2000 metres, and above it hung my deep-sea thermometers and five or six buckets, at the depth of 1500 metres. As each bucket came up, Dr. Gazert and Dr. Philippi speedily emptied it of its contents to search for bacteria and determine the amount of contained gas. Dr. Bidlingmaier, on the captain's bridge, regulated his registering apparatus in the meteorological screen, while Captain Ruser, beside him, kept the ship heading the swell and watched that the deep-sea lines should not get foul and that the ship should not overrun them. The chief engineer, Stehr, on the after bridge watched the sounding apparatus with me. The first officer looked after the line as it came up and quickly dismounted the attached instruments. Vahsel saw to the running of the windlass itself, and Ott, in the small dinghy, picked up a huge albatross which Dr. Gazert had shot, and which was at once dissected by the practised hands of Dr. Werth. Then came up Dr. Stehr's question as to how many wheels were running on board at once, without actually counting them.

On Saturday, November 23, we reached Cape Town, having made some magnetic observations near the coast. On Saturday, December 7, the expedition will start again.

I can only say, in conclusion, that we shall never forget the warmth of the reception we met with, not only from the Imperial Consul-General von Lindequist, the members of his staff and the German colony, but also from the officials and scientific men of Cape Town, which rendered our stay there particularly pleasant.

THE USE OF ANATOMICAL CHARACTERS IN THE IDENTIFICATION OF WOOD.[1]

THE chief contributions to the study of the secondary wood of plants have been made by students of forestry, amongst which the names of Nördlinger, Hartig, Brandis, Gamble, and of many men connected with the Indian Forestry Department, deserve our respect. The school of Radlkofer (especially Solereder) has done good work in connection with the structure of the primary wood, which throws many sidelights upon that of the secondary wood, yet there is much less help to be derived from their studies than one would suppose, because there is frequently much difference in the structure of the two classes of tissue.

The grouping of the vessels and the medullary rays and the arrangement of the wood-parenchyma are frequently so characteristic that various genera can be recognised by a glance at the transverse section, *i.e.* horizontally as the tree stands; and, further, it is by no means rare to find the same structure running through a whole genus or, less frequently, through a whole order. A hundred genera could be cited which exhibit a strong family likeness, and of the Proteaceæ and Sapotaceæ it may be said that the description of the structure of the wood of one species will practically serve for the whole order. On the contrary, there are orders which appear to consist chiefly of exceptions, as in the case of the Celastraceæ, where it is difficult to find two genera with any important feature in common. The structure of the woody portion of cryptogams has been employed for years in the study of fossil plants; that of the monocotyledonous trees and of the conifers is notoriously uniform, and is as sure a guide to their position in the natural system as any external character. Why then should not the same rule apply to the angiospermous dicotyledons, and for what reason should the thread be lost as soon as we pass from one division of the vegetable world to another? It seems a by no means extravagant idea that, inasmuch as it is quite indifferent to the welfare of a plant what the structure of its woody portion may be so long as it performs the mechanical duties imposed upon it, ancestral traits should be preserved undisturbed in the wood more than in any other part.

Ignoring this debatable question there is no doubt whatever of the economic importance of this study. There are not only so many kinds of timber in use in Europe and elsewhere, but there are great numbers which are destined to become useful, together making a variety with which no timber dealer can keep *en rapport* by the old method of rule of thumb. It is still more difficult in the colonies and in new countries to tell one wood from another, because the number of persons possessing the necessary training is smaller than at home. The popular and vernacular names are in many places so frequently duplicated or misapplied that they are useless as guides unless the structure of the wood be taken into account. Instances could be multiplied in which wrongly named timbers have been referred to their proper titles, and of inquiries for unknown woods being directed into the proper channel, and of cases in which attempted deception has been frustrated by the anatomical method.

