bitten by a rabid animal. Experiments are now in progress to determine how long an interval may elapse before the treatment ceases to be effectual. This interval is at least a number of days.

In the case of the boy Joseph Meister, who was successfully treated by this method, Pasteur began the inoculation sixty hours after the reception of severe bites by a rabid dog. The first inoculation was with a portion of spinal cord which had been preserved fifteen days. The treatment lasted for ten days; in all, thirteen inoculations were made, each one with a cord one day fresher than that used in the preceding inoculation; at the last inoculation there was used a cord preserved only one day, and containing a virus which produced rabies in a rabbit in seven days; that is, a virus more malignant than that in the bite of a dog affected with the rabies of the streets. The boy was kept under observation, and at the time of Pasteur's communication — three months and three weeks after the bite — no symptoms had developed.

After Pasteur's communication, Vulpian advised that a service be organized for the treatment of rabies by Pasteur's method.

Pasteur is unable to explain in what way immunity is produced by his method of inoculation. He thinks that the virus is altered in quantity rather than in quality by his method of preserving the cords. He notes the interesting fact, that, if the cords are preserved in a moist atmosphere of carbonic acid, with oxygen excluded, the original virulence remains unchanged, even after several months.

The full details of Pasteur's experiments upon animals, with description of symptoms and of *post-mortem* examinations, will be awaited with great interest. It is a matter of regret that we are not informed as to the nature of the virus, which, indeed, does not seem to have been discovered. It is probable that Pasteur's studies in this direction will lead to fruitful results.

A large number of observations are necessary in order to establish the efficacy of Pasteur's treatment of hydrophobia in human beings. His results certainly warrant a belief that, if the treatment be begun soon after the reception of the poison, this otherwise most hopeless and dreadful disease can be prevented. Should this belief become a proven fact, then Pasteur will merit the gratitude of all mankind.

THE PLAINS OF BRITISH AMERICA.

Striking contrasts present themselves to the experienced eye between the plains of British America, through which the lately finished Canadian Pacific railway has laid its tracks, and those crossed by any of the transcontinental lines in the United States. In the first place, they are larger. It is more than 1,000 miles from where the forested granites of Keewaydin dip under the Silurian prairie-floor in the Red River valley to the first escarpments of the Rocky Mountains. In Kansas it is hardly half as far between the wooded region and the foot-hills of Pike's Peak.

Another feature is the prairie-like look of it all, save certain far-western tracts. The grass is dense and long, flowering herbage is profuse. West of the South Saskatchewan this gives place to a greater, more 'plains' like scantiness of vegetation, to be sure, but nowhere is the bareness and aridity of the southern plains equalled.

This is due to the greater moisture in earth and air, and to the extraordinary fertility of the soil; Manitoba producing an average of 21½ to 22 bushels of wheat to the acre, or 4 to 5 bushels in excess of the average of any other similar space on the continent. The soil is coal-black, and declares its richness at first sight. Dr. Robert Bell, of the Canadian geological survey, discussed the causes of this fertility before the Canadian royal society, May 23, 1883. He pointed out that the materials were the best possible, having been derived from the glacial drift of the north, mingling sand and gravel with the cretaceous marls spread over all British America. Having this favorable constitution, Dr. Bell assigns to the moles the chief agency in the formation of the thick top-layer of vegetable mould which is now the joy of the farmer. In the Assiniboine valley the moles have thrown up almost every foot of the soil into hummocks, each containing a large shovelful of earth, and burying completely the grass and vegetation over a space a foot or more square. The vegetable matter thus buried decays, and becomes incorporated with the soil; so that the process is analogous to ploughing under the soil. This work of the moles not only enriches, but refines the soil. In making their burrows, they select the finer material and cast it up to the surface, leaving behind the coarser. The effect of this is similar to that alleged by Darwin of the earthworms (which do not exist in the north-west territories), since, in the course of time, all the stones are buried. Their labor is supplemented by that of the gophers, spermophiles, and badgers, the last named digging deeply, and heaving up large quantities of gravelly subsoil, which the moles work into and improve, while all bury much vegetable rubbish as nests and food. This beneficent animal agency nearly ceases, however, when the elevated hard and stony 'third steppe,' called the Grand Coteau du Missouri, is reached, and when the mountains are approached, where the soil is clayey.

