erence had been made, the purpose of which is to determine the zenith distance of stars culminating very near the zenith.

The second regular paper was by Mr. Hayford on 'The New Precise Leveling Instrument' of the Coast and Geodetic Survey, with exhibition of it. The instrument is very low and stable, the new iron-nickel alloy is used, the level tube is sunk well into the telescope tube, the parts are not reversible as formerly, and an auxiliary telescope with mirror is provided for the left eye to read the ends of the bubble. Field experience shows that both rapidity and accuracy of working have been much increased by the use of the new instrument. [The full description will be published elsewhere.]

CHARLES K. WEAD,
Secretary.

DISCUSSION AND CORRESPONDENCE.

WHOSE FAULT AT THE U. S. NAVAL OBSERVATORY.

TO THE EDITOR OF SCIENCE: It is natural and very proper that the Superintendent of the Naval Observatory should defend his institution, even vigorously, against charges, where he conceives there is ground for believing there has been lack of fair play. The delicate task imposed upon the Board of Visitors should evidently have been sufficient motive for safeguarding their report against the suspicion of unfairness, if any has been shown, by first giving full credit to the existing organization in preparation for their suggestions looking to an improvement. Otherwise, the entire affair will degenerate into a dispute, and that is the most hopeless basis upon which to approach Congress for remedial legislation.

Your editorial in SCIENCE of January 4, 1901, on the 'Naval Observatory Report' does not seem to be free from the objection that it charges against the administration of the Observatory certain results which do not in reality belong there. You blame it for the removal of the Magnetic Observatory to its present site, and for the imperfections of the instrumental apparatus acquired during the past thirty years. It is very easy to misplace responsibility, but in a discussion of this kind it ought not to be done; and the fact is admitted that in such matters of administration the executive acts upon the advice of his subordinates. Now, certainly, there could not be two more conspicuous examples chosen to show that, where the astronomers have had their own way, the blame is being shifted to the chief. For it is well known that the magnetic observatory was moved by the counsel of the Astronomical Director, in cooperation with that of a prominent visiting English astronomer, and against the arguments of the professor in charge of the magnetic work, and all others in Washington interested in magnetic observations. The action of neighboring trolleys and dynamos was pointed out, but the wish to possess the equipment overruled the interests of science. The fact that the work of the magnetic observatory has not been otherwise efficient is partly due to the appointment of untrained officers of the Navy to conduct the operations, and this is of course a matter of administration. In the planning of new instruments the astronomers have for a long while had their head, and if they chose to experiment in novel constructions and to entrust the building of the instruments to American firms, they ought at least to relieve the administration, which simply expressed their decisions, of the blame for an unsatisfactory outcome of that kind.

This brings up the problem of administration. There are two types of organization, the first, where there is a strong head and a corps of subordinates who are his assistants, and over whom his decisions are final, of which the observatories at Cordoba and Harvard College are examples; then there are staffs formed of practically independent professors whose real bond of union is cooperation, of which the Naval Observatory is an example; other observatories have a mixed system in operation. The first type is calculated to put out a large mass of routine work, and to do immense pieces of observation and reduction along well-understood simple lines; the second type is suited for scientific researches into unexplored territory, where the initiative and the successful progress depends entirely upon the personality of the astronomer. No chief by executive order can aid his research, and the heads of institutions are always only too glad to support the work of men

who show real capacity, and the persistency required to bring things to a conclusion. This type of organization is the one in keeping with the highest requirements of modern science, where a work is allotted by choice or natural selection to a man, and he is given the opportunity to develop it. If in such a body of men cooperating for a common good, there should enter jealousy, dissension and rivalry, the end will be defeated, but by no fault of the system. The astronomers of the United States should consider seriously whether it is wise to debase an organization which gives the utmost possible freedom to the individual astronomer, and supplant it with a scheme where authority at the top limits the scope of operations to the will of one man.

The executive in the large Government surveys is so far burdened down with administrative duties, finances, correspondence, mediation between Congress and the public, that it is quite impracticable for him to devote energy to the advanced problems of the day. A scientist can take up these duties only by abandoning his researches, and it is little more than a dream to suppose that one can carry both along together. The proper attitude is that of cooperation between the administrator and the astronomer engaged in practical research, and I am quite persuaded that the officers of the Navy, in the Bureau and at the Observatory, have been quite as faithful to their duties as the astronomers to their tasks. Lack of cooperation, from whatever cause it may arise, is not to be remedied by legislation; this may destroy the free chance to cooperate by introducing subordination, but it would be a step backward, and it should be taken only when a body of American astronomers can not be selected, who are willing to make the most of their splendid opportunities. Furthermore, the attachment of the Observatory to the Navy Department has been the source of its prosperity, in that it has thus secured liberal and generous congressional action through half a century. Now Congress has not yet felt that its duty lies in establishing and supporting an astronomical observatory for research only, no matter how valuable this might be to the world at large. Its theory is that a practical *quid pro quo* must be given for the people's money. The fact that the Navy needs a Nautical Almanac and a time service, and that these are practical utilities has been the ground for the annual appropriations. There is no other Department of the Government better fitted to press such claims upon Congress than the Navy, and to abandon this utilitarian ground would be to diminish the financial resources of the institution. As matters now stand there is no prospect of being able to persuade Congress to support such a research observatory; under the circumstances the nearest we can come to it is the free cooperation of the astronomers in the Naval Observatory. If these 'lay down' behind their commissions, or if their 'human nature' is too much for their good sense and the progress of science, there is no question where the responsibility should be placed. If it be true that the past generation at the Observatory, consisting of able, honorable men, failed to accomplish all they expected to do, may we not hope that the spirit of mutual cooperation between the executive and scientific staff, and the professors one with another, may still be the true remedy, rather than an angry discussion or any type of restrictive legislation which could be devised?

FRANK H. BIGELOW.

WASHINGTON, D. C., January, 10, 1901.

POTASSIUM NITRATE IN WYOMING.

LAST fall Mr. Victor Milward, of Dayton, Wyoming, sent me a small package of mineral which he wished tested for nitrates. The sample was a dark brown color, pulverent and contained a large amount of sand. Upon testing the substance I recognized that it was a nitrate and, in looking for the base, potassium was found in unusual quantities. Mr. McClelland an instructor in this department made a preliminary analysis and found that the sample contained upwards of fifty per cent. of potassium nitrate, and that it was nearly pure. Sodium was not detected. Mr. Milward was informed of his discovery and encouraged in making further investigations, and also asked to furnish some data as to his discovery and its extent. Later a number of samples of dark colored sandstone were received, that had been taken from