become a master of any trade which he might afterwards choose. Such is not the case at present. From the census of 1880 it appears that out of every thousand persons engaged in gainful occupation, three hundred and twelve were classed as common laborers. This proportion was doubtless increased between 1880 and 1882 by immigration, and it is this class which suffered from diminished railroad-building during the last three years. The true remedy can only exist in the development of versatility and manual dexterity, and of capacity on the part of the poorest child in the community to take advantage of all opportunities which may offer.

With respect to the applications of science, crude as they are in respect to agriculture, they assure an abundance for any increased population during the present century. With respect to the mechanism of distribution, the cost has been reduced so that there is little margin for further saving. In the conversion of crude materials into forms ready for consumption, the field for improvement is still a broad one. In wholesale traffic, as well as in retail distribution, of perishable commodities, there is a waste; and in the science of consumption, almost no progress has been made.

Again recalling, however, that to common laborers their food constitutes sixty per cent of the cost of life, it will be obvious, that, if we can show them how to maintain themselves in full vigor at the cost of thirty or forty per cent of their ordinary income, we shall have done good service. Prof. W. O. Atwater of Middletown, Conn., has prepared a number of tables, in one of which it is shown, that, if we buy protein in a sirloin of beef at twenty-five cents a pound, we pay one dollar a pound for it; whereas, if we seek for protein in oatmeal or cornmeal, we pay twelve to fourteen cents for it. Mr. Atkinson praised for their cheapness the Yankee dishes of fried fish-balls, and pork and beans; and also the weekly ration of the southern negro, — a peck of meal, and three and a half pounds of bacon; which, probably, supplies the cheapest subsistence known. The rice of the east may cost less in money, but is deficient in the nutrients necessary for full vigor.

While the American could live cheaply on oatmeal, or pork and beans, yet he would not willingly do so, but would wish for meat; and it is to the cheapening of the cost of meat, rather than to the reduction of its consumption, that there is need of attention. Mr. Atkinson referred to the partially abandoned lands of the New-England States, as probably capable of producing, if properly fertilized, beef at a cheaper rate than is now done by cruder methods in Texas, adding the cost of transportation to this market.

Mr. Atkinson based his scheme upon the claim of Mr. Farrish Furman of Georgia, that he is able to raise two and a half bales of cotton to the acre on abandoned cotton lands when suitably fertilized with Stassfurt potash, and the phosphate rocks of South Carolina. He would bring the cotton-seed meal to Massachusetts, there feeding it, and thus converting the minerals into fertilizing elements to be used on the barren lands of New England to raise Indian corn, which should be used as pitted fodder or ensilage for the cattle. If this proposition can be sustained, it may happen that when the population of the United States of 1880 shall have doubled, an area of land no larger than that needed in 1880 will be required to sustain the people of that day.

At the close of his address, Mr. Atkinson presented a number of statistical tables showing the cost of life of various classes of people, mostly operatives or mechanics, and some tables showing the cost of maintaining inmates of public institutions. The investigation of the statistics does not increase Mr. Atkinson's faith in the law of population propounded by Malthus, or Ricardo's theory of rent, or the so-called law of diminished returns from land.

PROCEEDINGS OF THE SECTION OF ECONOMIC SCIENCE AND STATISTICS.

THE opening paper in this section was by Mr. Henry E. Alvord of Houghton Farm, New York, upon the relative values of human foods, and had especial interest, as forming in a degree a continuation of some of the interesting considerations contained in Mr. Atkinson's vice-presidential address. The author's comparisons of different articles of human food were based upon their average chemical composition alone, it being his belief that "we are so much in the dark on the questions of the actual proportions of digestibility in different forms of food, that it is safer to drop this factor than to include it."