For practical purposes it is rarely necessary to use high powers of magnification or to study the sculpture upon the walls of the cells. A pocket lens or a two-inch objective will frequently suffice to display the special character of the structure. If higher powers be used this individuality, as I may call it, is lost, as it is dependent upon the arrangement or complex of the elements. For instance, the radial or tree-like arrangement of the vessels in the wood of all the trees of the genus Quercus is recognisable by the naked eye, but it fails to be striking when viewed under a half-inch objective. This particular feature may be traced through the genera Corylus, Castanea, Ostrya, Castanopsis and Carpinus, but not in Fagus. The concentric undulating lines of vessels characteristic of the elms are also usually visible to the naked eye and can be traced in every

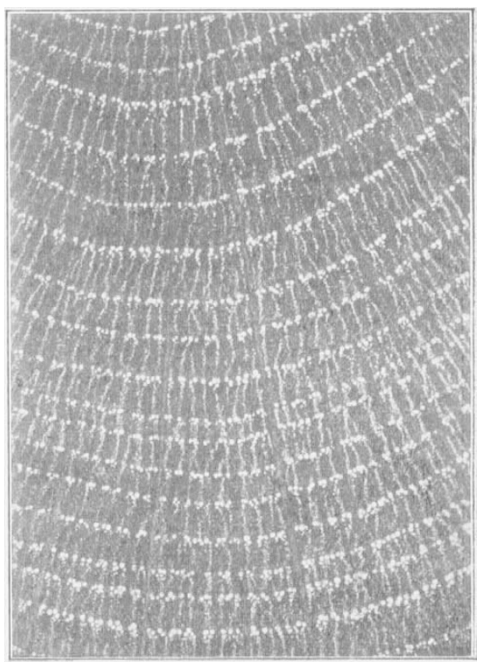

FIG. 1.—Oak. Transverse section × 3½.

species of Ulmus and, in a modified form, in Celtis, also in Ficus, Morus, Artocarpus, Maclura and Urtica.

It may at once be conceded that anything like a natural system of classification of woods by their structure is quite impossible at present. There are too many glaring exceptions and there is too little recorded information. Out of sixteen species of Caprifoliaceæ examined,[1] fifteen have the same type of structure, while the remaining one, *Viburnum Tinus*, L., is quite different; while out of nineteen species of Celastrus there were found no less than seven distinct types of structure.

Nevertheless, amongst such a number of different woods a guide to enable one to trace the name of any wood is a crying need, and several authors have attempted with more or less success to satisfy it. There are several by which the European woods may be identified, notably those by Mathieu, Hartig, Schwartz and Nördlinger, that of the latter embracing exotic woods also, to the number of 1100. Unfortunately, Nördlinger, whose work is otherwise unrivalled, relies upon the definiteness or indefiniteness of the boundary of the year's growth of wood in too great a degree, hence the student is led astray. Alfred Ursprung has recently shown how elusive this

[1] Based upon a paper read before the Society of Arts on December 4, 1901, by Mr. Herbert Stone.

[1] Sambucus, 2 species. Viburnum, 6 species. Lonicera, 8 species.

character is. From the examination of some 1500 species I am convinced that the character of the medullary rays (which, by the way, are anything but medullary in the secondary wood) is the most constant feature and should form the basis of an artificial key, but it separates the genus Betula, the rays of which are but a millimetre high on a vertical section from Alnus, where they may run to inches, and it cuts the Leguminosæ into two halves, one of which has bold spindle-shaped rays in transverse section (Ulex, Cytisus, &c.), while in the other the rays seem to meander amongst the vessels like so many limp threads (Mimosa, Gleditschia, &c.).

Nevertheless, a useful key may be constructed by first distinguishing those woods with two kinds of rays (many Cupuliferæ) from those having but one. The latter then fall into two groups, one having rays which have intervals between them of not less than the transverse diameter of the largest pores present, the other conversely having the intervals between the rays never greater than the pore-diameter, *i.e.* the rays diverge and run round or avoid the pores. These two types of rays are very clearly marked and have quite different aspects. The arrangement of the vessels or pores can then be usefully employed, as the concentric radial, tree-like or undulating groups, or uniform distribution of the pores is very constant in many genera, as are

FIG. 2.—Common elm. Transverse section ×3½.

also the equally varied forms assumed by the soft-tissue (wood-parenchyma), which comes next in order of importance. It would be out of place here to go into further detail, and it need only be pointed out that by following this sequence all members of the same genus except the aberrant forms fall together into the same ultimate group, which is not the case with Nördlinger's or any other key that I have used.

