

Buffalo. In both places local researches in taxation and other economic subjects are also contemplated. The secretary of the Canton branch reports that Professor Ely's "Problems of To-Day" is being studied, and that "the members are enthusiastic."

The branches at Orange, N.J., and Washington, seem to have patterned largely after the Springfield plan.

These suggestions may furnish some help in the solution of the problem of how to extend the work and influence of the association, and form centres of economic study in many parts of our country.

THE WEATHER SERVICE.

THE popular dissatisfaction with the weather predictions as now furnished by the Signal Office has become so great, that a thorough discussion of what is best to be done to improve the service is certainly desirable. Such a discussion has been taking place in the columns of the *Boston Post*, and from that paper we here quote from a recent letter of Mr. H. H. Clayton of the Blue Hill Meteorological Observatory, Readville, Mass. In an editorial note the *Post* seems inclined to doubt the wisdom, if not the truth, of the sweeping assertion of the inefficiency of a large part of the Signal Corps made by Gen. Greely in his recent report to Congress, and it was this which called forth Mr. Clayton's letter in which he takes the following ground.

"Gen. Greely may possibly not be right in his specifications as to exactly what persons are inefficient, but any one who has studied the history of our weather service in comparison with that of foreign countries can scarcely doubt but there is great inefficiency somewhere in our service; and it seems right to allow Gen. Greely every assistance possible to improve the service, until there is proof that his efforts are in the wrong direction. The financial support and the facilities afforded our signal service are the best in the world, and it has been a continuous surprise to the writer that its efficiency has not been greater. The following figures show in round numbers the amount of money appropriated by various governments in Europe and America for the support of their weather services: United States, \$900,000; Great Britain, \$80,000; Germany, \$56,000; Russia, \$65,000; Austria, \$10,000; Switzerland, \$6,000; France, \$40,000. This estimate for France does not include the cost of observations made at a few astronomical observatories and mountain stations, which may perhaps increase the total amount expended by France to \$60,000. It is thus seen that the amount of money appropriated for its weather service by the United States is ten times greater than that of any country in the world, and is greater than the amount appropriated by all of the governments of Europe combined, including Italy and others not mentioned above.

"In Europe a large part of the observers are voluntary observers, or they are men who are engaged in other pursuits, and for a small compensation take meteorological observations, and telegraph them to the central stations. For this reason it has been necessary to adapt the observations somewhat to the convenience of the observers, and it has been impossible to obtain all over Europe a system of simultaneous observations such as are obtained in the United States. The principal set of observations in the different European countries is taken all the way from 7 A.M. to 9 A.M.; and on account of the difficulty of arranging codes, and transmitting telegrams from one country to another speaking different languages and having different interests, it is almost noon before the morning observations are in an available form in the different countries for use in making weather predictions, while in the United States it is but little more than an hour after the observations are taken before they are available for use at the central office. Again, owing to their small appropriations, none of the European countries have been able to obtain extensive reports more than once a day from surrounding countries, and thus form a set of relatively complete weather maps, such as was previously done three times a day in the United States, and is now done twice a day. The full weather map made by the European weather services is from the morning reports taken between 7 and 9 A.M., though most of the services make supplementary maps from less complete reports received in the afternoon and evening.

"So far, it is seen, then, that our weather service is better equipped, and with far better facilities for effective work, than any service in the world; but what are the results? In 1881 the per cent of verification of their weather predictions estimated by the French meteorological office was 82. Since then it has steadily risen, until, in 1888, a verification of 90 per cent was claimed. In the same manner the per cent of success estimated by the London office for Great Britain has risen from 78 per cent in 1882, to 83 per cent in 1887. In Germany the per cent has risen from about 80 per cent ten or twelve years ago, to 88 per cent in 1887. According to the official verifications of our signal service, the per cent of successful weather predictions rose from about 82 per cent in 1875, to 89 in 1883, and then decreased irregularly to 74 per cent in 1887, or 81 per cent when corrected for the greater interval covered by the predictions. These signal-service verifications for different years are not strictly comparable, because they were verified according to varying rules and with different degrees of care; but the signal service uses them so, and the figures at least agree with the general impression that there has been no increase in the accuracy of the signal-service predictions during the last fifteen years. Neither are the per cents of verification for one country comparable with another, since many of them were verified by different rules; but the results are comparable among themselves, and the steady increase of accuracy claimed for the European weather predictions is no doubt a fact. The able papers and investigations proceeding from the members of the European bureaux seem sufficient evidence that great thought is being given to the improvement of meteorology, and the advance of meteorological knowledge is undoubted.

"The great difficulty with our bureau seems to have been that Congress made it a military rather than a scientific organization. Several years ago a committee appointed to investigate the bureau recommended that it be transferred to a civilian organization, either gradually or suddenly. The National Academy of Science, when consulted on the subject, recommended the same thing; but for some reason unknown to the writer, Congress has neglected or refused to make such a transfer, and last year struck out a clause to that effect in the agricultural bill. There is scarcely any doubt, that, with some scientific investigation, certain of those storms might have been predicted which in recent years have struck our coast unheralded by the signal service, and left wreck and ruin behind,—notably the storm of Jan. 9, 1886, for which no signals were ordered, and in which it is estimated that about 125 vessels were wrecked on the New England coast. Were the weather service of our country in the hands of well-selected scientific men, it would undoubtedly become, as it ought to become with such splendid facilities as it now has, one of the finest meteorological bureaux in the world. If, however, this cannot be, it is hoped that every facility will be furnished Gen. Greely to make it an effective military organization. Gen. Greely's recent books and excellent 'Report of the Lady Franklin Bay Expedition to the Arctic Regions' indicate a deep interest in and a knowledge of the needs of meteorology, and he is no doubt sincere in his efforts to increase the efficiency of the Signal Corps.

"Besides the re-organization of the bureau, an immense advance might be made by organizing local predicting bureaux, where the predicting officers could make a closer study of the conditions surrounding them, and gain more time for prediction, instead of, as now, being compelled rapidly to make predictions for almost the entire length and breadth of our land, which is many times larger than any country of Europe, except Russia. The favor with which the Blue Hill predictions, as well as those of others in this and other parts of the United States, have been received, seems proof that local weather bureaux would be at once appreciated by the public."

MENTAL SCIENCE.

The Genesis of Error.¹

PROFESSOR S. EXNER of Vienna contributed to the Congress of German Naturalists and Physicians a very suggestive essay upon the principles underlying the origin of illusion in man and the ani-

¹ From the *Revue Scientifique*, Jan. 12, 1889.