represented. I have spoken of applied mathematics, I meant rather mathematical dynamics than applications to art and mechanical operations. Then practical applications should be represented, mechanics and mechanical engineering; then again civil engineering and geodesy, mining engineering, statistical inquiries, and the scientific branches of her Majesty's service ought to be thoroughly represented. Engineer and Artillery officers and the navy should be represented both in its navigation department and in the department of seamanship, and the department of gunnery. The mercantile interests of the country and the agriculture of the country ought certainly to be represented. The universities ought to be represented amply—the English universities, the Scotch universities, and the Irish universities. Also practical telegraphy, which is a very distinct branch of engineering, civil engineering or mechanical engineering would not sufficiently represent it."

"Do you think that the functions which are proposed to be assigned to the scientific Council would not interfere in any way with the existing scientific departments of the Government; for example, the Medical Department of the Privy Council, or some of the other Government scientific departments?—I think it would relieve the departments from pieces of scientific work at present given to them, because there is no other body to whom they can be given, and for which they are by their organisation and *personnel* almost necessarily ill fitted and insufficiently competent."

"You would leave to these departments their administrative functions, but give them the advantage of consulting with the Council upon higher questions of science on which they desired information?—Yes, certainly; every question of science that falls under the notice of any department of the Government would naturally be referred to the scientific Council."

Dr. Frankland ithus deals with Col. Strange's proposal:—

"Are you acquainted with Col. Strange's proposal for the establishment of a consultative council of science?—Yes, I have heard from him some of the chief ideas that he entertains on that subject."

"Are you disposed to consider that such a Council would be desirable?—I think so. I am not prepared to say that it should be constituted exactly in the way that Col. Strange mentioned, but a Council of that description would be exceedingly desirable, on many grounds, for furnishing the Government with trustworthy scientific opinions in cases requiring them. . . ."

"Are you of opinion that the advice of such a Council, even on matters to which the larger proportion of the members of the Council had not paid special attention, would be valuable?—Yes, I think it would, because those members of the Council who were thoroughly acquainted with the subjects would be expressing their opinion to men conversant with scientific methods, and they would be able to convince their colleagues with respect to the opinion that the Council generally ought to give upon the matter. It would be a very different thing from that of convincing a Parliamentary Committee, for instance, upon a scientific point, because all the men upon the Council would have received a scientific training and would understand the bearing of scientific arguments."

"Have you considered at all how such a Council could best be appointed, whether would you leave it to one of the Ministers to appoint and select the proper persons to serve on the Council?—I should think that it must ultimately fall upon the Minister, but he might be assisted by the presidents of different learned societies or by the Council of the Royal Society, in whom I think everyone would have confidence."

(*To be continued.*)

THE IRON AND STEEL INSTITUTE

EVERY friend of science and true patriot must heartily welcome the sound and steady progress of the Iron and Steel Institute. The proceedings at the Manchester meeting last week, as also its Journal, just received, containing the papers read at the last London meeting, show that it is doing exactly the kind of work which is now becoming quite necessary for the maintenance of the dignity and prosperity of British industry. It also displays a very important feature of industrial progress. One need not be grey-headed to be able to remember when iron-workers and iron-masters, in common with other artificers, were nearly unanimous in believing that their trade interests were best served by each man hugging up to himself every bit of newly acquired trade information, and keeping his competitors as much as possible in the dark respecting it. Indentures of apprenticeship still describe our common trades as "mysteries," and bind the pupil to abstain from revealing the secrets of the craft which his master solemnly agrees to communicate in return for the premium and seven years' servitude. The ceremonials, secrets, and degrees of freemasonry are based on the old practice of hoarding the arcana of a "craft" and communicating them in various degrees of profundity to certain privileged individuals, who were bound under dreadful penalties to reveal these sacred mysteries to none but the initiated.

Contrasted with these lingering shadows, these penumbral fringes of the old passing darkness, the meetings of the Iron and Steel Institute are full of hopeful suggestion, by displaying the magnitude of the revolution which modern science is gradually effecting. In the still older and still darker times all knowledge was made a mystery and a craft, and was selfishly held by the initiated few who used it for the oppression of their fellow-men. Abstract or pure science was first thrown open; learned societies were formed for the discovery and diffusion of natural truth by the open and world-wide co-operation of philosophers; their discoveries threw new light into the dark mysteries of trade, and now we see the craftsmen themselves emulating the philosophers, and offering freely to all the world the best results of their technical knowledge, their laborious investigations, and hard-earned technical experience. This is the true chivalry of trade, that only needs its full development in order to place industry fairly upon the throne of its natural and proper dignity.

The Manchester meeting, under the presidency of Mr. W. Menelaus, has been as successful as could possibly have been wished. Although the papers read were too purely technical to be referred to at length in NATURE, still they are all evidences that the iron and steel industries are being more and more rigidly conducted on scientific methods. The papers read were few, but they were all of a thoroughly practical kind, and along with the discussions which generally followed, were well calculated to promote the objects for which the Institute has been established. The first paper read, and which gave rise to a warm discussion, was by Mr. Daniel Adamson on "The Application of High-pressure Steam to Quadruple Engines." Mr. I. Lowthian Bell's paper on "The use of Caustic Lime in Blast Furnaces" is likely to prove of great value to

those interested in the subject. The object of the paper was to show that for high furnaces it was unnecessary to calcine the limestone before using it.

