of the year's rainfall may, under favourable conditions, be stored in the soil for the next year; thus, if only 15 inches fell each year, making a total of 30 inches in the two years, the wheat crop grown during the second year should have moisture available equivalent to 25 inches or more, on which, of course, it should do very well. Unfortunately, the rainfall does not necessarily remain near its average, but fluctuates considerably, and records are not available for many districts; it has occurred in districts where dry farming was considered a great success that the rainfall was, after all, about 20 inches, and ordinary cultivation would have been equally good.

However, the interesting problem is this: What is function of the compact subsoil and the loose surface layer? It is usual to suppose that the compactness of the subsoil facilitates the upward lift by surface tension of water from the permanent water table, but it would seem equally rational to suppose that the compact subsoil retards the percolation of the water. So far as the writer is aware, no crucial experiments have been made that show beyond doubt how far the upward movement of water by surface tension is a factor in ministering to the needs of the plant. That it takes place, of course, is not disputed, but its relative importance is unknown. The function of the loose layer on top, the "mulch," is not settled. It is commonly regarded as a break in the structure of the soil leading to a rupture of the "capillary films" of water. It may equally be a non-conducting layer shielding the mass of the soil from the sun's heat, and therefore lessening evaporation.

Until these problems are solved, little advance can be expected from the scientific point of view, although the practical man continues to effect improvements. The fundamental need seems to be a mathematical analysis showing how water will distribute itself over a mass of particles varying in diameter from below 0·002 mm. up to 0·1 mm., the bulk being below 0·01 mm., and how rapidly any disturbance in equilibrium will readjust itself. The pressing need of work in this direction may be gauged from a perusal of the Transvaal, the Cape, or the South Australian Agricultural Journals; in South Africa alone a considerable part of Cape Colony, the western halves of the Orange Free State and the Transvaal, the whole of the Bechuanaland Protectorate and a considerable portion of southern Rhodesia fall within the "dry lands" area. Some useful practical work may be expected from the newly established dry-land experiment station, but that will only intensify the necessity for a scientific study of the problem.

There is also need of work by the plant physiologist on the effect of insufficient water supply on plant growth. In Dr. Leather's paper data are given showing how much water is transpired by a plant in the production of one pound of dry matter, and on the basis of these figures a table is made out showing how much irrigation or rain water is needed to obtain crops of certain sizes. The values depend on the amount of food-stuff available; less water is needed per pound of dry matter produced in a rich soil than in a poor one. Although there is no direct causal relationship between transpiration and assimilation, the ratios obtained by different observers in various parts of the world are roughly of the same order; thus for barley the number of pounds of water transpired per pound of dry matter produced are:—

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|---|---|
| Lawes and Gilbert (Rothamsted, 1850) ... ... | 257 |
| Wollny ... ... ... ... ... ... ... | 774 |
| King (Wisconsin, 1894) ... ... ... ... | 393 |
| Leather (Pusa, 1910) on manured soil ... ... | 480 |
| ,, ,, on unmanured soil ... ... | 680 |

E. J. RUSSELL.

## THE CAVENDISH LABORATORY.

THERE is no more pleasant way of spending a week-end than by re-visiting the University Town of Cambridge in term time to meet the old friends and comrades of years gone by, and it was a happy thought that induced the writer of the "History of the Cavendish Laboratory" to choose a Saturday for presenting an edition de luxe of the book to the Cavendish Professor of Experimental Physics.

Saturday, November 12, was a red letter day for all who are interested in the Cavendish Laboratory, for it was the occasion of the assembling of a number of distinguished persons to do honour to the "boy professor" of a quarter of a century ago, who has so amply justified the confidence of the Board of electors in appointing so young a man to a post of such importance. Clerk Maxwell and Rayleigh were not easy men to follow; the standard they had set was a high one, the Cavendish Laboratory had become a prominent institution dependent for maintaining its position and for its further development not only on the scientific reputation of its Director, but on his power to attract the ablest young men of the day.