About 100 species of trees and shrubs are recorded as growing on the north-western plains, while the list of herbaceous plants is a very long one. A good many noxious weeds have been introduced with civilization, and some flourish most aggressively. The worst pests are Canada thistles, wild mustard, oats and buckwheat. The Thlaspi arvensis, or mithridate mustard, commonly known as 'penny cress,' is a great nuisance in the Red River valley, where it sprouts and flowers in spring, surrounded by snowbanks, and exposed to severe frosts. Sunflowers rise abundantly wherever the soil has been disturbed, and ought to be utilized. Insect and fungoid pests to crops are remarkably scarce, though the Rocky Mountain locust has at times invaded the Red River valley.

The grasses are many, and those called 'buffalo-grass' attract the first attention. True buffalo-grass (Buchloe), however, is not found north of the boundary. The buffalo-grasses of that region are Butchelona oligostachia, representing the gramina grasses of the south-western United States; and Stipea spartea, more often called 'spear-grass,' or by several names indicating what Dr. Holmes calls its 'diabolish' characteristics. The young spring leaves of the Stipea spartea are the most succulent and nutritive of all the prairie-grasses, which, as a rule, are harsh and sedge-like; they are short, and form themselves into tussocks (most noticeably in dry uplands), which, though useless in making hay, provide a very valuable pasturage. It spreads over the entire north-west, and is most plentiful on the buffalo plains, where it stood as the staff of life to the vast herds of wild cattle once ranging those limitless opens.

The peculiarity which earns for it the evil names 'spear-grass,' 'wild oat,' etc., belongs to the fruit. The covering of the seed is about seven-eighths of an inch long, and terminates in an excessively hard, sharp, and obliquely curved point; the extreme tip is bare, but close behind are set stiff, fine, silky hairs, all pointing backwards and upwards. The seed is borne at the end of an awn, which is kinked and twisted in a peculiar way, so that when dampened it gradually straightens out with a corkscrew motion, the effect of which (whatever its 'design') is to force the spear of the seed forward and spirally into whatever it happens to be pressed against, while the barb-hairs aid the penetration and prevent easy withdrawal. Darwin's experiments with the awns of an allied but less formidable species (S. pennata) will be remembered; while the Proceedings of the Linnean society of London, 1884, contain an account of experiments with S. spartea itself, by R. Miller Christy.

The seeds ripen about the middle of July, and are at that time troublesome, as they have the power of penetrating the clothing and pricking the skin painfully. An insect-collector finds them a great nuisance, since they knit his net into hard knots in a short time. Woolly-haired dogs are tormented by them, and this grass has always been dreaded by sheep-owners and cattle-herders. Most of the stories told of it, nevertheless, are gross exaggerations, though it is true that they do get into wool badly, and sometimes penetrate the skin. On the extensive sheep-ranges at the foot of the mountain it is now customary, before stocking a certain range, to burn over one-half of it a year in advance, before the spear-grass has had time to ripen. The sheep are introduced to the new grass the next spring, and feed upon it while the remaining half of the range is burned. When that is ready, they are moved and the first half is reburned. By this means the spear-grass is said to be got rid of in two or three years, and will not return so long as the sheep remain.

Horses and cattle live upon this grass on the wild plains without harm. Prof. John Macoun of Ottawa told me that in seven years of plains travel his horses had never been harmed. The object of the mechanism of the awn apparently is to insure its planting by being pushed well into the ground; this accomplished, the awn soon rots off, and the seed germinates. Mr. Miller, in his Linnean society paper, points out how the buffalo paid for his pasturage by transporting the seeds of this best of grasses in his rough coat, extending its distribution by planting them wherever his mats of shedding wool fell off in the spring. Thus this beast constantly widened its feeding range, and provided for its increase in numbers. Of course, this grass was not the only plant thus carried by seeds north, south, east, and west, by the migrating herds; nor was the bison the only animal whose hairy coat would carry the clinging awns.