Mr. W. Hackney read a paper on the designing of ingot moulds for steel rail ingots. Mr. Hackney has designed a mould in which the outside is rounded, the thickness of the metal being so adjusted at different parts of the circumference that the expansion under heat should be equal all round. This form has given satisfactory results, one proof of its correctness being that when it becomes heated to redness by an ingot of steel cast in it, the temperature of the outside is apparently equal all round.

Mr. Charles Wood described some improvements made by him in the hearths of blast furnaces. Another paper by Mr. Lowthian Bell described Mr. W. Price's retort furnace. In Mr. Price's furnace the temperature of the air, as well as that of the gaseous and fixed constituents of the coal, is raised by the waste heat before it enters the chimney. Mr. Price cannot compete with the Siemens furnace as regards intensity of temperature, but he avoids the loss which occurs in the gas-producers of the regenerative furnaces.

A paper by Mr. C. J. Horner, on the North Staffordshire Coalfields, had to be considerably curtailed, and two other papers had to be taken as read, in order that the excursion programme might be carried out. Indeed, one of the chief objects of the autumn meeting of the Institute is to visit places of interest from an industrial point of view, and hence the number of papers read is generally limited. This year the visits and excursions were very numerous indeed to industrial establishments in and around Manchester, and all of them seem to have been completely successful. Our space does not permit us to give a detailed account of these excursions, although many of the processes witnessed by the visitors were of considerable scientific interest. The meeting was brought to a successful termination on Friday by a visit, which formed, indeed, a hard day's work, to the North Staffordshire iron and coal district. From first to last the members of the Institute have good reason to be satisfied with the Manchester meeting.

In conclusion, we must express a hope that ere long our other great industries will follow the example of the iron and steel trade in forming their own special technological Institutes and holding meetings and publishing records of similar character and value to those of the Iron and Steel Institute.

RUTHERFORD'S "PRACTICAL HISTOLOGY"

Outlines of Practical Histology. By William Rutherford, M.D. (London : J. and A. Churchill, 1875.)

OF the different methods whereby the standard of scientific education is capable of being elevated, few will not place foremost the extension of theoretical studies into first principles and collateral branches which have a bearing, ever so little as it may appear to be, on the main subject. How much, for instance, does physiology suffer from a deficiency in mathematical and physical knowledge on the part of many of its most enthusiastic devotees. A wider general acquaintance with chemistry would, also, not be out of place. Practical aptitude and experience no doubt stand next in importance. A mastery of the methods by which what is already known has been arrived at cannot but be one of the best trainings for original investigation. How many a valuable suggestion has been allowed to drop undeveloped, simply because of a want of manipulatory skill on the part of the deviser, whose love for the conception of his own brain is the only sufficient stimulus towards the realisation of its importance, and the working out of its details. All attempts to raise the standard and develop facilities for practical education deserve special attention. The work before us is one of the best of these.

The Notes on Practical Histology were published originally in the *Quarterly Microscopical Journal* for January 1872. Several additions have been made, and various fresh methods have been introduced. As it stands, the work contains all the information on the subject necessary for the student of medicine ; and we are certain that anyone who has mastered its details will be in a fit position to undertake high special investigation under favourable auspices. It is evident in every page that Prof. Rutherford is thoroughly master of every method he explains, as much from the minuteness of the detail into which he enters, as from the manner in which matter the least irrelevant is omitted. This is nowhere better seen than in the sections devoted to the "preparation of tissues previous to their examination," which, within a few pages, states exactly what is to be done in the way of preparation and preservation with the body of an animal, such as a guinea-pig, in order that all its tissues and organs, extending to such minutiæ as the structure of the cochlea, shall be in a condition most favourable for detailed investigation.

The book is divided into two parts. The first of these treats of the microscope itself, together with the method of using it ; which account is followed by a series of histological demonstrations, explaining the manner in which each tissue and organ of the body must be manipulated in order to show its minute anatomical features. The following is an example under the head of *Nerve Tissue*. "The fibrillar structure of the processes of nerve-cells may be shown as follows. Cut the fresh spinal cord of a calf into pieces about a quarter of an inch in length. Place these for a month in a one per cent. potass. bichrom. solution. Remove a thin slice of the grey matter of the anterior horn with scissors, tease with needles, stain with carmine, and mount in glycerine." Among other special processes described, we find a novel one devised by Dr. William Stirling for exhibiting the structure of skin, which consists in partly digesting it, when stretched, in an artificial peptic fluid, and then staining. By so doing "the white fibrous-tissue swells up and becomes extremely transparent, thus permitting of a clear view of the other tissues." Dr. Urban Pritchard's method of exhibiting the structure of the organ of Corti is also fully explained.

The second part of the book consists of general considerations regarding histological methods. In it the relations of the tissues to surrounding media, the methods of hardening tissues (including the employment of the excellent freezing microtome introduced by the author) and of softening them, are fully explained ; as well as are the composition of the best staining fluids, and the most efficient means of preserving microscopic preparations.