SCIENCE.

FRIDAY, DECEMBER 31, 1886.

COMMENT AND CRITICISM.

MR. EDWARD ATKINSON of Boston has for years ranked as one of the first statisticians in the world. To be a statistician implies a great deal. It implies more than a prodigious memory in retaining figures, and more than an untiring energy in gathering them together. The statistician must add to these qualities a graphic power of presentation and an insight into the real meaning of figures, which amount almost, if not quite, to genius. All of these qualities Mr. Atkinson possesses in a marked degree, and his two articles on 'The relative strength and weakness of nations,' contributed to the *Century magazine*, the first of which is published to-day, show them at their best. These articles are certain to be widely read and discussed, not only by the general reader, but by the economist, who will pay particular attention to Mr. Atkinson's methods and his interpretation of his results. Much of this first article reads like a chapter from 'Triumphant democracy,' and the ingenious illustrations used by the author add greatly to its force. Since 1865 we find that our population has increased 69 per cent; our hay-crop, 106 per cent; our cotton-crop, 194 per cent; our grain-crop, 256 per cent; our railway mileage, 280 per cent; our insurance against fire, 310 per cent; and our production of pig-iron, 386 per cent.

Mr. Atkinson's warning to the military powers of Europe is, 'Disarm or starve.' He holds that the annual product of a country is the source of wages, profits, and taxes. If one secure a larger proportion than now exists, the other two must supply it. Furthermore, Mr. Atkinson believes that wages, earnings, salaries, and the income of the small farm, are not the measure of the cost of production, but the results of the conditions, both material and mental, under which the work is done. From this it follows that the wages or earnings will be higher in that country which is not weighted down by the cost of a large standing army or the burden of a heavy war debt, and in which the work is done by the most intelligent people, under the most favorable conditions. The mental, material, and political influence of such a country will become the most potent factor in the world's commerce. This is the future Mr. Atkinson sees for the United States. The keynote of the argument for democracy against dynasties is commerce. Mr. Atkinson estimates the world's population at 1,400,000,000, of whom 400,000,000, are classed as machine-using. The other 1,000,000,000, being non-machine using, must depend almost wholly on the work of their hands for production. The control of the commerce of the world lies in the answer to the question, Which of the machine-using nations shall supply the need of the non-machine using nations? Mr. Atkinson sees that the nations of Europe cannot sustain themselves under their present conditions without commerce; but, if they hold to their present conditions, the United States, by virtue of its high wages and low cost of production, will take their commerce away from them. Therefore he says to the dynastic countries, 'Disarm or starve.'

The reasons for the vast gain in the conditions of material welfare in the United States, Mr. Atkinson finds to be seven. The first is the free purchase and sale of land, and the stability resulting from the large number of land-owners. The second is the absolute freedom of exchange between the states. The third is the extension of the common-school system. The fourth is the right of suffrage, with the consequent feeling of independence every voter possesses. The fifth is the conservation of local self-government in its strictest sense. The sixth is the existence of general state laws which preclude the possibility of any monopoly of the mechanism of exchange. The seventh is our habit of organization and self-government, which is so far developed, that "if any thousand persons were suddenly removed to some far-distant place, away from their fellow-men, the men of adult age would immediately organize an open meeting, choose a moderator, supervisor, or mayor, elect a board of selectmen, of assessors of taxes, and a school committee, appoint one or two constables, and then, adopting the principle of the English common law, would at once undertake their customary gainful occupa-

tions." These seven reasons may not be distinct, and we are inclined to believe that they are reducible to fewer; but, at all events, they form a comprehensive summary the value of which is not impaired by elaboration. Mr. Atkinson also negatives that foolish fallacy, now so widely held, that the "rich are growing richer, and the poor poorer." Its main force lies in the euphony of its expression.

Impressed, as we well may be, with the phenomenal development of the United States and the magnificent possibilities that lie before it, yet we must study development elsewhere as often as we can find it. That Great Britain has not been standing still for the past decade, Mr. Mulhall conclusively proves in the *Contemporary review*. Since 1875 the population of the United Kingdom has increased 12 per cent; wealth, 22 per cent; trade, 29 per cent; shipping, 67 per cent; and instruction, 68 per cent. During the ten years the natural increase of the population has been 1,200 daily, and the outflow to the United States and the colonies has averaged 600 daily. Besides this natural increase, there has been an immigration of 1,317,000 persons, consisting of returned colonists and foreign settlers: 65 per cent of the emigration came to the United States. Mr. Mulhall wants the medical association to investigate the fact, that, while the marriages have declined only 1.5 per cent, the births have fallen off 5.5 per cent. He considers that this furnishes ground for grave apprehensions of physical decadence. The condition of the people at large has materially improved in the ten years. Pauperism has declined (the rate per thousand of population being 27 in 1885, as against 41 in 1870, and 48 in 1850), savings-bank deposits have increased, and there has been increased consumption per capita of tea, sugar, meat, and grain. The criminal statistics show a large decrease in the number of committals, and the average number of children attending primary schools has risen 68 per cent in ten years. The bankruptcies are fewer than in 1875, and the consumption of alcoholic drinks has decreased.

