SCIENCE.

FRIDAY, JANUARY 28, 1887.

COMMENT AND CRITICISM.

THE DEATH OF General Hazen, chief signal officer of the army, marks the close of the second period of the development of our weather-bureau. During the ten years from 1870 to 1880, while the bureau was under the direction of its first chief, General Myer, the labor expended upon it was given in greatest part to its organization. Stations had to be selected and their instrumental outfit determined; the time and kind of observations had to be decided upon, and observers instructed in their duties; the methods of reduction of data to practical form for use on a weather-map had to be adapted to the needs of a larger area than was ever before brought under the control of a single weather-office. Apart from the almost exclusively military constitution of the service during these years, its most marked characteristics in contrast with the European weather-services were the large sums of public money devoted to its support, the system of tridaily observations, and the absolute control exercised over all telegraphic lines in the collection of reports, in virtue of the law of 1866. Its maps were thus prepared more frequently and more promptly than weather-maps are abroad, and were admired all over the world.

General Hazen took charge of a highly developed service, and turned his efforts in two directions that to most persons appeared quite contradictory. He insisted on the need of military organization, and at the same time introduced numerous and important improvements that had nothing military about them. But during his administration, public discussion was frequently turned to the advisability of 'civilizing' the weather-bureau, for its work was not as successful as was desired. A committee of the National academy of sciences reported in favor of the change, the then secretary of war urged it, and a joint congressional commission recommended it, three members of the commission advising a gradual, and three an immediate, transfer from military to civil authority. Popular opinion very generally supported these recommendations, and the chief objections to them came from the military element of the service itself. All the official declarations of the service maintained to the last that a military organization was essential to success in weather-prediction. It might be forcibly contended, on the basis of published statements in the annual reports, that the service had for its first object the availability of its entire force in case of war, were it not that its whole public work refuted this theory. The real work of the service is the announcement of the approach and force of storms throughout the United States for the benefit of agriculture and commerce in time of peace.

The people at large have taken a great interest in the government weather-bureau, and desire to see its work continued and its predictions improved. They would be glad to see an extension of scientific study in its offices, for on such study all its chances of better success depend. The opening of the third period in its history will therefore be watched with the deepest interest. The needs of the service must be thoroughly and deliberately considered. Immediate action, resulting in the appointment either of a military chief or of a civil director, would be deprecated on all sides, for the interests involved are too great to be endangered by hasty decision. Moreover, there is a very general desire, on the part of meteorologists and of scientists generally throughout the country, that they should at least he heard in the matter before decision is reached, so that whatever plan of future organization is adopted shall be based on full and open discussion. Deliberate action and authorized opportunity for consideration of scientific as well as of military methods are therefore of the first importance. It should be the earnest effort of all who have watched the development of the signal service thus far to secure these guaranties of its further progress.

MR. ATKINSON'S SECOND ARTICLE in the *Century* magazine, on 'The relative strength and weakness of nations,' is just as interesting as the first, to which we called particular attention at the

time of its appearance. In the present paper Mr. Atkinson considers the sources of the weakness of nations governed by dynasties, and presents some conclusions that must sound strange enough to the adherents of the 'blood and iron' policy. The writer also indorses Professor Seeley's conclusion that nearly all the European wars of recent times have originated in the desire of one nation to dominate a continent, or part of a continent, in order to build up colonies the commerce of which might be controlled by the mother-country. Mr. Atkinson points out that the fundamental fallacy here is economic, and consists in regarding commerce as a sort of war in which what one nation gains, others must lose. It was the international jealousy arising from pursuance of this policy that gave us for a mere song the vast territory embraced in the Louisiana purchase. This war-waging policy has resulted in the raising of funds by mortgaging the future through the medium of a national debt; and this, says Mr. Atkinson, has now become the chief source of the weakness of nations. He shows that the same century that has seen the European national debts increase from $2,600,000,000 to over $22,000,000,000 has also seen Spain, Portugal, Austria, and Greece become bankrupt, and Russia without credit.

Large as our national debt seems, and is when compared with our financial history previous to the rebellion, it is small in comparison with the national debts of Europe. Indeed. as Mr. Atkinson says, when at its highest point in 1865, it was $84 per capita, an average which is equalled by the debts of the commercial and manufacturing states of Europe to-day. And while we have, omitting Alaska, 32.7 acres per head of population, Great Britain, Germany, France, Italy, Holland, and Belgium have only 2.8 acres per capita. On the other hand, while our national debt is only 73 cents per acre, that of the above-mentioned countries is $30.06 per acre. The force under arms in those countries, omitting the reserves, is at the ratio of one man to each two hundred acres, and the annual tax for his support averages $1.10 per acre. With us the ratio is one man to fifty-one thousand acres, and the annual tax for his support and for all other military purposes is something over three cents per acre. The war-waging countries have obtained, however, one advantage over us, which is probably due to the extent and perfection of their military systems; and that is, that while it takes $1,600 a year to sustain each man in the army and navy of the United States, — including the cost of ships, fortifications, navy-yards, and so forth, — the continental nations do it for $223 per man.

