corona he and his party secured during their expedition to Souk-Abras, in Algeria, in August, 1905. Perfect weather was experienced on this occasion, and the programme was carried out in its entirety. When it is stated that the diameter of the moon on these plates measures 7·5 inches, the scale of the reproductions can be better understood. The main object of the expedition was to obtain the structure of the inner corona by means of photography, and for this purpose a horizontal telescope of 20 metres focal length was used, fed by a cœlostat. The objective itself was by Zeiss, and of 160 mm. aperture, and achromatised for wave-lengths 531·7 and 405·1 $\mu\mu$, the resulting solar image being 19 cm. in diameter. In the introduction to these plates Prof. Schorr gives details as to the kind of photographic plates used, and the details of exposure. Great pains seem to have been taken to make the reproductions as representative of the original negatives as possible, and the result is remarkably successful. Each plate is accompanied by a celluloid sheet over it, on which the correct orientation and prominent features are marked. The last plate is a reproduction of a drawing by Dr. Graff of the structure of the inner corona, in which are combined the details shown in all the negatives. Fortunately, on the occasion of that eclipse the corona was fully of quite extraordinary detail, especially in form, and this record is therefore of particular interest. The atlas is a valuable outcome of a most successful expedition.

KELVIN MEMORIAL WINDOW.

THE memorial window to Lord Kelvin, subscribed for by engineers in Great Britain, Canada, and the United States, was dedicated at a special service in Westminster Abbey on Tuesday. The window is in the east bay of the nave on the north side. The light from it falls upon the graves of Kelvin and Isaac Newton, and immediately beneath it are the graves of Darwin and Herschel. The window, which was designed by Mr. J. N. Comper, is chiefly ecclesiastical and historical in character. The lights contain two large figures under canopies; and in front of the pedestals of these two figures are tablets held by angels, containing the words:—"(1) In memory of Baron Kelvin of Largs, (2) engineer, natural philosopher, b. 1824, d. 1907." Beneath these again are the arms of Lord Kelvin and of Glasgow University.

The Dean of Westminster, in the course of an address, is reported by *The Times* to have said that forty years ago there were at Cambridge an extraordinary constellation of great men of mathematical genius—Adams, Clerk-Maxwell, Cayley, and Stokes—occupying professorial chairs. Of the four, two had been justly commemorated in the north aisle of the Abbey. Another Cambridge man, William Thomson, was destined to surpass his four friends. In originality, in range of study, in ingenuity and resource, Kelvin was pre-eminent. It was said by Goethe that to make an effort in the world two conditions were essential—a good head and a good inheritance. Lord Kelvin and his four friends had both. The new world of electricity had been already discovered. They entered into that inheritance and transformed its glories for the practical utility of mankind. It was Kelvin who subdued the whole province of the new realm of science. All through his life, in the face of a strong prevailing current of materialism, Kelvin preserved the simplicity of his early Christian faith. He wrote in 1892: "The real phenomenon of life infinitely transcends human science." He spoke with the humility of a great man, and many could look back with gratitude to the example which the religious belief of a man of his gigantic intellect furnished to those of a younger generation. His name was one of the most epoch-making in the domain of natural philosophy.

The chairman of the Memorial Committee then offered the window to the Abbey, and it was gratefully accepted by the Dean on behalf of himself and the Chapter.

THE EXETER MEETING OF THE ROYAL SANITARY INSTITUTE

AT the twenty-eighth congress of the Royal Sanitary Institute, held at Exeter on July 7–12, many useful papers were contributed, one or two of which dealt with research work of scientific interest.

Mr. James Crabtree contributed a paper which embodied some experiments on the lines of those carried out by Dr. E. J. Russell and his co-workers on the part played by protozoa in soils, the experiments here recorded relating to sewage disposal beds. From these experiments it is evident that the fauna of the bacteria bed play an important part in keeping the bed open and porous; it seems probable that they play a further part by the actual digestion of some of the more easily resolvable colloidal matter precipitated on the beds. The conclusion arrived at is that the animal population of the bacteria (contact) bed is entirely advantageous in maintaining the capacity of the bed, probably in keeping down extraneous bacteria, and thus assisting purification to some extent, and also by bringing about some actual digestion of colloidal deposited matter.