Mr. Mulhall's conclusions from his study of the figures are very gratifying, the only two unfavorable items being the decline in the ratio of the number of births per marriage, and the lamentable condition of Ireland. The fall in the death-rate is ascribed to sanitary improvements and the increased consumption of wholesome food. The 24-per-cent decline in the consumption of liquor is especially to be noted, and considered in connection with the 82-per-cent increase in the savings of the working-classes, the larger amount of wheat and meat consumed, and the decrease of 36 per cent in crime and of 33 per cent in pauperism. Mr. Mulhall's figures are confirmatory of Mr. Atkinson's argument; for Great Britain is virtually a democracy, and, while subjected to a large annual expense for her army and navy, this is nothing like the drain upon her resources that the cost of their military establishments is to the great continental powers. Mr. Atkinson's further contributions to this discussion will be awaited with interest, and we shall expect some criticism of his fundamental tenets from economists.

Meanwhile Mr. Atkinson's position, that "high wages, either in money or in what money will buy, are the correlative or reflex of a low cost of production measured by labor or effort," receives an indorsement in some statistics that the United States consul at Tunstall has communicated to the department of state. He says in regard to silk, that, in a Macclesfield mill, 144 hands are employed in throwing 500 pounds of Canton silk, with average earnings of $2.25 a week; while in an American mill 80 hands throw from 1,000 to 1,200 pounds of Canton silk at an average wage of $5.50 per week. So American average earnings of $5.50 give far better results than the English average earnings of $2.25. This instance from the silk industry is supplemented by one from the boot and shoe industry; Frankfort-on-the-Main, and Lynn, Mass., furnishing the data. The price paid at a factory near Frankfort-on-the-Main for making uppers for ladies' high-top button gaiters is 21 cents a pair; while the cost of the same labor in Lynn, Mass., is 11 cents, or nearly 50 per cent less than in Germany. The whole boot, solid and finished, and laid in boxes, costs 33 cents in Lynn, which is far below what it is in Germany. The actual earnings in Germany, taken from the work accounts, are, on the average per hand employed, $3.38, while in Lynn they are not less than $9 per week.

THE FALLACY CONTAINED in the common saying that numbers cannot lie, is well shown in the recent discussion of the statistics of insanity by Dr. D. Hack Tuke. The statistics may be all right,

but they must be taken in a certain way to warrant definite conclusions. From the facts that more cases of insanity are now treated, that we have more asylums, and that our age is called a neurotic one, the mournful conclusion is drawn that a greater proportion of civilized humanity is succumbing to the stringent requirements of modern life, and losing its mental equilibrium. Dr. Tuke shows, that, by such statistics, the insane of the past thirty years or so, whose lives our improved methods of treatment have succeeded in prolonging, are pushed upon our shoulders. The real test of the prevalence of insanity is the proportion of first attacks occurring within certain periods. On this basis, Dr. Tuke shows that since 1878 (the earliest date from which adequate statistics exist) there is no increase in *occurring* insanity in Great Britain. On the whole, there is a slight tendency to decrease; and this, too, though cases are now more apt than ever to be brought to notice. Of course, this should not lessen our vigilance in the matter, nor remove our attention from that large class on the borderland of insanity which is not recorded, and from which any sudden crisis chooses its victims.

THE PHYSIOLOGY OF DIGESTION has been so thoroughly investigated of late years, that it would seem that there could be very little opportunity for difference of opinion on most of its leading principles, and yet we find that authorities are on some points very much at variance. We are told that nothing can be more prejudicial than the habit of chewing gum, supposed to be so common among school-children. The salivary glands are unnaturally excited, and pour forth so much saliva in the act, that when food is masticated they are not able to respond as fully as is necessary for the proper insalivation of the food. We are also informed that food should not be eaten just before retiring; that thoroughly refreshing sleep requires perfect repose of all the organs; and that, if we go to sleep with a more or less full stomach, sleep will be disturbed and unsatisfactory. The authorities of Amherst college evidently do not agree with these views. In the instructions which they give to their students to guide them in their gymnastic exercises, after specifying the kind and amount of physical exercise, they recommend sleeping for half an hour after dinner and supper if possible, and, if sleepless at night from brain-work, to eat a few graham crackers before retiring, to draw the excess of blood from the brain to the stomach. In reference to the practice of chewing gum, this statement is made: chewing gum daily before eating and between meals increases the flow of saliva, and so aids the digestion of fat-making foods. It also indirectly stimulates the secretion of the digestive juices of the stomach. We have no means of knowing, but we presume that Professor Hitchcock of Amherst, who is himself a physician, is largely responsible for this advice, and have no doubt that he has given it after mature consideration. We fully agree with what is said in the instructions about the usefulness of food in cases of sleeplessness, and believe that many a person has been kept awake at night from a mistaken idea of the necessity of abstemiousness before retiring. This, of course, does not mean that late suppers are under all circumstances to be recommended; but a few graham crackers can never do harm, and will often do good. In regard to the chewing-gum, we do not feel so sure. Besides being a practice which is from an aesthetic point of view not to be encouraged, it is very doubtful whether, under the most favorable circumstances, it is really a benefit to digestion; and, until there is some guaranty as to the composition of what is called chewing-gum, we should hesitate before recommending it in such unqualified terms.