How far Sir J. J. Thomson has done this was evidenced by the number of distinguished visitors to Saturday's ceremony, among whom we noted: Lady Thomson and her little daughter Joan, Mrs. Sidgwick, the Vice-Chancellor, the Bishop of Ely, the President of Queens' and many Masters of Colleges, Sir T. Clifford Allbutt, Sir Robert Ball, Profs. P. V. Bevan, R. H. Biffen, F. C. Burkitt, Sir George Darwin, Prof. Ewing, Dr. Wm. Garnett, Profs. W. M. Hicks, F. G. Hopkins, B. Hopkinson, Dr. J. N. Keynes, Sir Joseph Larmor, Profs. Liveing, Leahy, Alexander Macalister, Dr. J. E. Marr, Profs. H. F. Newall, W. J. Pope, J. H. Poynting, E. Rutherford, Dr. J. E. Sandys, Mr. Sidney Skinner, the Hon. R. J. Strutt Mr. H. M. Taylor, Mr. W. C. D. Whetham, Prof L. R. Wilberforce, Mr. C. T. R. Wilson, Prof. G. Sims Woodhead, and Prof. A. M. Worthington.

In the unavoidable absence of the Chancellor, the Vice-Chancellor presided, and declared his position a sinecure in that the speakers needed no introduction.

Dr. Glazebrook, in making the presentation, began by reading a message, contained in a letter to himself, from Lord Rayleigh, Chancellor of the University:

My interest in the Cavendish Laboratory began with—indeed preceded—its inception, and I had the privilege of the acquaintance of that great genius, the first professor, on whom fell, of course, a vast amount of work in connection with the building and equipment. The laboratory had hardly more than got to work when British science sustained an irreparable loss by the death of Maxwell. My interest then became a responsibility. During the five years from 1879 to 1884 the educational work was greatly developed under yourself and Dr. Shaw, and in research some good work was done. But I must not dwell upon what, no doubt, most of the present students look upon as the dark ages. For six-and-twenty years Sir Joseph Thomson has had the direction, and under him the Cavendish Laboratory has assumed the first place among physical laboratories. By his own researches, pursued with astonishing ardour and success, he has opened up a new world, and, what is in some respects a task even more difficult, he has inspired and trained a number of followers, among whom I am pleased to reckon my own son. Cambridge has every right to be proud of the Cavendish Laboratory, its professor, and his staff.

I will ask you to convey my congratulations to Sir J. J. Thomson. For the future one can wish nothing better than that it should resemble the past.

Dr. Glazebrook, continuing, briefly sketched the history of the Laboratory as contained in the book, which he said was written by men who took part in the events they described.

The book has been written partly in the hope of enabling educated Englishmen who are not physicists to understand the meaning of the work done at the Cavendish Laboratory. . . . It covers a wide range of intellectual qualification from that of the M.B. student to that of the brilliant band Rutherford, Wilson, Townsend, McLellan, Langevin, Richardson, Zeleny, and the others who were research students ten years ago. The Master of Trinity in an eloquent speech a few months ago told his audience he was a dreamer of dreams, and in one dream he pictured a larger university with its portals opened wide and men of many nations and kindred flocking in from all lands to reap the rich harvest of ancient learning or modern science which only Cambridge can furnish, and to carry back to their distant homes the garnered sheaves to feed and fertilise the world. Sir J. J. Thomson has realised such a dream. The new regulations for advanced students passed in 1895 were accepted in large measure through his advocacy, and since that time an ever-increasing stream of men coming from every land has been directed towards Cambridge; the list of those who have carried on researches in the Cavendish Laboratory during the last forty years contains some 250 names; the list of published memoirs covers forty pages. Former students hold important posts in almost every great university; the fact that of the professorships of physics in the colleges of university rank in England all but one are held by Cambridge men shows the wide influence of the laboratory at home. Go where you will, not only in English-speaking lands, to any centre of physical study and you will find one or more who is proud to say he was a research student of the Cavendish Laboratory and a pupil of Sir J. J. Thomson.

As representing those pupils and in the name of the large assembly here present, in the name of the scientific world, I am here to express to you our high appreciation of the services you have rendered to science and to the University, to assure you of the affectionate regard for you personally of all your pupils, and to wish for you and Lady Thomson many years of fruitful activity and continued happiness. Can I do better than repeat the Chancellor's wish—that the future may resemble the past?

