weak. Other lines have made their appearance, the strongest of which are 3868 and 3970, 4364 and 4720. The first is an unknown line strong in the spectra of planetary nebulæ, while the other three are of unknown origin. It is suggested that the second line (3970λ) is not the line of hydrogen at Hϵ, as the other hydrogen lines in the spectrum are so weak. There is, further, a new line in the ultra-violet at wave-length 342 (about), which Gothard has independently recorded. It is interesting to note that the new gas lines show a structure somewhat similar to that of the hydrogen lines in earlier photographs. The enhanced lines of iron, magnesium, &c., which were such a conspicuous feature of the first photographs, have entirely disappeared, and the probability is that the bright lines now, other than hydrogen and helium, belong to gases the terrestrial equivalents of which have not been found.

VARIATION OF LATITUDE.—Prof. S. C. Chandler has made an exhaustive examination of the old records obtained with the reflex zenith tube at Greenwich from 1852–82, which were abandoned as being affected with undiscoverable sources of instrumental error, and finds that for the periods providing continuous measures throughout the year they yield most valuable data for the determination of latitude variation, and that this anomaly, unknown at the time, was most probably the cause of the want of agreement among the observations. The two periods yielding continuous values were 1857–63 and 1864–70 (*Astronomical Journal*, vol. xxii., No. 511.)

DETERMINATION OF THE ELEVATION OF METEORS.—During the rather brilliant display of Perseids in August last a series of successful experiments was made by the observers at Juvisy Observatory to determine the heights of as many meteors as possible. Two stations, Juvisy and Croix-de-Berny (Antony), were chosen at a distance of 9·200 km. The number of meteors registered at both stations was 21, of which 8 fulfilled all the necessary conditions for the determination, and a table is given showing their calculated heights of appearance and disappearance, and also the resulting length of trajectory. The lowest record is 15 km. and the highest 119 km. (*Bulletin de la Société Astronomique de France*, November 1901.)

MERIDIAN OBSERVATIONS AT HARVARD COLLEGE OBSERVATORY.—In a separately published portion of vol. xli. of the *Annals of Harvard College Observatory* (No. 7, pp. 189–211) Mr. A. Searle gives an account of a series of special investigations which have been in progress with the hope of eliminating several systematic errors in the transit observations. It was thought that these might be due to the employment of ruled glass plates instead of spider threads, and for a time the latter have been substituted for trial. The result showed that the change produced no important difference in the discrepancies referred to. Personal equation with respect to magnitude was noticeable in both right ascension and declination when the transits were taken over inclined lines, as was the case with the ruled glass plates formerly used.

LENGTH OF THE TERRESTRIAL DAY.—Mr. R. S. Woodward has been investigating the extent to which the secular cooling of the earth and the fall of meteoric dust may affect the length of the terrestrial day. Attention is first drawn to the conclusion of Laplace that the day has not changed appreciably owing to secular cooling during the past 2000 years, but this was on the assumption that the earth is in the last stages of cooling. This the present author thinks an unnecessary and doubtful restriction, and proceeds, using the other conditions identical with those of Laplace, to develop a method of determining the effect on the length of day of the cubical contraction of the earth during any portion of, or during the entire history of, the process of secular cooling.

It is suggested that, contrary to the views of Laplace, Fourier and Poisson, the dissipation of the internal heat of the earth is not controlled by the atmosphere and oceans, but escapes as if they did not exist.

The main conclusion is that in the entire history of secular cooling of the earth the day may be shortened from this cause by as much as 6 per cent. of its original length. With respect to a definite time variation, it is concluded that the length of the day will not change, or has not changed, as the case may be, by so much as half a second in the first ten million years after the initial epoch.

The concluding portion of the paper deals with the effect of accumulations of meteoric dust. The distribution is assumed as uniform over the surface. Taking Newton's estimate of the number of meteorites falling daily, it is calculated that at least a million million years would elapse before a change of a quarter of a second would be produced. The effect of secular cooling is thus considerably more than that of meteoric accumulations. (*Astronomical Journal*, vol. xxi, No. 502).

PHYSIOLOGY AT THE BRITISH ASSOCIATION.