Mr. Atkinson next proceeds to establish a comparison between the product per capita of European countries and that of the United States, at its measure in money. In this problem he takes the known factors to be the relative rate of wages paid in the countries considered, the relative amount of national taxation per capita, and the assumption that the value of the per capita annual product of the United States is two hundred dollars' worth. From these data Mr. Atkinson figures out the value of the product per capita of other countries by adding to the original elements of cost — the sum of the current rates of wages and the per capita taxes — from five to fifteen per cent as the corresponding profit. As a specific example of this computation, we have the following: "Assuming that one person sustains two others in France as well as in this country, we know first that the average wages in France are not more than sixty per cent the rate of wages in this country. We also know that national taxes are eighteen dollars per head in France, and less than five dollars here. We need, therefore, only to establish the rate of profit which will induce the employment of capital in the arts which can be established in France, in order to reach an approximate estimate of the average value of the product of each person employed in productive industry." Then, taking any group of skilled artisans in this country who earn two dollars a day, each supporting two other persons, the final value of the product of one such workman, following the method above outlined, would be six hundred and sixty dollars, divided into, profits, sixty dollars; taxes, fifteen dollars; net wages, five hundred and eighty-five dollars. The gross value of the French workman's product, similarly computed, is found to be four hundred and fourteen dollars, of which fifty-four dollars is diverted for taxes, and fifty-four dollars for profits.

Many of the other statistics and conclusions are of equal interest with the above, but we have not space to quote them all. For example: if the "product per capita of the United States may

be valued at two hundred dollars' worth, that of England, with its income from foreign investments added, may not exceed one hundred and seventy-five dollars' worth; that of Great Britain and Ireland combined may be assumed not to exceed one hundred and fifty dollars' worth; that of France as not exceeding one hundred and twenty dollars' worth; that of Germany as not exceeding one hundred dollars' worth; that of Italy as not exceeding eighty dollars' worth; such being substantially the ratios which the average rates of wages, with the per capita national taxation added, bear to each other, and to the wages and taxes of the United States, with corresponding profits added in each case." Again: at the ratio which the national taxes now bear to product in the United States, the actual work required to sustain all the functions of the national government, directly or indirectly, is that of 500,000 men; whereas, if our ratio were that of England, the labor of 1,348,000 men would be required; if it were that of France, Germany, or Italy, the labor required would be that of 3,000,000, 2,400,000, or 2,950,000 respectively. Mr. Atkinson's final conclusions are full of interest and importance, and merit close attention and study.

IN THE ISSUE of this journal for Jan. 7 will be found a formidable list of papers read before the Indiana academy of sciences at its last meeting on Dec. 29 and 30, 1886. An examination of the titles, together with the well-known scientific reputation of some of the authors, proves that there is a good deal of vitality in science in Indiana at the present time. Not many states west of the Alleghanies can boast of a more vigorous scientific society than this: indeed, the line might be drawn farther east without including one. The Indiana academy, although enrolling more than one hundred members, most of whom are actively interested in scientific work, was organized only a year ago. It doubtless owes its existence to the enthusiasm of the secretary of a village society of natural history, Mr. Amos W. Butler of Brookville, who, in the summer of 1885, assumed the labor and expense of the issue of circulars, appointing a meeting at the capital of the state on Dec. 27 of that year, and making all preliminary arrangements. With such men as Kirkwood, Jordon, Coulter, Owen, etc., as a nucleus, the academy was at once clothed with a dignity and character which drew to it nearly all in the state who were engaged or interested in scientific research. The second meeting, held a few weeks ago, was largely attended, the membership was greatly increased, and the society appears to be starting upon a career of usefulness, which it is hoped may be a long one.

As might be expected, the natural history sciences have by far the largest number of votaries among its members at present. This is the result of example and environment; but mathematics, physics, astronomy, chemistry, etc., already have their representatives in the state, and will not be found slow to claim their share of the yearly programme. The great danger to which the academy is exposed is the possible loss of interest after the novelty of the thing has worn away. Let it not be in a hurry to increase its membership, and particularly let it be slow to follow the example of so many young societies in breaking up into a half-dozen or more 'sections,' none strong enough to stand alone, while all might do well together. The greatest good which such a society can do is to be found in the inspiration which it affords young men who attend its meetings and breathe its atmosphere. A society similar to the Indiana academy, well directed and full of vigor, in every state of the union, would be of incalculable benefit to the science of the country.

