

THURSDAY, FEBRUARY 25, 1897.

THE NATIONAL PHYSICAL LABORATORY.

THE case for the establishment of a National Physical Laboratory is very simple. The Kew Observatory began in a humble way, but became famous in the last generation for the work done there in connection with terrestrial magnetism. As the President of the Royal Society remarked, in his last annual address, the late Sir William Grove, more than thirty years ago, expressed the hope that Kew might become "an important national establishment." "And if so," he added, "while it will not, I trust, lose its character of a home of untrammelled physical research, it will have superadded some of the functions of the Meteorological Department of the Board of Trade, with a staff of skilful and experienced observers."

In the interval which has elapsed since Grove uttered these words Kew has advanced. It has become a considerable standardising institution. Including a large number of clinical thermometers, about 21,000 instruments are now examined there annually, and in spite of this commercial success, it still maintains its character as a home of physical research.

During the last ten years a similar institution has been established, on a much larger scale, at Charlottenburg. It is needless to describe the Reichsanstalt in these columns. It is sufficient to say that it is divided into two Departments—the one devoted to physical research, the other to technology. The work which the new Institution has done is very good, its reputation stands high, and after full consideration the chief scientific and technical Societies of this country decided to ask the Government to assist in placing Kew in a position to be similarly useful. A Committee was appointed, consisting of representatives of the Royal Society, of the British Association, of the Royal Society of Edinburgh, the Royal Irish Academy, of the Physical, Chemical and Astronomical Societies, and of the Institutions of Civil and Electrical Engineers. A memorial, prepared during the meeting of the British Association at Liverpool, was signed by a large number of representatives of science and industry. The request made to the Government suggested that the grant should be expended partly in improving the work of standardising, partly in promoting researches of a kind which cannot be undertaken by individuals or educational establishments. The terms in which this last request were made were almost a literal translation of those used in the memorandum in which von Helmholtz set forth the aims and objects of the Reichsanstalt. Lord Salisbury, however, entirely declined to accept this part of the programme, though he held out hopes that something might be done to help in the work of standardisation and verification. With this decision we do not quarrel. It is impossible for the Prime Minister to go beyond public opinion in such matters. We hope that the good work done at Kew may receive State aid, but the outburst in the *Times* of Saturday is sufficient to show that the innate tendency of the English people to distrust and reject all opinions based on special or expert knowledge is aroused by the terrible word "research." It is curious

to observe in how many ways this tendency displays itself.

The official head of science in this country is a man on whom a peerage has just been conferred for an application of science to surgery by which thousands of lives have been saved. Lord Lister is also the head of an Institute for Preventive Medicine, which, if properly supported, would give to England all the benefits which are to be derived from the most modern methods of contending with infectious disease. The reward that he receives for these further efforts to benefit this curious Anglo-Saxon race is that a monster petition is presented to the Home Secretary against the licensing of the Institute for the performance of vivisection. If, therefore, a Pasteur Institute in London is anathema, we can hardly wonder if the gorge of the average Briton rises at the suggestion that there should be a Reichsanstalt at Kew.

The "splendid isolation," which we prefer to an alliance with either France or Germany, appears to include a rejection of their methods of avoiding rabies and correcting thermometers.

Some measure of the logical weakness of the opposition is, however, afforded by the misrepresentations of the *Times* article. The allegation that the memorandum attributed the loss of trade in thermometers to improvements in verification made abroad, is absolutely incorrect. The assertion that the Reichsanstalt and the proposed institution would be very different, is made in spite of the fact that the published descriptions of the work of the one, and of the proposed work of the other, are almost identical. Absolute ignorance was displayed as to the part which official science has played in the development of improved thermometers. For those who care for the reputation of a great journal, the article was painful reading. But it is needless here to describe or to defend the idea of a National Physical Laboratory, and we prefer to discuss another point on which we are glad to be at one with the *Times*. We agree that Germany beats us in scientific industries, not only because she fosters them, but because the examiner does not loom so large there as in this country.

It is, however, absurd to tell scientific men to remedy this. Who is responsible for the delay in making the University of London other than the mere college of examiners which at present it is? Almost every scientific man in London has done what he can to bring about that desirable consummation. The delay is due to those who claim to represent the views of the average Briton, as represented by the average passman of the University. Who is it that refuses to receive from candidates for scientific appointments in the Civil Service any evidence of scientific ability other than that which can be displayed in an examination? Not the Professors, but the State. It is a common experience of every teacher of advanced students, that he has to advise some member of his class as to whether he should undertake a piece of practical work or prepare for a particular examination. The teacher has no right to play fast and loose with the future of those who have placed their careers in his hands, and, even at the risk of being called a pedagogue, he is too often reluctantly obliged to confess that the future will be better