THE Section of Physiology was presided over by Prof. McKendrick, F.R.S., and the place of meeting was Prof. McKendrick's laboratory at the University. Despite the near approach of the date of the fifth triennial International meeting of Physiologists held at Turin in September, the Section was well attended by working physiologists, and the audiences were often large. Profs. Schäfer and Sherrington were vice-presidents, and amongst others contributing to the meetings were Sir Michael Foster, Sir John Sanderson, Dr. Theodore Beer, Dr. Brodie, Miss F. Buchanan, Dr. Burch, Prof. Gotch, Dr. A. A. Gray, Dr. Edridge Green, Prof. Marcus Hartog, Dr. Kennedy, Dr. Myers, Dr. Noel Paton, Prof. Waymouth Reid, Dr. W. H. R. Rivers, Prof. W. H. Thompson, and Dr. J. A. Wanklyn.

The proceedings of the Section commenced with the president's address. Prof. McKendrick took for his theme the relation of physical and chemical structure as understood at present to our conception of the structure of living matter. The president commenced by pointing to the progress which had been made by physiology in the quarter of a century that had elapsed since the previous meeting at Glasgow. Physiology in its progress had proven itself a living and logical inductive science grappling successfully with its problems by help of the same laws that physics and chemistry apply to non-living matter and its phenomena. In this respect it contrasted strikingly with subjects, *e.g.* human anatomy, which had been closely associated with it formerly in educational curricula.

Physiology had in the last quarter of the century proved fruitful of discovery to an astonishing extent. Many of its discoveries were of high practical value to medicine as well as of theoretical value. It had struck deep into the soil, acquiring many new data of extreme accuracy and obtaining much profounder insight in the concatenations of the machinery of life. The phenomena of muscular contraction—that prime event in biodynamics,—the process of secretion by gland cells, the mutual synergy of organs as illustrated by internal secretion, the functional architecture of the nervous system, the mechanics of rejuvenescence of protoplasm by sexual recombination (fertilisation), all these branches of the physiological tree of knowledge had, under the cultivation of the last five and twenty years, grown vastly in extent and yielded blossom and invaluable fruit. Facts more accurate and theories more profound had drawn their science closer to the elder sister sciences of more exact measurement and at the same time had created, it must be admitted, a gap between it and subjects with which it had formerly been usually associated in teaching. It had widened the educational field and educational worth of physiology, releasing it from former restriction to narrower technical applications. Save in mathematics, knowledge cannot be absolute in any domain of natural science. Physiology shared with the sister sciences their birthright of problems that were, to speak in paradox, the more insoluble the further one progressed toward their solution.

The animal body—the human body—was a machine of high complexity, constituted of many interrelated parts, called organs, the "simple" tissues and the "compound" tissues. A number of its phenomena had indubitably received their lasting explanation; but the difficulty of examining the machinery of living matter while still in living action was extreme. The first step of the chemist's analysis was to kill the substance; yet his goal was analysis of matter still alive. A number of thoughtful physiologists had returned in recent years to study of the unit of physiological structure, the cell. For the study of the phenomena of life an object more suitable than the undifferentiated single independently living cell was in many cases a simple tissue composed of numbers of such cells associated and highly differentiated, but all differentiated in the same way one as another. Hence the tendency of the modern physiologist to examine the powers and reactions of the simple tissues rather than of unicellular organisms such as amœba. It must be admitted, however, that in spite of all their labour in many respects their knowledge had not yet reached far. For instance, the visible details of structure revealed in the cell by the most perfect modern microscopes in collaboration with all the elaborate technique of modern histology seemed to bring us in no perceptible degree nearer towards an explanation of the chemical and physical construction of the cell. But if the matter were considered fully it became evident that the phenomena of life depend on changes occurring in the interactions of particles of matter far too small even to be seen by the strongest magnification yet obtainable by microscopes.

The physicist and chemist had not been content, it was pointed out, with the investigation of large masses of dead matter. To explain many of the phenomena they met with they had had recourse to the conceptions of molecules and atoms and to the formulation of laws that regulate the movements of these units almost infinitely small. The conception of the characters and dimensions of the molecules of *living* matter had occupied certain of the astutest physicists. Clerk Maxwell had placed before the physiologist a curious dilemma. Either the germ could not be homogeneous, developing as it does into a complex being with its hundred thousand characteristics, or if structurally diverse it is so small that its number of parts is insufficient to give a basis for the development of all the characteristics inherent in and developed by it as it expands into the adult creature. Only another supposition was postulable, namely that the germ was not a material system entirely; the adoption of that last supposition was, of course, equivalent to resigning the problem as inaccessible to any method obtaining in natural science.