Dr. Gilbert G. Fowler and Mr. E. Moore Mumford contributed an interesting paper on the bacterial clarification of sewage. The area and cost of sewage filter beds depends mainly upon the amount of colloidal matter present in the sewage, and some confusion of ideas is probably due to the fact that the ordinary sewage filter is called upon to do two entirely different things at the same time, namely on one hand to oxidise, granulate, and finally discharge as humus the colloidal matters present, and, on the other, to oxidise and nitrify substances in true solution. If this oxidising and coagulating process could be brought about by suitable open-tank treatment before the filtration process, it is obvious that the latter could be enormously accelerated, if not dispensed with altogether; and the whole operation of sewage treatment could be conducted on a much smaller area.

In the course of a research on another matter, one of the authors had occasion to study the reactions of an organism occurring in nature in pit-water impregnated with iron. This organism is a true facultative organism, preferably an aërobe, and it exercises a specific action on iron solutions. The action of the bacillus on iron solutions proceeds in two stages, in which the aërobic and anaërobic actions appear to be symbiotic, at any rate under the conditions occurring in nature. The aërobic action is to precipitate ferric hydroxide from iron solutions; while the anaërobic action is to transform the hydroxide thus precipitated into bog ore, with partial reduction of the iron to a ferrous state. It was found that in order to precipitate the iron sufficiently the organism required a certain proportion of albuminoid organic matter. It was, therefore, natural to expect that ordinary sewage matter could be utilised in this way. Experiment, in fact, showed that a previously sedimented sewage effluent could be effectively clarified in this way when acted upon by this organism in presence of small quantities of ferric salts, aërobic conditions being maintained in the liquid by means of a current

of air. An experimental plant has been erected at the University of Manchester, which will permit of accurate observations of this process and the collection of further detail.

Mr. F. Southerden has extended the investigations made at Leeds, Glasgow, and London, upon atmospheric pollution, to the atmosphere over the city of Exeter and its immediate surroundings. He finds that rain-water collected less than a mile from the centre of the city is very noticeably superior to that collected more centrally, the proportion of dissolved solids and sulphate reaching only about one-half, but there is no marked difference as regards the chlorine or ammonia, and so he concludes that these are derived in the main from sources other than coal smoke. The experiments make it clear that the atmospheric pollution of Exeter, though less in amount, is similar in its nature to that in larger towns.

Mr. Southerden also gave the results of his investigations upon the effect of coal smoke on the stonework of Exeter Cathedral. The stonework consists of limestone of varying quality and texture, and the oxy-acids of sulphur derived from the combustion of coal convert the calcium carbonate of the stone into soluble calcium sulphate, and the surface of the stones slowly crystallises and expands in such a way that disintegration results. The author concludes that the exact conditions which lead to scaling are not simple, but the extent of sulphate formation appears to be an important factor, and the destructive influence of sulphuric acid is doubly important, for in the more sheltered situations it leads to disintegration by scaling, and in exposed positions calcium sulphate is formed and dissolved away, thus hastening the destruction brought about by more natural agencies, such as frost, wind, and rain. The blackening which is very noticeable on portions of the stone structure is due to a thin film of soot, from which it has been possible to extract a small amount of tar.

REPORT OF THE ADVISORY COMMITTEE ON FORESTRY.