Selecting as his basis of comparison for animal food, average ox-beef (flesh free from bone) at sixteen cents per pound, and for vegetable food, potatoes at one cent per pound, and rating animal fat at twelve cents per pound, and the carbohydrates of vegetables at four cents per pound, he arrived at the following money values, per pound, for the three classes of nutrients: —

	Protein.	Fat.	Carbohydrates.
Animal	72 cents	12 cents	7 cents.
Vegetable	10 "	7 "	4 "

Based upon these valuations, elaborate tables were presented, showing the nutritive value expressed in money, of all important articles of human food in comparison with their cost. The investigation was undertaken with particular reference to the food value of dairy products, and the results show that skim-milk, butter-milk, and cheese, at usual retail prices, furnish a given amount of nutriment more cheaply than any other articles on the list, being approached in this respect only by fresh mackerel and dried cod-fish. Milk, on this scale, sells for about its nutritive value; while butter costs two or three times its real food value, and often more. "What shall be said," continued the speaker, "of domestic economy in America, where more butter and less cheese are consumed per capita than in any other nation in our zone? And what of the government of some of our great cities, where boards of health absolutely prohibit the sale of skimmed milk, and actually destroy all that can be found?"

Of meats, pork and mutton are the cheapest, and veal the dearest. Of fish, mackerel is cheapest. Eggs generally sell at their full food value. Wheat-flour, oat-meal, and beans are the cheapest forms of vegetable food.

In the ensuing discussion, attention was called by several speakers, including the author of the paper, to the fact that chemistry alone cannot measure the nutritive value of the food, and to the great importance of those nervous and other influences which play such an important part in nutrition. Some very interesting statements were also made by the president of the section, regarding the dietaries of the working-classes and their cost.

Next followed a paper by Dr. C. V. Riley, upon the probability of injury by locusts (grasshoppers) in the immediate future. A certain periodicity has undoubtedly been established in the visitations of these insects, a period of about eleven years, on the average, elapsing between the times of serious damage. At present, considerable apprehension exists, based upon knowledge of somewhat serious injury by locusts, in California, Montana, and Dakota. A large part of this damage has been done by local (non-migratory) species; but the migratory species are also rather numerous, and we are probably at the beginning of a period of increase. To what extent this increase may go, depends considerably upon the climatic conditions during the present summer and autumn: but it is probable, that, even in the most unfavorable case, the damage will never reach the proportions which it did in 1873–77; for the advance of civilization since that time will prevent the massing of the insects in such enormous bodies as was then possible.

This paper was followed by another, by the same author, upon a new method of destroying locusts by the use of poison-bait composed of bran, sugar, arsenic, and water, which has been used successfully in California, and promises to be valuable in some cases.

The afternoon session was opened by a paper from Mr. C. Reemelin, upon city government. After a lengthy historical review of the history of city governments, its failures and mistakes, the question of remedies was taken up. These must be chiefly sought in constitutional reform. Of special suggestions may be mentioned, the strengthening of the executive power, and its committal to one responsible head; supervision of city expenditures by state authority; a state city council of from four to ten delegates from each state, for consultation upon common interests; and reform in municipal taxation. In the discussion which followed, special stress was laid upon the fact, that in a democracy good government depends ultimately upon the individual citizen; and Mr. Reemelin's paper was criticised as leaning too much towards purely legislative remedies.

Following this, a paper was read by the president of the section, Mr. Edward Atkinson, upon insurance against loss by fire. In all systems of fire-insurance, the losses are paid from the premiums; that is, by the assured. Consequently, while at first sight it may not seem to be to the interest of the assured to take special precautions against loss by fire, it really is so; since the greater the risk of loss, the greater the premium he must pay. The speaker described the workings of an insurance company of which he is president, which aims to prevent loss by fire by a system of inspection. The system is applicable only to large manufacturing and like establishments where strict care and rigid inspection are possible. Before insuring, the owner is required to conform to certain requirements regarding construction of buildings, provision of fire-apparatus, etc. After he is insured, regular periodic inspection by the experts of the company is made, and any dangerous conditions must be remedied. In case of persistent refusal to comply with the recommendations of the company, the policy is cancelled. About the usual rate of premium is charged; and the excess of premiums over losses, amounting to a considerable proportion, is returned to the policy-holders. The interest upon the premiums paid in has nearly paid the running expenses of the company; and the saving in cost of insurance during the last thirty years, at five per cent compound interest, equals the total combustible value of the property insured.

