

has been fruitful in result. In the course of experimental work occupying eight years, the percentage of sugar in field crops of sorghum was raised from 9 to 14. The investigations concerned with beet cultivation have been so successful that the establishment of an indigenous sugar industry is now certain, and the benefit to American agriculture in the near future will be measured by hundreds of millions of dollars.

It would be instructive to refer to the work of the Weather Bureau, and of the divisions of entomology, agrostology and forestry; but it must suffice to conclude with a few observations on the bureau of animal industry.

Those who have been engaged in recent years in the administration of the Diseases of Animals Acts in Great Britain will best appreciate the comprehensiveness and the excellence of the work of the Washington Bureau. It is a bold statement to make, perhaps, that the whole of the United States territory—from the Atlantic to the Pacific, and from the great lakes to the Gulf of Mexico—has been swept free from pleuro-pneumonia; and those who are familiar with the history of this most troublesome disease in Great Britain will only hope that the assertion may prove to be true.

The microscopic inspection of pork intended for export is worthy of all praise, and we reproduce an illustration showing this work in progress. Last year 1,881,309 specimens were thus examined for trichinae, and only 13,325 were found infested; the cost of this inspection was 111,670 dollars.

#### EDWIN DUNKIN, F.R.S.

AT the ripe age of seventy-seven, with the consciousness of having fulfilled a useful career, and amid the respect and sympathy of his associates, Mr. Edwin Dunkin has passed away, again diminishing the small band of zealous assistants, that Sir George Airy collected around himself, when some sixty years ago he undertook the reorganisation of the Royal Observatory, and inaugurated that system of uniform and continual observation which has ever since remained the chief characteristic of that institution. To trace the career of Mr. Edwin Dunkin is to recall the history of the Observatory under its late director, for during nearly half a century Mr. Dunkin took a prominent part in its activity, filling many responsible positions, till finally he became the chief and confidential assistant. In whatever capacity he was placed he was admirably adapted to it by reason of his painstaking and accurate observation, his loyalty to his chief, and his keen interest in the science. It was his fortune to see and to assist in the creation and development of a magnetical and meteorological department, to witness the establishment of a system of extra meridional observations of the moon, to see the observations of Right Ascension and Zenith Distance effected by a single instrument, and to mark the substitution of chronographic registrations for the older method of recording transits. He remained at his post long enough to note the introduction of the spectroscope and of photographic processes: in a word, to form a link between the methods of the old astronomy of position and the purposes of the newer physical science. He lived to see the staff of the Observatory trebled and quadrupled, as fresh objects of inquiry were brought within its scope; and that he could adapt himself to every change, and lend his experience to ensure the smooth working of the ever-growing machinery, is to say that he was an able and useful official, rendering good work in his day and generation.

Naturally, from his official position, Mr. Dunkin took part in many of the scientific expeditions organised at the Royal Observatory under Government auspices. Among

the earliest of these was a visit to Christiania to observe the total eclipse of the sun in 1852. The instrumental equipment provided, consisted of a telescope of  $3\frac{1}{2}$  inches aperture, mounted on a firm tripod, and provided with steadying rods. If this optical assistance appears to us now antiquated and inadequate, the observations made with it read even more strangely. We may quote one sentence from the official report, which illustrates the progress of physical inquiry accomplished within a single scientific life. Mr. Dunkin is describing his first impressions of a solar prominence:

"My eye was intently fixed upon it for about a minute of time, and during that interval not the slightest change took place in its form. Its colour was pink, or rose colour, but the shade was not very deep. It seemed to me at the time, from the excessive steadiness of this prominence, and from the fact that I had zealously watched it for so long an interval without its undergoing any change, that this object had some connection with the moon. However . . . it is possible I may be deceived."

Another classical experiment in which he was engaged, and to whose minute care the measure of success obtained was mainly due, had reference to the determination of gravity at different distances below the earth's surface, by means of pendulum experiments. Some thirty years previously, the late Astronomer Royal had carried out an investigation of the same nature, which had not led to a satisfactory termination; but in the case of the Harton Colliery, where experiments could be effectively made at a depth of 1260 feet, Sir George Airy expressed himself as quite satisfied with the result achieved, and considered that it established a favourable precedent for similar inquiries in the future. The result was to show an increase in the force of gravity of  $1/19000$  at the depth reached. Longitude determinations may be said to come almost within the daily routine of the Royal Observatory, and it would not be necessary to refer to the share Mr. Dunkin took in these, but for the fact that the system of telegraphic signals was a new and practically an untried method when Mr. Dunkin and M. Faye were engaged in the longitude determination of Paris. Doubtless there were difficulties in those days, which have been so effectually overcome that they have been forgotten; but as a pioneer, Mr. Dunkin, and those who were associated with him, must have exhibited a manipulative skill which we may now fail to appreciate.

We should do less than justice to Mr. Dunkin's memory if we did not recall his long and eminent services to the Royal Astronomical Society, which he served in various capacities. He was Secretary at the time of the removal of the Society's property from Somerset House to its present quarters, and the reorganisation of the library, and the restoration of order into the Society's affairs, which had fallen a little out of gear, devolved mainly upon him, but his methodical habits and unstinted devotion to the interests of the Society ensured complete success in the regularity and management. Among other services to the Society, one may mention the many obituary notices which it was his misfortune to have to write, but which were always recognised as just and appreciative, and not without literary merit. His scientific communications had generally some reference to points of importance in practical astronomy, such as the treatment of personal equation in observations, or the determination of proper motions of stars. He was eminently a practical astronomer, rendering useful, if less brilliant work than the mathematician; but the many solitary hours he passed at the eye-piece of the transit circle, or the altazimuth, will not be without their due effect in advancing the interests of astronomical science.

W. E. P.