A FEW weeks ago was issued a Blue-book of general interest, the Report of the Advisory Committee on Forestry for the period July to October, 1912 (Cd. 6713, price 6*d*.). The Advisory Committee on Forestry comprises such well-known names as Sir E. Stafford Howard, Sir S. Eardley-Wilmot (late Inspector-General of Forests, India), Sir D. Prain (director of Kew), Sir William Schlich (the Oxford professor of forestry), and Prof. Somerville, of the Oxford School of Rural Economics, who is perhaps as well known for his writings on forestry as for those on agriculture; and Mr. E. R. Pratt, president of the Royal English Arboricultural Society. Of the ten members of the Committee only four are professional foresters, so that the professional element is not even in a majority. Mr. R. L. Robinson, the chief of the forestry branch of the Board of Agriculture and Fisheries, fulfills the office of secretary to the Advisory Committee, and is apparently the author of the two chief appendices to the report, though one of these is not signed. These appendices, on forest research and development, contain a mass of technical information and interesting general observations, which will well repay perusal by those interested in British forestry.

The Blue-book contains the advice of the Forestry Committee on three questions submitted to it for opinion by Mr. Runciman.

The first of these questions relates to forest surveys, which it is advised should be divided into two classes: (*a*) preliminary or flying surveys, (*b*) detailed surveys.

The surveys proposed should bring together much useful information, and supply a long-felt want in the cartography of these islands. We have excellent geological, topographical, meteorological, and other maps; but he who wishes to see what is the extent and value of the woodlands must be satisfied with the ordinary ordnance maps and a few forest maps. The ordnance maps give no indication of the quality, and are often misleading as to the quantity, of the forest. Yet few of the special maps that exist have the importance of a forest map, with the national issue of 30,000,000*l*. yearly sent out of the country for timber and forest produce, which could be produced easily in these islands! The extension of forest surveys is therefore an excellent scheme, which should meet with universal approval.

When, however, we go on to read that surveys of both types are necessary "*as a preliminary step towards the inauguration of afforestation operations*," the forest surveys assume a sinister aspect. If they are to be taken as an excuse for postponing the commencement of practical forestry, the country will be better without them. This, perhaps, is why Mr. Munro Ferguson adds his rider to the report: "I am of opinion that 2000*l*. is a sufficient sum to apply for survey work for the next two years, after which the expenditure could be reviewed in the light of experience." In the estimate at p. 50, the total cost of the surveys is given at 35,000*l*., and the time at eleven years; and this is for a partial survey, not embracing the whole of the seven areas mentioned in the report of the Advisory Committee. These seven areas for the forest surveys are:—

1. South Wales.
2. North Wales.
3. Westmorland, Cumberland, and Northumberland.
4. Kent, Surrey, and Sussex.
5. Berks, Hants, Wilts, and Dorset.
6. Derby, Lancashire, and the West Riding.
7. Lincoln, Norfolk, Suffolk, and Essex.

It is recommended that surveys be begun in districts 1, 3, 4, and 7, and that in conducting these preliminary surveys use should be made to the fullest extent of the knowledge which local owners, foresters, and agents possess. The cooperation of the Royal English Arboricultural Society and of local committees is also invited. This is excellent.

The report expresses doubts as to the advisability of publishing these forest surveys. It is not clear wherein lies the difficulty of doing so, but obviously they should be of much general utility, both to the public at large and the student of forestry.

The second question on which the advice of the Forestry Committee has been asked relates to "demonstration areas." These have figured largely in British forest literature of recent years, and the Advisory Committee states that "it has received their very careful consideration" (though, indeed, this phrase is repeated in the answer to each question). It seems possible that forest demonstration areas are one of those side issues which during the last three years in British forestry have served to distract attention from the main question—the inauguration of practical forestry by the acquisition and planting of ground on a large scale. Here Mr. Munro Ferguson has added another rider which will receive the hearty approval of every forester—"I agree with paragraph 6, that the Forest of Dean, with the adjoining Crown woods, is well suited to meet the requirements imposed by a demonstration forest, and am of opinion, therefore, that the whole area should be removed from the control of the deputy-surveyor and placed under a trained forest officer." Some years ago, when the post of deputy-surveyor of the Forest of Dean became