assured by success in the examination than by investigation. This is no fault of his. It is the fault of those who having once grasped the fact that ability of a certain kind can be tested, without any suspicion of unfairness, by marks assigned by examiners to candidates whose names they do not know, insist on applying this test, and this test alone, in as many cases as possible, without inquiry as to whether the ability of the examination-room is the kind of ability for which they are in search, or whether other evidence could not be obtained, sifted and allowed to weigh in the final decision. It is the fault of the public, which regards the mystic letters B.A. or B.Sc. as an infallible test of the merits of a schoolmaster, but would not have a notion of the meaning of the words if he were described as the author of a memoir in the *Transactions* of the Royal Society. Nowhere is a more strenuous condemnation of the defects of the examination system found than among scientific investigators who are also examiners in science. It is, of course, impossible to change suddenly a method to which the public assign a value far above that which it deserves; but if teachers of science suggest any mitigation of its severity, they are at once told that they are seeking to fill their class-rooms with candidates for their patronage, and that they are trying to evade the only satisfactory test of the value of their teaching. Under these conditions they are helpless. It is not they, but those whose motives cannot be misrepresented as self-seeking, whose opinions cannot be misrepresented as biased, who can loosen the fetters which English public opinion binds around the intelligence of English youth, and, unfortunately, the majority of such persons are convinced that the present system is the best.

We have followed the precedent set by the *Times* in passing from the proposal for the establishment of a National Physical Laboratory to the discussion of the examination system, for we agree that the rejection of the scheme for carrying out research in the one, and the general acceptance of the other, are alike indicative of the present temper of the English people on such questions. They do not believe that scientific ability is worth the cost of training and using it. They refuse to supply laboratories for advanced students, such as German students possess. They make the advancement of a middle-class youth depend entirely on his success in examinations. As represented by the London County Council, they appear to think that the best use to which they can put a Huxley, when they are fortunate enough to secure his services, is to set him to lecture to evening students.

They refuse to admit that there are certain conditions which must be fulfilled if the tasks of giving advanced instruction in science, and of advancing science, are to be carried out successfully, and then they turn and rend those who, in spite of these difficulties, have done something to advance both education and learning. Truly, history repeats itself.

"He said, Ye are idle, ye are idle. Go therefore now and work; for there shall no straw be given you, yet shall ye deliver the tale of bricks. And the children of Israel did see that they were in evil case."

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RÖNTGEN RAYS AND CONSTITUTION OF GASES.

Röntgen Rays and Phenomena of the Anode and Kathode.

By Edward P. Thompson, M.E., C.E.; with a concluding chapter by Prof. William A. Anthony. Pp. xiv + 190. (New York: Van Nostrand. London: Spon.)

The Constitution and Functions of Gases, the Nature of Radiance and the Law of Radiation. By Severinus J.

Corrigan. Pp. viii + 127. (St. Paul: Pioneer Press Company, 1895.)

ALTHOUGH it is but a short time since Röntgen published his famous work on the X-rays, the very large number of scientific papers dealing with the subject, which have been published in all parts of the civilised world, makes the labour entailed in the production of a book of this kind very large.

Mr. Thompson, in his book on the X-rays, has endeavoured to give as complete an account as possible, not only of Röntgen's discovery, but of all the phenomena attending the passage of electrification through gases. With a view to make the subject intelligible to the lay mind, a short account is first given of induced currents and the discharge through gases at atmospheric and lower pressures. The author then passes to the consideration of the magnetic effects of the discharge, and the phenomena observed in the very high vacua of the Crookes' tube. A detailed description is given of Lenard's famous researches on the kathode rays, and of Röntgen's discovery of the X-rays and their properties. Considerable space is devoted to experiments dealing with the photographic developments and the use of the Röntgen rays in surgery. In the concluding chapter, Prof. Anthony sums up the results, and gives a short discussion on wave motion, without, however, venturing to suggest any explanation of the real nature and origin of the X-radiation.

A large number of X-ray photographs, or sciagraphs, as they are termed, are scattered throughout the volume, and some dust figures are also shown, a chapter being devoted to the description of them.

The author has adopted the method of dividing the book into numbered paragraphs, each of which is headed by the experiment to be explained, while references to the original publication are in nearly all cases given. The consequence of this is that the chapters consist of a detailed description of a number of experiments which are quite independent of one another; and as no attempt is made to criticise the results, or connect them together in any way, the result is somewhat confusing. The author, in many cases, lacks discrimination as to the relative importance which he assigns to the various experiments, and much of the earlier part of the book, notably the opening chapter, might be omitted with advantage.

The part of the book which deals with the X-rays, and the recent experiments on the subject, is much the best, and great praise is due to the author for the accurate *résumé* which has been given of nearly all recent work; and it is as a collected and condensed account of recent experimental work on the X-rays and allied phenomena that the book will be found most useful.