Many groups, or even whole genera, are so similar in structure that their species can only be distinguished by long acquaintance, *e.g.* Fraxinus, Acer, &c., and it is then necessary to have recourse to other features, such as the specific gravity, colour, smell, taste, hardness, behaviour with certain reagents, colour of their solution with water and alcohol, &c. Frequently these are so pronounced that a single feature may be sufficient to describe a species, as, for example, the offensively powerful cheese-like smell of *Goupia tomentosa* and the flinty hardness of *Lignum vitae*, hence it has often been urged that if a wood can be so readily identified by such simple means, why employ a more complicated and less accessible method. No one underrates obvious characters, but there are thousands of species, hundreds of which are employed in the arts, that have no pronounced feature of this kind to distinguish them. The value of the anatomical characters to the systematic botanist and to the trader is, however, in inverse proportion. The closer the resemblance in structure between the members of the same group the stronger the claim for a place in classification. On the other hand, the greater the dissimilarity the easier becomes their discrimination for commercial purposes.

CONFERENCE ON SCHOOL GARDENS.

A CONFERENCE on school gardens was held under the auspices of the Berkshire County Technical Education Committee at Reading College on Saturday. Mr. T. G. Rooper, one of His Majesty's inspectors of schools, read a paper on "School Gardens in England and in Germany," giving an account of those he has helped to institute in this country and others which he visited on the Continent. He dwelt, too, upon the provision made in Germany at the Pomological Institute for training elementary teachers, and one of his most interesting points was with regard to them. They are not, as here in England, expected in return for tuition, maintenance and travelling expenses, to attend courses of instruction during well-earned holidays, but they have the additional privilege of working at the Institute during term time, a substitute being paid to take their duty.

English school gardens, though at present comparatively few in number, are on all sides acknowledged to be the most practical yet instituted. Except in the case of those attached to continuation schools, no attempt must be made to utilise them for the technical teaching of gardening or otherwise than as mere training, mental and manual. A point obvious enough that was touched upon was that inspectors of schools should know something of horticulture if they are to report on school gardens and these are to be instituted in larger numbers. The importance of it is that, with very few exceptions, the inspectors are not at all well versed in the subject. County Councils cannot spend money directly upon elementary schools, but training of teachers they can arrange for, they can hold conferences such as the one here discussed, and their horticultural instructors may, and do, without breaking the law, give advice on the laying out of school gardens. Mr. J. C. Medd, in the course of his remarks, alluded to the Nature-Study Exhibition, with a view to holding which in London during next summer an association has just been formed. At this, which if it comes about will be greatly due to Mr. Medd's efforts, garden produce that may be in the proper condition at the time will no doubt be welcomed. Sir John Cockburn, lately Premier and Minister for Education in South Australia, is the chairman of the executive committee. Sir John, speaking at the Conference, alluded to "Arbor Day," upon which everyone in the antipodes who can plants a tree. The idea, one might say, is borrowed from America and is a very good one.

The difficulty of getting proper time for practical work was also touched upon by Sir John Cockburn, who said that, although one hour was all he could obtain at first, nevertheless, before he left South Australia, schools had been started in which only half the time was devoted to theoretical instruction.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—At the 232nd meeting of the Junior Scientific Club on Wednesday, February 12, two papers were read, viz. "Colour and Chemical Composition," by Mr. S. A. Ionides, Balliol College, and "The Centrosome," by Mr. A. D. Darbishire, Balliol College.

By his will, Sir J. H. Gilbert, F.R.S., who was Sibthorpean professor of rural economy from 1884–90, and who died on December 23, 1901, bequeathed the portrait of himself by his brother, Josiah Gilbert, to the University of Oxford, to be placed in the library of the Sibthorpean professor of rural economy.

DR. F. T. TROUTON, F.R.S., of Trinity College, Dublin, has been appointed Quain professor of physics in University College, London, in succession to Prof. H. L. Callendar, F.R.S.

DR. W. H. WILLCOX has been appointed deputy lecturer in hygiene at Bedford College for Women, on the resignation of