greatly relieved by dividing the facial nerve and grafting its distal end upon the spinal accessory, the operation being an application of results obtained by experiments in nerve grafting performed on lower animals.

Professor Reed, of Dundee, pointed out that the assertion that proteids in solution exerted osmotic pressure was in all probability due to the use of impure preparations, since by using carefully washed recrystallized proteid no trace of such pressure could be obtained on a membrane formed of formalized gelatine. It would appear from this result that the so-called solutions of proteids were not true solutions but merely suspensions. Professor Reed also called attention to an observation he had made that the absorption of glucose by the intestine was favored by the presence of potassium salts as compared with those of sodium, and attributed the result to an ionic effect.

Dr. W. Brodie Brodie, of Glasgow, gave the results of experiments he had made on the action of oxalates on muscle tissue. He pointed out that it had been shown that the presence of calcium salts was necessary for the rhythmic contraction of the heart, and from his experiments it seemed probable that at the moment of muscular contraction there was a liberation of calcium from a salt of that metal present in the muscle substance. Oxalates did not destroy the irritability of resting muscles, although they did have that effect on muscles in a state of activity, and the results of previous observers require to be modified to this extent. It was probable that the action of the oxalate was due to the precipitation by them of the calcium liberated during contraction.

Professor Noel Paton reported on the results of observations made in conjunction with Drs. Gulland and J. S. Fowler on the hæmopoietic function of the spleen, and stated that they had not been able to obtain any evidence that the organ took part in the production of blood corpuscles.

Dr. W. H. R. Rivers gave an account of the measurement of a visual illusion in the cases of thirty-eight natives of Murray Island, Torres straits, compared with forty-two Englishmen. The apparatus used was the Müller-Lyer line with reversed arrow-heads, the standard line having a length of 75 mm. The illusion proved to be much less, on the average, among the islanders, to whom the two lines appeared equal when the movable line measured 60 mm. while the same appearance occurred to the Englishmen at 55 mm. Dr. C. S. Myers reported some observations which he had made with Galton's whistle on the same islanders, which showed that at all ages they were unable to hear as high a note as inhabitants of Buchan, Aberdeenshire.

THE BOTANICAL SECTION.

The presidential chair of the Botanical Section was occupied by Professor I. Bayley Balfour, who selected for his address a discussion of the causes which have led the Angiosperms to become the dominant type of the existing flora. Before the appearance of the Angiosperms upon the earth's surface there was a dense vegetation, composed of Pteridophytes and Gymnosperms, but this is now represented by a relatively small number of forms, having been replaced by Angiosperms. What, then, were the causes which have led to the dominance of this latter type, what are the structural peculiarities which have given it the advantage over its predecessors? The climatic differences of our epoch, contrasted with earlier periods, naturally suggest themselves as factors in the change, and of these differences perhaps the most important is the great difference in the relative proportions of the land and water areas upon the globe. "The statement is warranted that the Angiosperms have become dominant in great measure because in their construction the problem of the plant's relationship to

water on a land area has been solved more satisfactorily than in the case of the groups that preceded them.''

By the formation of the flower and seed the Angiosperms freed themselves from the risks which attend sexual reproduction in heterosporous Pteridophytes by providing a special nidus for the development of the germ and thereby rendering it directly independent of the presence of water. The tegumentary system of the Angiosperm ovule has for its primary function the conveyance and storage of water for the embryo and in addition serves as a food reservoir. The function of the ovular tegmina cannot now be regarded as of so much importance in the reproductive act as was formerly the case, and the existence of haustoria which penetrate them, either from the embryo itself or the embryo-sac, point clearly to their function as reservoirs of food and water. In passing it was pointed out that the classification of the Dicotyledons into Unitegmineæ and Bitegmineæ proposed recently by van Tieghem seems to rest upon an insecure foundation, since all the genera in certain families, such as the Rosaceæ and Ranunculaceæ are not alike in respect to the number of teguments.

And it is not only to this development of special water reservoirs for the ovule that the Angiosperms owe their advantage as a land-type, but in two features of their water-carrying system they are greatly superior to the older types. No one will deny that their general monostely is a more perfect arrangement for water carriage in a massive plant than is polystely, nor is there doubt that the vasa which are conspicuous characteristics of the Angiosperms are more favorable for a rapid transport of water than are tracheids.