The buffaloes have abandoned all the region south of the Saskatchewan since 1878. Even their bones have been pretty thoroughly picked up. The little tributary of the Qu'Appelle River, upon which Regina, the capital of Assiniboia (province), is situated, is called Pile of Bones Creek, after a great heap of bones, chiefly bovine, which formerly lay upon its bank where the Crees had a favorite camp-ground. It would have been a 'bonanza' for the archeologist, doubtless; but an unscientific person shipped the whole heap away to Philadelphia and sold it, relics and all, at five dollars a ton. One sees all along the railway track now, just as used to be the case in Kansas and Nebraska, mounds of buffalo skeletons ready for shipment to fertilizer factories. At many

stations, particularly Moose Jaw (which owes its name to the shape of the bend in a creek there), you may buy excellent specimens of buffalo-horns, somewhat polished, and bound together with forehead-hides or bead-embroidered flannel, — the work of Indians and half-breeds.

ERNEST INGERSOLL.

NEWCOMB'S POLITICAL ECONOMY.

IN illustrating the ease with which labor may rush from one channel to another in case of a change in demand, Professor Newcomb remarks on p. 115 that "a professor of one science can commonly teach another." If he had said that it is unhappily true that an ignorant and unthinking public often considers that a man eminent in one department is equally so in several or all other departments, or that it is a common but most vicious notion that a college professor of one branch might just as well be professor of another also — as, for instance, that the professor of Christian evidences and New Testament Greek may also take physics as well as not, — and that this absurd notion is at present one of the most serious obstacles to any real improvement of our educational system, he would have been very much nearer the truth, and, we cannot help believing, nearer to his own real opinions when in his soberer moments. Certain it is, at any rate, that if a man who had given the best years of his life to the study of political economy should wander over into the field of astronomy and physics, and undertake "to bring order into the reigning confusion," and "to give the subject a recognized place among the sciences by being the first to treat and develop it as a science," Professor Newcomb would be just the man to administer a severe and deserved castigation. The offence is none the less serious, because in this case we have a great and successful astronomer and physicist wandering over into the economic field and undertaking to set things to rights.

The fact is that the progress of modern science in every branch has been so great within this century, that he is a bold man indeed who thinks that he is entitled to speak as an authority even in two or three fields, though they be very closely allied. The mere work of mastering the facts which are necessary to enable one to speak with confidence has become so great in almost any of the more developed branches of human science, that it is the task of years to do this for a single branch, to say nothing of a half dozen. It is, however, perfectly within the power of an able man to write a treatise on a science of whose present status he knows next to nothing, which shall present the subject as it was some time in the past, provided he goes back far enough toward the beginning of things. This is just what the author has done in this book. If he had published it fifty years ago it would have been a valuable contribution to the subject. Coming at this late day, it is still valuable as an instance of how completely a man may enter into the ideas and thoughts of a past generation, and how skilfully he may re-present them.

There is no evidence in the style of reasoning in this work that the author is at all acquainted with the recent literature of the science either in England or on the continent. One great advance in economic science of the last twenty-five years lies in a change of its prevailing method. It has been affected in a most healthy way by the enormous progress of physical and natural science. It is reaching out to avail itself of their methods so far as possible. As a result of this new method, it has come to reject the old generalizations, and, while recognizing that they were exceedingly valuable in their time, and formed important, nay, necessary links in the chain of scientific progress, it now insists that we have ample evidence of their crudeness and incompleteness, and that, taking whatever may be left of them that is true, we must now look for valuable results to careful and far-reaching inductive study of the facts of our social and economic organism as the indispensable basis of new and more fruitful generalizations.

Of all this there is scarcely a trace in Professor Newcomb's treatment. He repeats exploded theories and almost universally rejected laws with the utmost naïveté as "principles which will be accepted by all who understand the subject." It is true that he calls attention, in his chapter on economic method, to the necessity of more exact definition and careful reasoning; but taken in connection with his actual treatment, it has much the same effect on the professional economist that would be produced on the physicist or astronomer by an attempt on the part of Wilhelm Roscher or Cliffe Leslie to restate the corpuscular theory of light on the Ptolemaic system of astronomy with a greater exactness of definition, and closeness of reasoning. A work prepared in this latter spirit would doubtless have a value, as, for example, for disciplinary purposes in an old-fashioned college, but it would hardly be accepted by prevailing authorities as in any sense a productive contribution to the science.

Professor Newcomb's work is written from the old stand-point of extreme individualism. The author takes it for granted, and indeed expressly asserts in more places than one, that the individual, in fol-

Principles of political economy. By SIMON NEWCOMB, Ph.D., LL.D. New York, *Harper & Bros.*, 1886. 548 p.