If, however, in the light of twenty-five years of additional knowledge since the time of Clerk Maxwell the problem were reexamined we were not led necessarily to the dilemma he propounded. A quarter of a century ago it seemed to so competent an inquirer as he that the number of organic molecules in the fertilised ovum would be too few to account for the transmission of hereditary peculiarities. It then seemed that the molecules would not amount to a million in number. But to-day, Prof. McKendrick urged, it was reasonable from existing data to suppose that the germinal vesicle might contain a million of millions of organic molecules. Complex arrangements of these molecules suited for the development of all the parts of a highly complicated organism might satisfy all the demands of the theory of heredity. Doubtless the germ was a material system through and through. The conception of the physicist was that molecules were in various states of movement; and the thinkers were striving toward a kinetic theory of molecules and of atoms of solid matter which might be as fruitful as the kinetic theory of gases. There were motions atomic and molecular. It was conceivable that the peculiarities of vital action might be determined by the kind of motion that took place in the molecules of what we call living matter. It might be different in kind from some of the motions dealt with by physicists. Life is continually being created from non-living material; such, at least, is the existing view of growth by the assimilation of food. The creation of living matter out of non-living may be the transmission to the dead matter of molecular motions which are *sui generis* in form.

Sir John Burdon Sanderson opened the ordinary work of the Section by communicating a paper on the use of the telephone for investigating the rhythmic phenomena of muscles. The communication was largely based on the recent researches of Miss Florence Buchanan. Sir John explained that it was well known that violent contractions of muscle are sometimes obviously rhythmical. The muscular rhythm he should deal with was of a different kind and seat of production to that of violent willed action. The latter had its origin in the rhythmic discharge of nerve-centres. But the muscles themselves seemed to respond rhythmically, not continuously, to even continuous excitation. Their rate of rhythm was of much higher frequency than that of the nervous system; it amounted to repetitions amounting to about 100 per second. The rhythmic variation in the contracting elements of the muscle was variation of, amongst other states, that of electrical tension. Wedenskii, of St. Petersburg, had used the telephone for investigation of this condition of the muscle. A certain note might be low, *e.g.*, A in the bass clef, and if they applied stimuli to the muscle at something like the rate of that pitch they could force the muscle to harmonise. If the stimuli were regulated to G instead of A it would correspond with G, if with B instead of A, with B. But if the frequency were increased to much higher the muscle showed the same response as before—they had always about the same note. The muscle had, therefore, within limits a period of phasic activity of its own.

The next communication made, on behalf of Dr. A. S. Grünbaum (Liverpool) and himself, by Prof. Sherrington (Liverpool), dealt with experiments on the brain of the chimpanzee. The brain of the chimpanzee is, after that of the gorilla, the brain which approaches most nearly to that of man himself. The experiments undertaken had been the ablation of certain portions of the cortex with the view to study the after effects upon the behaviour and movements of the animals observed. The cerebral cortical centre for the right hand had first been carefully exposed and delimited by excitation with faradic currents. All that region of the cortex which had under excitation provoked movement commencing in the right hand had then been destroyed. The immediate effect of the injury had been paralysis of the hand, with a less degree of paralysis of the wrist and shoulder. In the course of five weeks, however, recovery had been so marked as to restore to the hand its uses almost completely, as far as mere inspection could decide. The animal often used the hand and sometimes fed itself on fruit, &c., from it alone, without use at all of the left hand. The right arm had in the course of even a fortnight recovered its use for climbing, &c. Examination of the spinal cord for the degeneration of tracts following this lesion led to the discovery of an anthropoid feature in the cord not previously found in any spinal cord except the human, namely, a fully-developed "direct pyramidal" tract. In another individual a limited destruction of the cerebral cortex in the leg-region of the "motor" area produced at once severe but short-lasting paralysis of the leg, with immediate increase of the knee jerk. The paralysis seemed in the course of four weeks to have passed away, although there still remained marked exaggeration of the knee jerk. The spinal degeneration when examined revealed no direct pyramidal tract in this case: either, therefore, the existence of that tract is subject to great individual variation or the tract is not connected with the more mesial portion of the motor area. Ablation of the posterior part of the left inferior frontal convolution did not produce any obvious alteration either of the character or of the amount of the vocal sounds uttered by the animal. The animal "talked" as much and apparently as variedly after as before the cortical lesion. Regarding descending tracts which degenerated in the spinal cord after lesions of the cortex it was noteworthy that the lesions which produced spinal degeneration were in every case situate in front of the fissure of Rolando. A further point of interest was that the degeneration descending from lesion of the hand area extended down along the spinal cord as far as the top of the lumbar region. Microscopic specimens were demonstrated in illustration of these points.