An interesting discussion followed upon methods of construction of slow-burning buildings, automatic appliances for extinguishing fires, etc.

The morning session of Aug. 28 was opened by an exercise illustrating a method of teaching elementary science in grammar schools by Mrs. Ellen H. Richards of Boston. The method is designed to lead children to observe and think for themselves, and was very successfully illustrated with a class of children from the Ann-Arbor schools.

Following this was a paper on the present status and future prospects of silk-culture in the United States, by Dr. C. V. Riley. Silk-culture has been practised in this country for half a century; but the industry is far from being established, these trials having only shown that silk can be raised over three-fourths of the United States if there is a market for the cocoons. At present this is largely lacking, all attempts to manufacture so-called 'raw' (reeled) silk in this country having proved financial failures. The writer advocated a protective duty upon 'raw' silk to encourage the production of cocoons in the United States. The raising of silk he holds to be an industry best carried on as a domestic industry on a small scale, and as adapted especially for the many women and children who cannot readily find any other productive employment. The profits he estimates at $15 to $25 for the season for a family of three persons with cocoons at $1 per pound.

In the discussion of the paper some of Dr. Riley's conclusions were questioned by Mr. Atkinson, who maintained that the establishment of silk-culture in the United States is not desirable. There is no lack of employment for labor in the United States, as the high rate of wages shows; and the fact that the making of reeled silk has been unprofitable, shows that capital can be better employed. Silk-culture is a handicraft simply, and has always been carried on by

the poorest and most inefficient peoples, who, as they rise in the scale, abandon it, as is now coming to be the case in southern France. The argument, that we shall save the $20,000,000 which we now pay for imported silk, is fallacious. When we exchange articles produced by labor costing $1 per day for the silk of China or Japan raised by labor costing five or ten cents per day, we gain and not lose. We cannot afford to do for ourselves what foreign paupers will do for us cheaper. A power-loom for weaving silk has probably been invented in the United States; and when this is perfected, we may buy raw silk, and manufacture it here at a profit.

The afternoon session was opened by a long and interesting paper by Gov. John W. Hoyt of Wyoming, on the need of a systematic reorganization of the executive departments of the government in the interest of science and of public economy. After describing the gradual growth of these departments, and pointing out forcibly the many incongruities and disadvantages of their present organization, and the need of a reorganization, the writer proceeded to describe his plan, which he supported with powerful arguments. It is in brief outline as follows: First, the transfer of the bureau of Indian affairs to the war department, and the separation from the interior department of various technical and scientific bureaus. Second, the separation from the treasury department of similar bureaus not properly belonging to it. Third, the expansion of the department of agriculture into a real department of industry and commerce, presided over by a cabinet officer. Fourth, the expansion of the post-office department into a department of post-offices and telegraphs. Fifth, the erection of a department of science under a cabinet officer, to include the bureau of education, the government-surveys, the signal-service, the naval observatory, the national museum, the library, a bureau of charities, the charge of government scientific expeditions, an advisory superintendence of public works, and, in short, all the scientific work of the government.

An interesting discussion followed, turning largely upon the fundamental points of the legal right of the government to undertake scientific work, and the desirability of its so doing.

The president of the section next presented a paper entitled 'Competition and coöperation synonymous terms,' in which he maintained that the final result of competition is to better the condition of the laborer, and to improve the quality of the product. Like the forces of nature, it produces occasional great disasters, but produces its beneficent results silently and unnoticed. The competition of laborer with laborer is occasional; that of capital with capital constant, and to the advantage of labor. Since the beginning of this century, working-people have been receiving an increasing share of an increasing product.

The day's session was concluded by a paper by Mr. Charles W. Smiley upon some defects of our savings-bank system, and the need of postal savings banks in the United States, in which the writer presented the well-known arguments in favor of postal savings banks, some of which were rather severely handled in the ensuing discussion.