Passing on to a consideration of the differentiation of the Angiosperms into classes, Professor Balfour discussed the new class proposed by van Tieghem, that of the Liorhizal dicotyledons, and came to the conclusion that the two recognized families included in the class, the Nymphæaceæ and Gramineæ, do not present sufficiently distinctive characters to warrant their separation from the already established classes. The most recent observations on the embryogeny of the Nymphæaceæ seem to indicate that the apparent dicotyledonous nature of the embryo is due to the splitting of a simple cotyledon, and if this be correct the order is most properly assignable to the monocotyledons and the structure of the root-tip upon which von Tieghem lays so much stress is what might be expected. The idea that the epiblast of the embryos of the Gramineæ represents a second cotyledon, Professor Balfour is inclined to dispute, and points out that in any event its occurrence is not universal in the order, since it is present in *Triticum* and absent in *Secale,* present in *Elymus* and absent in *Hordeum.* The evidence as to the morphological significance of the structure is at present too obscure to warrant its being taken as a basis for the separation of the Gramineæ from monocotyledons.

Recognizing then but the two classes, Monocotyledons and Dicotyledons, the lecturer stated that if he were to express an opinion as to their phyletic relationship it would be that they had arisen on separate lines of descent. The Dicotyledons are by far the more adaptive and progressive, though this does not necessarily imply their more recent origin, and the advantages which they present over the Monocotyledons in their free internodal growth and copious root system as compared with the contracted stem growth and arrested root system of the latter, are but a carrying out of the structure of the embryo with its terminal plumular and root buds and its lateral cotyledons, so markedly different from what obtains in the Monocotyledons, in which the cotyledon is terminal, the plumu-

lar bud lateral and the primary root bud often internal.

As regards the genetic relations of the various groups into which the two classes are divided, Professor Balfour believes that there is "no evidence to sanction the belief, or even the expectation, that there is extant any family of Dicotyledons or Monocotyledons which represents, even approximately, a primitive type in either class. The stem in each has gone. We have the twigs upon a few broken branches."

The list of papers presented to the Section was somewhat extensive and mention can be made of only a few. Professor Letts and Mr. John Hawthorne submitted a report on some observations they had made upon the absorption of ammonia by *Ulva latissima*. They found that this sea-weed could absorb within twenty-four hours all the ammonia from a sample of rather highly polluted sea-water (containing 0.046 parts of ammonia per 100,000) and suggested the possibility of this characteristic of the *Ulva* being turned to practical account. Professor Marshall Ward presented the results of his observations on the brown rust of the brome grasses. The seeds of the grasses could be treated antiseptically and sown in nutritive solutions and when inoculated with uredospores would give rise to pure cultures of the rust. The results gave no support to the idea that there might be an internal or seminal infection and it was found that although the uredo was in all morphological respects the same in all species on which they were grown, the spores grown on *B. sterilis* would never infect a plant of *B. mollis*, although they could be readily transferred to other plants of *B. sterilis*. Spores from *B. mollis* would infect its allies such as *B. secalinus* and other species of the *Serrafalcus* group, but failed on members of the *Stenobromus* group and so with other cases.

Mr. A. C. Seward described some sections of jet from Yorkshire which he had studied in the British Museum. Sections cut from specimens which consisted partly of petrified wood and partly of jet showed a gradual transition from Araucarian wood to pure jet lacking all indications of ligneous origin. It would seem from these sections that the Whitby jet was formed by an alteration of coniferous wood.

Other papers presented were on 'The Structure and Morphology of the Flowers of *Cephalotaxus*,' by Mr. W. C. Woodsell; 'The Histology of the Sieve-tubes of *Pinus*,' by Mr. A. W. Hill; 'A Contribution to our Knowledge of the Gametophyte in the Ophioglossales and Lycopodiales,' by Dr. W. H Lang; 'The Vascular Anatomy of the Cyatheaceæ,' by Mr. D. T. Gwynne-Vaughan; 'The Anatomy of *Danœa* and other Marattiaceæ,' by Professor Brebner; 'Spore Formation in Yeast' by Mr. T. Barker; and on 'A Diplodia Parasitic on Cacao and on the Sugar Cane,' by Mr. A. Howard.

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SCIENTIFIC BOOKS.

Monographieen aus der Geschichte der Chemie herausgegeben von George W. A. Kahlbaum, IV. and VI. Hefte. CHRISTIAN FRIEDRICH SCHÖNBEIN, 1799–1868. Ein Blatt zur Geschichte des 19. Jahrhunderts von Georg W. A. Kahlbaum, Ed. Schaer und Ed. Thon. Leipzig. 1899 and 1901. 2 vols. 8vo. Portraits.

The previous volumes of this series of 'Monographs' have dealt with 'Lavoisier's Theory and its Acceptance in Germany,' 'Dalton's Theory of Atoms in Modern Light,' 'Berzelius' Growth,' and the 'Correspondence of Liebig and Schönbein,' by divers writers; the volumes before us deal with the scientific labors and personal character of the eminent chemist and physicist Schönbein by one who enjoyed superior opportunities for his undertaking, occupying a chair in the University of Basel analogous to that held by the famous man, and favored with the friendship of his living heirs.