Dr. Edridge-Green followed with a paper on colour-vision. He developed his well-known views on the classification of the various types of colour blindness. He urged the unsatisfactory character of the test followed in using Hohngren's coloured wools, and the advantage of replacing that test officially by a lantern-test. Dr. J. Wanklyn read a paper on arsenical pigmentation of the skin, and Dr. W. A. Osborn recounted observations on the physical properties of caseinogen salts in solution.

On Friday, September 13, the proceedings opened by a most lucid and interesting paper by Prof. McKendrick on the registration of sounds. His description was richly illustrated both pictorially and by experiment. It proceeded to deal with the subject in its historical development. The methods adopted for the registration of speech sounds from 1875 onwards were shown. The gradual evolution of the phonograph was traced. and of the methods employed for the analysis of the marks made upon the wax cylinder of that instrument. There were special characteristics about vocal sounds which distinguished them from all the sounds of musical instruments. Language would come to be recorded, not by such symbols as are used at present for words and syllables, but by less arbitrary and more reasoned systems. It had been suggested that the signs should indicate what had to be done by the vocal and articulating organs for the production of any given sound. Prof. McKendrick then examined the various theories put forward regarding the formation of vowel sounds. He spoke especially of the recent researches of Dr. Marès, of the Physiological Institute of the Sorbonne, Paris. Marès had approached the problem from a very original point of view, regarding the grouping of the vibrations, in the internal sequence rather than the external sequence, as of main influence. Using a syren with plates perforated according to the sequences observed in the flame pictures, &c., of vowel sounds and adding to the syren certain resonators which were faithfully moulded on the shapes taken by the mouth in utterance of vowels, Marès had succeeded in reproducing the vowel sounds with a degree of fidelity surpassing those of all previous efforts. Prof. McKendrick urged the phonographic registration of dialects. Such a collection of phonographic records would be of help to the science of language. How little could we tell to-day of the spoken sounds of ancient Sanskrit, of how Demosthenes spoke in Greek or Cicero in Latin; how little also of the exact accent of Shakspeare's English. Finally, a demonstration was given of the practical efficiency of the intensification of the sounds of a phonograph by causing their waves to fall upon a microphone and that instrument in turn to affect a loud-speaking telephone.

Dr. R. Kennedy (Glasgow) read a paper on return of voluntary movements after alteration of the nerve-supply by nerve-crossing or anastomosis. His experiments on animals had shown that when the nerve supplying the flexor muscles of a limb were divided and cross-united to the nerves supplying the extensor muscles, the animal in time regained the functional use of the limb, although the innervation of the muscle groups was reversed. The nerve-centres for the flexor and extensor muscles interchanged their positions and could be thrown into appropriate activity for the crossed relations of the muscles. This principle of nerve-crossing found a practical application in many cases of paralysis of a muscle or group of muscles supplied by a particular nerve. A portion of the nerve below the lesion could be grafted on to a neighbouring normal nerve with probability of restoration of the function of the paralysed muscles. Photographs were shown of a case of facial spasm which he had relieved by dividing the facial nerve and grafting its distal end on to the spinal accessory. The result had been return of normal voluntary movement in the face and absence of spasm. But movements of the face tended to occur as an accompaniment of certain movements of the arm.