The short morning session on Monday was occupied with a paper by Dr. G. W. Hubbard of Nashville, Tenn., on vital statistics of the colored people of the southern states. The death-rate among the negroes in the cities and large towns is much greater than among the whites; while, so far as the confessedly imperfect statistics show, the birth-rate is not greatly different. The writer instanced the three cities, Chattanooga, Memphis, and Nashville. In the latter, very carefully kept statistics for the past ten years give an annual death-rate per 1,000 of from 17 to 26 for the whites, and of from 27 to 50 for the blacks. The other two cities showed nearly the same proportion. The birth-rate in Nashville, according to official statistics, was in the proportion of 1 white to 2 colored in 1881 and 1882, as 1 to 1 in 1883, and as 1 to a trifle over 1 in 1884. These figures, however, the author put but little confidence in. The causes of the greater mortality among the negroes the author classed under the three heads of ignorance, poverty and its attendant evils, and race characteristics. He considers that the condition of the negroes is gradually improving in the first two particulars. In regard to the prospects of an amalgamation between whites and blacks, attention was called to the fact, that, in most of the southern states, intermarriage of the races is a criminal offence; and that the proportion of illegitimate births of mixed parentage is small and decreasing.

The afternoon session was opened by a paper from Hon. C. S. Hill, statistician of the U. S. department of state, upon the science of statistical analysis, giving some account of the collection and publication of statistics by means of the consular service of the United States, and emphasizing the need of the application of a scientific method to the interpretation of statistics. This was followed by a paper upon social economy, by Dr. John Müller, which closed the day's session.

In his paper upon the silver question, Mr. E. B. Elliott of Washington, D.C., after recounting briefly the history of silver money in the United States, and alluding to the danger which at present menaces the finances of the country, proceeded to enumerate briefly the remedies, which were: 1°, to coin no more legal-tender dollars, but only subsidiary coins; 2°, to increase the weight of these subsidiary coins from 12.5 to 15 grams per half dollar, and to stamp each coin with its weight and fineness; 3°, to base all statements, weight of bars, bullion, etc., on the metric system. An interesting discussion followed, in which Professor William Harkness pointed out most clearly the great gravity of the problem, and commended the recent action of the New-York banks in endeavoring to tide over the danger of the payment of silver by the U. S. treasury in its settlements through the New-York clearing-house. He also alluded to the great temptation to counterfeiting which the present law offers, and stated that it was pretty well ascertained that a considerable amount of it had been done. He closed with the statement that we had allowed ourselves to be made a cat's-paw to

relieve European nations, particularly Germany, of their excess of silver.

The closing paper was also by Professor Elliott, upon electric lighting, giving the results of an examination of the system in use in the Philadelphia post-office. The system is the Weston; the incandescent lights employing an electro-motive force of 73.75 volts, and the arc lights a current of 80.05 ampères. One effective horse-power of the engine was required for 13.25 incandescent lights, and for 1.43 arc lights. One horse-power on the incandescent circuit gave a light equal to 237 standard candles, and on the arc-light circuit of 1,077.3 candles. In remarking upon these results, a member called attention to the low electro-motive force employed, and pointed out that this largely increased the safety of the system as compared with others.

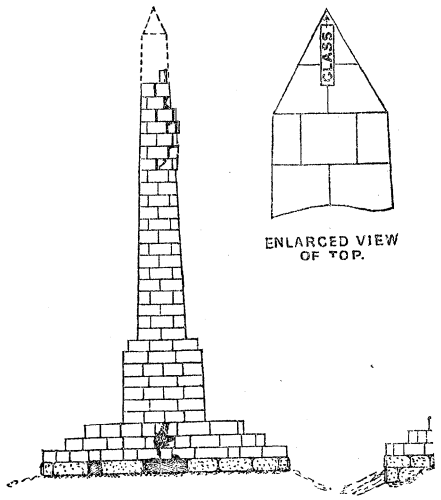
NOTES AND NEWS.