A FULL ACCOUNT of the Union Pacific railroad weather-service has been furnished to the newspapers in the west by Lieutenant Powell of the signal service, who is in charge of the new enterprise, and now engaged in bringing it into shape for practical work. There will be thirty-three stations in all. It is proposed to issue predictions twice a day, announcing the expected weather changes from twenty-four to forty-eight hours beforehand. This will give the railroad officials ample time before the trains start in the afternoon and morning to make any changes which the predicted weather may necessitate. The predictions will be couched in specific language, and not in meaningless general terms. For instance: one indication will predict in a certain division cold weather with snow, the wind being from the north and blowing at the rate of thirty miles an hour, followed by warmer weather, the wind changing to a southerly direction. Study of the road will determine where the worst snow-drifts most frequently occur, and from this it will be possible to tell pretty nearly where snow blockades are liable to form. An accu-

rate and comprehensive weather-service will enable the Union Pacific to save thousands of dollars every week to its patrons. If storms can be accurately predicted beforehand, the stockmen can withhold their shipments and allow cattle to be sent through without danger of perishing by being caught in blockades or blizzards. One prominent cattleman recently said that such a system of predictions, if accurate, would be the means of saving him fifty thousand dollars every year. The practical working of this service will be watched with much interest by raiload men in all parts of the country.

In the prominent mention given just now to the meteorological enterprise of the Union Pacific railroad, it should not be forgotten that very considerable contributions towards increasing the value of the signal service are made by other roads. The display of weather-flags on many western and southern lines is no small matter, for one of the greatest difficulties that the service has to contend with is the delay in placing its indications in the hands of those who wish to know them. The predictions based on the seven A.M. observations, and issued about ten o'clock from Washington, are read by most persons only at five or six o'clock in the evening, or later, when the time covered by the prediction is already well advanced. Besides this, there is a large contribution of temperature, wind, and general weather observations made to the Pacific coast division of the service, at present in charge of Lieutenant Glassford, by the Southern Pacific railroad company. Observations are taken daily at seven A.M. at about a hundred and twenty stations on their wide-branching lines, making a valuable addition to the tri-daily reports from the twenty regular stations of the service on the Pacific slope.

THE FIRST PUBLISHED print of the topographical survey of Massachusetts, executed jointly by the U. S. geological survey and the state, was the map of the Greylock-Williamstown-North Adams district, issued last summer by the Appalachian mountain club on the scale of the original plane-table sheets (1 : 30,000), and of which mention has been made in *Science*. The same district is now published in its official form, on a scale of an inch to a mile (1 : 62,500), with brown contours every twenty feet, blue water-courses, and black roads, towns, and lettering. Old Greylock makes a fine centre for the sheet, and its sharply moulded form is well displayed in the crowded contours on its steeper slopes. The curious 'Hopper,' with its deep-cut outlet valley opening to the west, is one of the best-marked topographic forms in the state. There ought to be found here a nocturnal wind-stream as distinct as the water-stream that flows from so well-developed a drainage surface; for on calm clear nights, as the air near the ground cools by conduction to the radiating earth, it becomes heavy, and, if resting on an inclined surface, tends to flow down it; if a large surface lead downward to a narrow valley exit, like that from the Hopper, a distinct mountain breeze should be felt at the mouth. This should be studied and defined, so that our teachers need not go abroad to Switzerland, or even so far away as the Cordilleras of the west, to find illustration of phenomena that are doubtless distinct enough near home.