Prof. Waymouth Reid, F.R.S. (Dundee), discussed the question "Can solutions of Native Proteids exert Osmotic Pressure?" Of the two methods of testing this question, namely, cryoscopy and direct measurement against a membrane impermeable to proteid, the latter alone is likely to lead to a satisfactory answer. Against the cryoscopic method would be the high molecular weight and errors due to traces of salts not fully eliminable by observation on solution of the ash. The method of direct measurement is liable to error in the possibility of presence of a contamination (not salts) which, like proteid, cannot pass the membrane, and so if in solution exerting osmotic pressure. A true finding on the point is only likely to be reached by working with "solutions" of pure proteid. The experiments of Starling with blood serum led to variable results, the osmotic pressure for the 1 per cent. concentration of the proteids in their native fluid being given as from 2·97 to 5·29 mm. Hg. at room temperatures. These experiments prove that substances exist in solution in serum to which a gelatine membrane is impermeable, but they do not prove that the osmotic pressure observed is due to the proteid constituent either in part or *in toto*. The proteid might be inactive *quâ* production of osmotic pressure, and some other constituent of serum in solution might be responsible. A well-dialysed solution of once crystallised horse serum-albumin gave osmotic pressure on a formalised gelatine membrane against distilled water in a rocking osmometer, a pressure which after fourteen days had settled to 15·5 mm. Hg. for the 1 per cent. concentration of proteid. The pressure remained constant at this level for another six days (*i.e.* until the twenty-first day of experiment), after which the observation was stopped. Had the experiment been stopped six days after the start the estimate of osmotic pressure would have been 28 mm. of mercury for the 1 per cent. concentration of proteid, a level at which it stood constant till the ninth day. The membrane was proved impermeable to proteid by the ordinary tests, but the preparation of serum-albumin was also proved impure, for it held more than 17 per cent. of nitrogen.

Ovalbumin is so readily crystallised and recrystallised by Hopkins' modification of the Hofmeister method that we can probably assure ourselves of the purity of this proteid better than of that of any other from an animal source.

With "solutions" of recrystallised and well-washed ovalbumin (15·41 per cent. of nitrogen) no pressure can be got on a natural or formalised gelatine membrane, proved (at the end of the experiment) impermeable to the proteid.

Dilute "white of egg" in contrast gives a lasting pressure against its filtrate through a gelatine filter, at similar concentration in proteid. The addition of sodic hydrate to the "solution" of ovalbumin, within the limits of appearance of alkalinity to litmus or phenolphthalein, does not affect the negative result.

Finally, a "solution" of crystallised hemp-seed globulin in sodic chloride solution put against the original salt solution gave no pressure on a gelatine membrane proved impermeable to the globulin at the end of the experiment.

If these experimental results are borne out by those still in progress, the conclusion of many will be strengthened, viz. that such so-called solutions are only suspensions, since the power to exert osmotic pressure on a suitable membrane is our most convincing test of solution in the case of a non-electrolyte.

Prof. Waymouth Reid also read a contribution to the study of ionic effects as exemplified in the small intestine. The action of salts in solution upon various vital phenomena has long been studied, but the subject is prominent just now as a result of the brilliant experiments of Prof. Loeb and his pupils.

From a general point of view his more important conclusions are:—

(1) Several different metallic ions are necessary for the exhibition of vital phenomena, and the nature of these and their optimum relative proportions vary in different tissues and classes of vital phenomena, even in one and the same animal.

(2) One can impart to a living tissue new properties by changing the quality and the relative proportions of the ions in it.

The sodium ion is the most active in starting rhythmical construction of skeletal muscle, but other ions must be present in addition, otherwise by mere excess the sodium becomes a poison.

Again, we cannot reason from the action of a given ion upon one tissue to its action on another, even if the second tissue performs functions which are superficially analogous.

Thus Lillie observed that in the larva of *Arenicola cristata* ciliary motion continued in solutions of calcium, magnesium and potassium salts which stopped the activity of the muscles of the body, while contraction of the body-muscles continued in solutions of sodium salt which stopped the motion of the cilia.

Potassium ions, so poisonous to cardiac muscle, may be beneficial to the action of other protoplasms. Loeb found that the early development of *Fundulus* embryos was favoured by potassium ions up till the formation of the heart.

In the eggs of the marine annelid *Chaetopterus*, which when unfertilised do not develop in sea-water, an artificial parthenogenesis can be started by potassium ions, and the action is ionic and not osmotic as in some parthenogeneses. Here the potassium ion acts as a specific stimulant. One would expect that if the cells of the mammalian intestine take an active part in the process of absorption a variation of the preponderating ion in the solution of the substance the absorption of which is being studied might affect the absorption of the substance by the gut wall.