It is my privilege to ask you to accept this volume with its record of your great work as some slight recognition of all you have done.

Sir J. J. Thomson responded in a characteristic speech. There was no mention of his own work further than the expression of the wish, which raised a smile on all faces, that he had done more. His speech was an acknowledgment of all he owed to his College, his University, and those personal friends from whom, he said, he had received help without which there would have been no such celebration. He referred to the triumvirate Rutherford, McLellan, and Langevin, and mentioned that one of them had received the Nobel prize. No one was forgotten in the expression his thanks; the demonstrators, the students, the assistants in the Laboratory, were all remembered and many of them mentioned by name. To everyone full appreciation was accorded, and the one person not mentioned, whose work and influence were not alluded to, was the Director of the Laboratory, the Professor to whom all else was due.

The Vice-Chancellor briefly declared the proceedings ended, and passed, "as a business man," to the next item of the agenda, "Cavendish Laboratory Afternoon Tea," an institution of Sir J. J. Thomson, which has accompanied Cambridge Physicists to all parts of the world and, conversation becoming general, the afternoon ended most pleasantly.

S. J. D. S.

## MR. W. R. FISHER.

As announced with regret last week, Mr. W. R. Fisher, assistant professor of forestry at Oxford, died on November 13, after an operation. He had not been in good health for some time past, but his death occurred rather suddenly.

Mr. Fisher was born in 1846, at Sydney, New South Wales, where his father was Crown Solicitor, but became afterwards the first Attorney-General of New Zealand. He came to England quite young, and was educated at Cambridge, the home of his father and grandfather, the latter having been a banker in Petty Cury. He joined St. John's College, and took his degree in 1867, being placed 17 senior optime. Soon afterwards he became a mathematical master at Repton School.

In 1869 Mr. Fisher competed for an appointment in the Indian Forest Service, being bracketed first. After the necessary training in forestry, chiefly at Nancy, and partly in Scotland, he joined the Bengal Forest Department in 1872. On the establishment of the Assam Chief Commissionership, in 1874, he was transferred to that administration and remained there until 1878. During that time he started the Charduar Rubber Plantation (*Ficus elastica*), which was extended to an area of about 1000 acres. Mr. Fisher was thus one of the pioneers of artificial rubber plantations. In 1878 he was specially selected for the appointment of deputy-director of the newly-established School of Forestry at Dehra Dun, and he rose subsequently to become the director of the school and conservator of forests of the school circle.

In the year 1889 he came home on furlough, and in 1890 he joined the staff of the School of Forestry at Coopers Hill College. In the year 1905 he went with that school to Oxford, where he became a member of Brasenose College.

Mr. Fisher has left his mark upon forest science and practice. At Dehra Dun he taught chiefly forest botany, and he brought out a volume on plant physiology. After he joined at Coopers Hill, he taught silviculture, forest protection, and utilisation. He joined Sir W. Schlich in bringing out the latter's "Manual of Forestry," of which he undertook the preparation of vol. iv. on "Forest Protection," and of vol. v., on "Forest Utilisation," now in their second edition. Although these two volumes are adaptations of Hess's work on protection and Gayers's book on utilisation, Fisher's books are more than the original works, since he adapted the material to British and Indian conditions. They may be considered the standard works on the two subjects.

Throughout his life Fisher was an active writer, and it would be difficult even to enumerate the many articles on forestry which he published. He was an active member, and president for two years, of the Royal English Arboricultural Society, and editor of the society's *Journal*. After his arrival at Oxford, he started an arboretum of indigenous and exotic trees on land belonging to Magdalen College.

During his leisure time he advised many British proprietors on the management of their woods, and thus helped forward the question of forestry and afforestation in these islands. He was, in 1907, a member of the Departmental Committee of the Board of Agriculture in Ireland on afforestation, and lately of the committee sitting in London, dealing with agricultural and forestal education in Britain.

Mr. Fisher was a man of very simple character, with a warm heart, and he was universally liked, not only by the students, but also by a large host of friends. He conducted the annual excursion to France, and it was quite touching to see how French