THE officers elected for the next meeting of the American association for the advancement of science, which will be held in Buffalo, commencing Aug. 18, 1886, are: president, Prof. Edward S. Morse of Salem, Mass.; section **A**, mathematics and astronomy, vice-president, Prof. J. Willard Gibbs of Yale College, New Haven, Conn.; secretary, Mr. S. C. Chandler, jun., of the Harvard observatory, Cambridge, Mass.; **B**, physics, vice-president, Prof. C. F. Brackett of the College of New Jersey, Princeton, N.J.; secretary, Prof. H. S. Carhart of the North-western university, Evanston, Ill.; **C**, chemistry, vice-president, Dr. H. W. Wiley of the department of agriculture, Washington, D.C.; secretary, Professor William McMurtrie of the Illinois industrial university, Champaign, Ill.; **D**, mechanical science and engineering, vice-president, Mr. O. Chanute of Kansas City, Mo.; secretary, Mr. William Kent of Jersey City, N.J.; **E**, geology and geography, vice-president, Prof. T. C. Chamberlin of the U. S. geological survey, Beloit, Wis.; secretary, Prof. E. W. Claypole of Buchtel college, Akron, O.; **F**, biology, vice-president, Dr. Henry P. Bowditch of the Harvard medical school, Boston, Mass.; secretary, Mr. J. C. Arthur of the N.Y. experiment station, Geneva, N.Y.; **H**, anthropology, vice-president, Mr. Horatio Hale of Clinton, Ont.; secretary, Mr. A. W. Butler of Brookville, Ind.; **I**, economic science and statistics, vice-president, Mr. Joseph Cummings of Evanston, Ill.; secretary, Mr. H. E. Alvord of Houghton Farm, Mountainville, N.Y. No nominations were made for section **G**, histology and microscopy, as it has been decided to merge it in the biological section. The permanent secretary is Mr. F. W. Putnam of the Peabody museum, Cambridge, Mass.; the general secretary, Prof. S. G. Williams of Cornell university, Ithaca, N.Y.; the assistant secretary, Prof. W. H. Pettee of the University of Michigan, Ann Arbor; and the treasurer, Mr. William Lilly of Mauch Chunk, Penn.

— The Germans hold the fifty-eighth meeting of their association of naturalists and physicists this year at Strassburg, Sept. 17–23.

— The Anthropological congress, which is shortly to be held at Rome, will have a curious feature in a collection of 700 skulls of criminals, numbered and classified. To these, says *Nature*, will be added the photographs of 3,000, and the brains of more than 150 convicts; thousands of autographs, poems, sketches, and special instruments, the work of criminals; an album containing a record of 700 observations, physical and moral, on 500 criminals, and on 300 ordinary men. There will also be graphic maps of crime in Europe, with reference to meteorology, food, institutions, suicide, etc.; tables of the stature of criminals in relation to the length of the arms, and of crime in towns compared to that in the country. Mr. Bertillon will exhibit the graphic curves of 23,000 *recidivistes* examined in twelve parts of the body, and the practical results obtained. Photographs of Russian political and other criminals, especially of those from Moscow, and wax masks of a large number of celebrated criminals, will also be exhibited. All the notabilities in the science of criminal anthropology will take part in the congress.

— On the 28th of April, 1884, during a very severe thunder-storm, the monument of the first duke of Sutherland at Lilleshall, Shropshire, Eng., was struck and badly injured by lightning. Mr. C. C. Walker, who was near by during the storm, made a careful study of the monument and its surroundings, the results of which are published in the *Quarterly journal*



of the Royal meteorological society (January, 1885). The monument stands two hundred feet above the surrounding country, and is built of sandstone in the form of an obelisk. In 1839, six years after its erection, it was so severely damaged by lightning that it had to be taken down and rebuilt. The builder, ignorant of electrical science, fixed on the top, as the apex of the shaft, a pyramid of glass eight inches square at the base, and also inserted pieces of plate-glass six inches wide and thirty inches in length, in grooves cut in the sides of the shaft, thinking, no