In the experiments glucose was selected for study since it is normal to the intestine and capable of fairly accurate estimation, and the absorption of isotonic solutions of glucose in sodium and potassium chloride solutions were compared.

The results so far have indicated that a preponderance of the potassium ion over the sodium ion favours the uptake of glucose, about half as much again of the glucose being absorbed from solutions holding potassium chloride as from solutions of equal molecular concentration holding sodium chloride.

Unfortunately, the ionic effect can only be studied, in this case, from the cavity side of the membrane, on account of the highly poisonous action of potassium upon the heart muscle when exhibited in the circulating blood. Experiments with other ions were in progress.

Dr. Albert A. Gray (Glasgow) read a paper on some methods of preparation of the inner ear, with remarks on its function. He showed a new method of preparing the membranous ear by first supporting the structure and then destroying the surrounding bone. From these preparations he drew inferences regarding the phenomena of giddiness and of the theories of hearing. A preparation was shown of the entire internal ear. After first embedding preparations in a firm substance the surrounding bone was decalcified by nitric acid, and the whole was rendered transparent by oil of thyme. The demonstration of the upward increase in width of the ligamentum spirale of the cochlea was a matter on which Dr. Gray especially laid stress.

Dr. Noel Paton (Edinburgh) gave on behalf of himself and Drs. Gulland and Fowler some account of experiments in examination of the asserted hæmatopoietic functions of the spleen. His previous work had shown that the spleen exerted no detected influence upon the course of chemical digestive changes in mammals. The question remained, "Is the spleen connected with production of blood corpuscles?" The methods he and his colleagues had employed were (1) comparison of corpuscles in blood entering and leaving the spleen; (2) effect of removal of spleen on number of blood corpuscles; (3) the rate of recovery of the number of corpuscles in animals with and in animals without spleen after hæmorrhages and after hæmolytics.

The results obtained by these methods were:—(1) No difference observed in blood of splenic vein and splenic artery. Rollett's well-known statement in Stricker's "Handbuch" of the great relative increase of leucocytes in the blood of the splenic vein was therefore not confirmed. (2) Removal of the spleen (dog, rabbit, cat) produced no perceptible change in the number of corpuscles in the blood. (3) Recovery of number of corpuscles after hæmorrhage and hæmolytics proceeded as fast in the animals without spleen as in those with spleen.

Dr. W. Brodie Brodie (Glasgow) made a communication on the action of oxalates on the calcium of muscle. From a series of observations made it was argued (1) that the action of oxalates in destroying muscular irritability was only manifest when the muscle was thrown into repeated contractions; (2) that the irritability of resting muscles was not injured by oxalates; (3) that it was probable that calcium was liberated from a complex compound when the muscle entered into contraction.

Dr. W. H. R. Rivers (Cambridge) communicated the results of testing the vision of natives of Murray Island and that of a number of English people with the visual illusion known as the Müller-Lyer. This well-known illusion is one in which additional straight lines lengthen or shorten in appearance an original straight line according to the inclination of the direction toward it. By means of a slide the line could be made of the same length as a standard line. Observations were carried out on forty-two English people and thirty-eight natives of Murray Island, between New Guinea and Australia. Each person made ten trials. The standard line measured 75 millimetres; to the average English person the line compared with it appeared equal to it when of 53 millimetres length. The average Murray Islander made the line 60 millimetres, so that the illusion was less pronounced with him than with the average English observer. There was marked agreement among the Murray Island men, who were as uncultured and unskilled in the European sense as any population could be. The Murray Islanders, though they could be regarded as savages, were yet able to make these observations very well. When Dr. Rivers went out on his expedition he anticipated great difficulty in getting people of that degree of civilisation to enter into the making of such observations. He had, however, in fact found that they made them with even more attentiveness than the average Englishman could be induced to give to the test. The English individuals tested could be divided into two classes, those acquainted with the illusion, such as students of psycho-physiology, and those who were roughly acquainted with it through the advertisements of soap manufacturers, &c. It was interesting that the results obtained from both these classes were practically the same. The English individual when told to make the two lines equal as he saw them no doubt sometimes involuntarily corrected to some extent the tendency developed in the illusion. The Murray Islanders gave more consistent results than the Europeans. This greater consistence may have been due to the total ignorance by the Islanders and their thus remaining uninfluenced by speculation founded on knowledge of the illusion. Prof. McKendrick, in thanking Dr. Rivers for his valuable communication, urged the great interest, both practical and theoretical, of the labour of psycho-physiologists. At present the labour was chiefly the accumulation of facts many of which as yet were difficult to coordinate into general laws. It was exceedingly important that the subject should be seriously taken up in this country. In the American schools a great deal of useful progress was being made.