ACCORDING TO PROFESSOR BAIRD'S annual report, the work of the Smithsonian institution during the past year has been carried on effectively but quietly, and without any incidents of special importance. The routine work seems to have increased largely, for the system of international exchanges now requires the constant labor of nine persons, while that of two formerly sufficed; and the correspondence, which also used to need but two persons to attend to it satisfactorily, now needs five. The urgent necessity for additional room for the government collections, and a congressional appropriation for its provision, are emphasized by Professor Baird, who says that a new museum building, equal in size to the present one, would scarcely furnish the needed accommodations, so rapid is the increase of the government collections. The lack of explorations during the past year is ascribed to lack of means to undertake any thing of magnitude. The publications of the year are commented on, and some interesting statistics given as to the working of the system of international exchanges. During the

past fiscal year there were 764 boxes of foreign transmissions, 14,496 parcels of domestic exchanges, and 143 boxes of government exchanges handled by the institution. Over two hundred thousand persons visited the Smithsonian institution and the national museum during the year.

MUCH DIFFICULTY has been experienced in accounting for the occurrence of cases of contagious diseases, when, so far as could be ascertained, no exposure to any pre-existing case had occurred. These instances have been regarded by some as evidence of the possibility of their originating spontaneously. M. Verneuil has suggested a theory which, if true, would account for such anomalies. The microbes of disease, according to this view, remain in the skin and other portions of the body in a state of quiescence, and may continue thus inactive for years. By some means, as yet inexplicable, these microbes are aroused to a condition of activity, reproduce themselves in great numbers, and set out on their deadly mission. It is, in the absence of evidence to the contrary, much more reasonable to suppose, that, in the obscure cases in which exposure has not been recognized, such exposure has actually occurred, than to adopt a theory like this, which has not the slightest basis for its existence. If all cases which cannot be traced to their source were to be explained in this way, it would be the rule rather than the exception. A physician who had had large experience in an English small-pox hospital delared that not one case in twenty was capable of being referred to any known source of infection, the disease being ascribed by the patient to cold, fatigue, or some other innocent circumstance. The instance referred to by Sir Thomas Watson, in his essay on 'The abolition of zymotic disease,' should be a constant reminder to those who would refer the appearance of these diseases to a spontaneous origin. In 1829 a prisoner in Millbank penitentiary was attacked with small-pox, under such circumstances that it was thought no possible exposure could have taken place, and for thirty years the case was quoted as proof of the possible spontaneous origin of small-pox. In 1860 the fact for the first time became known that the physician of the penitentiary had come directly from a case of confluent small-pox in a neighboring town to the prisoner's cell, and had undoubtedly been the carrier of the disease.

THE SUBMERGED TREES OF THE COLUMBIA RIVER.

THE attention of many tourists who have traversed the magnificent valley of the Columbia River through the Cascades, has been called to two phenomena which have excited their interest. One is the occurrence of submerged trees in the bed of the river: the other is the slow lateral creeping of the road-bed and track of the Oregon railway and navigation company. During the last summer I had an opportunity to make a brief study of these two subjects, and, as they are likely to prove of increasing interest, it may be worth while to recite the results of the examination.

The Columbia enters the Cascade barrier three or four miles below the Dalles. The platform of that range here has a width of eighty miles. From the Dalles to the Cascade Locks, a distance of over fifty miles, the Columbia flows as a broad, deep, quiet stream, with a sluggish current at low water. Its course resembles that of the Hudson through the highlands; and this fact is at once suggestive, because the passage of rivers through mountain-ranges is generally swift, and broken by many rapids. If it is otherwise, there is almost certainly an interesting reason for it. The Cascade Locks are situated almost exactly on the axis of the Cascade range. Here is a cataract which has always been an insurmountable obstacle to navigation; for, within a distance of a few hundred yards, the river makes a descent of about thirty feet. The government is now building a short canal with large locks, to enable steamboats from below to reach the still waters above. Beginning at a point about a mile and a half above the cataract, the traveller, as he sails up the river, observes many old stubs protruding from the water and from the sand-banks, laid bare during the low stages of the river. They are seen for a distance of thirty miles, recurring at frequent intervals, here clustered thickly together like the piles of an old wharf whose superstructure has decayed and vanished, there with wide intervals between them. During high water these tree-trunks are entirely submerged. An examination of the wood serves to identify them with the living species of fir which form the forests upon the mountains and cliffs round about.

These submerged trees, together with the long still reach of water above, at once suggest that an obstacle has been placed athwart the stream, forming a dam which converted the river-valley above it into a long narrow lake, and that the rising water submerged an old forest of which these trees are the vestiges. Indeed, this is the only explanation which suggests itself. It is strongly