photographs., delivered at Trinity College, Hartford, Conn., on the occasion of the opening of the Hall of Natural History.