The deep valley separating Greylock from the Hoosac range is included in this sheet almost to the head of its stream, the Hoosic, a little south of the village of Berkshire. From the low pass that leads southward to the Housatonic valley, the Hoosic runs north before turning at North Adams westward to Williamstown, and therefore presents an example of that class of streams that suffered obstruction in the latter stages of the glacial period; for, when the southern marginal remnants of the ice-sheet lay in the deeper valleys, they blockaded the streams that ran towards them, and flooded them into lakes that commonly rose until they overflowed backwards across their divides to the south. Glen Roy in Scotland, with its 'parallel roads,' is a famous example of the kind; the Red River valley of Minnesota and Dakota is a very large illustration of essentially the same type; the northward-flowing Contoocook in New Hampshire has been obstructed in the same way, according to Upham; but not a single example of a valley thus modified has yet been described in Massachusetts. It is time that the many examples which undoubtedly exist should be brought to light, that they may contribute their share to the proper foundation of geographic study. Enough has been done in the broad, vague way of distant continental homologies: what is now needed is the local examination of minute topographic details, so that we may learn to see and appreciate the forms about us at home; and nothing will lead sooner or surer to this long-delayed end than the publication of good topographic

maps. The educational value of these maps will alone repay the people of Massachusetts over and over again for their share in the cost of making them.

WHENCE COME RACE CHARACTERS?

ONE is often led to speculate as to the origin of national peculiarities; and soon such speculations take one to the conclusion that a great deal of what characterizes a nation in the way of mental traits is not an intrinsic quality of the race, but akin rather to folk-lore, as to its origin at least. There are modes of the mind, and fashions of thought, which spread by propinquity. Such modes may give currency to superstitious tales of witchcraft, to foolish prejudices, or to great intellectual impulses. Every man's mind is a country inhabited by ideas, very few of which are autochthonous. His opinions are an immigrant populace; and, when a sturdy thought goes forth from the mind of its birth, it breeds abundant exact reproductions of itself in many other minds. Indeed, most thinking is repetitive. So, when a strong man appears, his example establishes a tendency in those about him; and, if he is highly endowed, he founds a school perhaps, of politics, art, or science, as the case may be. If many such men come in one epoch and in one nation, it may well happen that their conjoint impulses may lead a whole nation in a certain developmental direction, without the qualities which become prominent really being intrinsic race characters.

It is a legitimate question, and one possessed of deep meaning, Are the Germans more musical inherently than other peoples, or has the succession of splendid musical geniuses among them at once guided and accelerated the musical culture of the nation? The same alternative query arises concerning the pre-eminence of Italian painting or of English literature. Or we may make the complementary inquiry, Does the lack of certain qualities in a nation depend on the lack of the right leaders? To go back to the Germans, at whom indeed we are aiming all the while, do they lack American inventiveness because it is nowise in them, or merely because they have never been rightly impelled into the habit of invention by example-giving inventors? Probably for the latter reason, for German scientific men have done their share in inventing scientific apparatus, and the Germans who come to America learn to invent. The final interest of these considerations resides in the decision as to whether national defects of certain kinds cannot be remedied by tuition and right leadership. It must be left, however, for some powerful investigator to definitely solve these problems by rigid historical research. Let us, however, by an act of cheerful faith, accept the belief in possible betterment even unto thinking that the German people may acquire the literary instinct.

I have referred on several occasions in the columns of *Science* to the absence of the literary sense in German scientific men. It is one of the most flagrant arguments against the classical education, with its supposed results of literary culture, that the Germans, who have school doses of classics much larger and more concentrated than are administered in the rest of the world, themselves write more barbarously than any other civilized western people. German scientific articles are full of sentences like this, which refers to the bristles serving among arthropods as organs of touch: "Man darf für wahrscheinlich halten, dass die so sehr wechselnde gestalt und ausbildung der 'Tastborsten' nach der art des thieres und den körpergegenden noch bestimmten nebenzwecken zu dienen hat, ohne dass wir uns davon rechenschaft zu geben vermögen."[1] Now, the author of this sentence is one of the most distinguished and justly distinguished of German zoölogists, but his manner of writing is similar in quality to that of most scientific writers in Germany. The sentence is neither better nor worse than thousands upon thousands of others, perpetrated by his countrymen equally without literary feeling. The Germans need literary conscience to reprove them for all their awkward and involved phrases, that their souls may know how guilty they are in ignoring their readers' rights. The quoted sentence was evidently written without attention to the forms of expression. It never occurred to the author that aught was due the reader. His meaning cannot be had except by an effort. It is ill-mannered to give others so much trouble, when a little pains on one's own part might save it. A cultivated Frenchman would be incapable of such a rudeness. The pith of the evil is the indifference of the German author as to how he writes: he feels no inward necessity of having a good style, and is inclined to despise the French qualities of grace and lucidity.

Perhaps reiterated complaints will stimulate improvement. May it be brought about that the few good writers among German *savants* will have soon many imitators. It is, to be sure, more trouble to write well than to write ill. We all have facilities for bad logic, bungling rhetoric, and poor composition; but these undesirable gifts ought not to excuse us from striving after their

[1] *Zoologischer anzeiger*, IX. 288.