On Tuesday, September 17, Dr. C. S. Myers (Cambridge) communicated the results of a series of observations made with Galton's whistle upon the hearing of the Murray Islanders and some inhabitants of Buchan, Aberdeenshire. The result showed that the Murray Islanders could not at any age hear such high-pitched notes as the people of Buchan. The latter had from childhood upward a finer perception for high-pitched notes than the former.

Prof. Marcus Hartog demonstrated a model showing the mechanism of the frog's tongue.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—The 230th meeting of the Junior Scientific Club was held on November 29. Dr. Gustav Mann (New College) read a paper on the theory of dyeing and staining, and Mr. D. A. Gilchrist one on agricultural experiments at Reading and in Canada.

Mr. A. J. Jenkinson, of Hertford College, has been elected to the John Locke scholarship in mental philosophy.

Mr. G. W. S. Farmer, of Balliol College, has been appointed Litchfield lecturer in clinical surgery for two years.

CAMBRIDGE.—The Allen scholarship for research in medicine, mathematics, physics and chemistry, biology and geology, or moral science, will be awarded in the ensuing Lent Term. The emolument of the student is 250*l.* for one year. Any graduate of the University is eligible, provided he is not more than twenty-eight years of age on January 8, 1902. Candidates must send their names, with a definite statement of the course of research they propose to undertake, to the Vice-Chancellor by February 1, 1902.

THE annual prize distribution and members' and students' conversazione of the Northampton Institute, Clerkenwell, will be held to-morrow, December 6. The Marquis of Northampton will distribute the prizes.

MR. HERBERT J. FLEURE, a student of Prof. Ainsworth Davis at University College, Aberystwyth, has been elected a Fellow of the University of Wales. The Fellowship is one of the highest distinctions of the University, and its conferment for the first time upon a student who has been engaged in zoological research is of noteworthy interest.

THE influence which the universities in Germany have had upon industrial progress was emphasised by Prof. Senier in an address entitled "Bonn on the Rhine: Pages from its History and Stray Thoughts on Education" (Dublin: Edward Ponsonby), recently delivered at Queen's College, Galway. It is sometimes thought that the advance of German industry has been due to technical schools, but Prof. Senier remarks: "Probably it would be more correct to say that the technical schools are due to the rise of industries. No doubt technical schools have had and will have some effect in assisting manufactures. But the main source of those industries depending upon science has always been and must always be science itself, the outcome of university work." In this opinion Prof. Senier follows what the readers of NATURE have been familiar with during the last twenty years.

A GIFT of 5000*l.* has been offered to the University of St. Andrews by Dr. T. Purdie, professor of chemistry in the University, for the purpose of building and equipping a small chemical research department. In his letter to Principal Donaldson intimating the gift, Prof. Purdie says that their universities are very poorly provided for research when compared with those of foreign countries, and that scientific industries suffer in consequence. At St. Andrews in particular, except in zoology, there is no special provision in any of the science departments for original investigation. He therefore trusts that the University Court will accept his gift for the purpose mentioned, and that means may soon be found to equip other science departments. The success of the scheme, however, presupposes that scholarships will be available to encourage students to undertake post-graduate work, and also that an annual grant of money will be provided for laboratory expenses. He makes it a condition of his gift that the Carnegie trustees shall regard the scheme with favour and signify their willingness to help in the direction indicated. The gift is made in memory of his late uncle, Mr. Thomas Purdie, of Castlecliffe.

So many subjects are dealt with in the latest report of the U.S. Commissioner of Education that it is impossible to do more than mention a few matters considered in this volume, the contents of which occupy as many as 1280 pages. An account is given of the origin, growth, influence and relation to the public of the great secondary schools of England. The change in the character of secondary instruction in some schools from the old exclusively classical system to one related to modern requirements is pointed out in connection with its cause—the demands of commerce and industry. The national conservatism appears in the slow rate of change and the spirit in which science is even now accepted in the secondary school