

## OUR ASTRONOMICAL COLUMN.

TABLES FOR FINDING LATITUDE VARIATIONS.—Prof. S. C. Chandler gives, in the *Astronomical Journal* (No. 392), tables for finding the variations of latitude for the present year, these being a continuation of those published in an earlier number of the same journal (No. 193). The formulæ used in the computation were derived entirely from observations made previous to 1894.0, so that, as is suggested, a good opportunity is given of comparing the theoretical with the observational places obtained since that date. Such a comparison made by him shows that only an average difference without regard to sign of  $\pm 0''\cdot 041$  is indicated, a quantity sensibly not greater than the uncertainty of the observed points themselves. This satisfactory conclusion shows us then that predictions of the movements of the pole may, with no reasonable doubt, be made for several years beforehand. From an investigation, which Prof. Chandler has in hand, he informs us that a discussion of the whole series of observations from 1889 to 1896.5, demonstrates that the radius of the 428-day revolution has been diminishing in accordance with the law given by him (Equation 52, *Astr. Journ.*, 322), but at a slightly greater rate. He further adds that a comparison of the observations at Kasan in 1895 and 1896, in conjunction with those made in Central Europe, confirms the fact of the "remarkable eccentricity of the annual ellipse which was developed from the previous European and American observations."

THE TRIFID NEBULA.—Prof. Pickering, in the Harvard College Observatory Circular (No. 15), gives a brief account of the performance of the Bruce photographic telescope which is now erected at Arequipa. This instrument was generously given by Miss Catherine Bruce, as it had been suggested that a telescope of 60 cm. aperture and 343.8 cm. focal length would give most probably excellent photographic results. Since it was set up, it has been in constant use by Prof. Bailey, and a plate accompanies the Circular to serve to illustrate the work already accomplished. The original negative was taken last year, on June 11, with an exposure of three hours, on a plate  $14 \times 17$  in. The region covered extends in R. A. from 17h. 40m. to 18h. 10m., and in declination from  $-20^{\circ}8'$  to  $-26^{\circ}5'$ . The two nebulae on that part shown in the figure are the Trifid Nebula N.G.C. 6514 and N.G.C. 6523. It is stated that photogravures of two regions have been prepared, and a limited distribution, mainly to observatories, is being made of them. It is also proposed to issue maps of other portions of the sky, such as the Magellanic Clouds. It was originally intended to map the entire sky, but it is now thought better to furnish contact prints on glass from the original negatives to such astronomers as will make use of them.

Excellent results have already been obtained with objective prisms, and these, as we are informed, will be communicated in a future Circular.

THE PERIOD OF SIRIUS' COMPANION.—In this column for November 19, we gave the measures made by Prof. Aitken of the companion of Sirius, and pointed out that the position angle differed from that reported by Dr. See. In the current number of the *Astr. Nach.* (No. 3400), Herr H. J. Zwiers communicates a short note, in which he has taken the mean of the new measures made at the Lick Observatory—namely:

1896.8235 ... Position angle  $189^{\circ}28'$  ... Probable error  $\pm 0^{\circ}67'$   
Distance ...  $3'74''$  ... " "  $\pm 0'12''$

and compares this place with that given by the computation of the orbit (*Astr. Nach.*, 3336), which is

Position angle  $185^{\circ}99'$   
Distance ...  $4'05''$

The difference, observation minus calculation, gives for the two measures: position angle  $+3^{\circ}29'$  and distance  $-0^{\circ}31'$ , showing that the computed place is sufficiently near until more observations have been obtained. Prof. Auwer's suggestion that the period may be a little longer than 49.4 years is thus endorsed, while Herr Zwiers' period of 51.10 years gives a somewhat too slow a movement.

HEAT RAYS OF GREAT WAVE-LENGTH.—It is well known that the spectrum we see when observing an ordinary red-hot poker through a prism is only a fractional part of a much more extensive one. In addition to the common light waves there are several other kinds, such as electrical, heat, &c., all of which may form part of the spectrum in its entirety, and the attempt has often been made to increase our knowledge over the broad

region between the electrical and light waves. This may be done by either reducing the wave-lengths of electrical oscillations, or by the discovery and measurement of longer heat waves. In the pamphlet we have before us, a reprint from the *Physical Review* (vol. iv. No. 22), Messrs. H. Rubens and E. F. Nichols have just completed a very interesting investigation of the infra-red waves of great wave-length. The new theories of dispersion have suggested a method by means of which homogeneous rays of great wave-length may be obtained, and in sufficient quantity to make the determination of their properties and wave-length possible: this can be done, further, without the intervention of either a prism or grating. The authors make "reflection" the basis of their investigation, and in the instrument they devised they have chosen three reflectors of the same substance as the light source used. The bolometer employed was one of platinum, after the design of Lummer and Kurlbaum, the absorbing layer being a coating of platinum black, deposited electrically.

The two substances studied were quartz and fluorite. In the case of the former, the mean wave-length of the observed rays gave in the first and third orders  $0^{\circ}00887$  mm. and  $0^{\circ}00882$  mm. respectively. The agreement between the two values lies well within the limit of probable error. For fluorite the maximum energy in the diffraction spectrum of the first order corresponded to a wave-length of  $0^{\circ}0244$  mm., the mean from other series varying from  $0^{\circ}024$  mm. to  $0^{\circ}025$  mm.

The authors remark that if these values be compared with those computed from the Kettler-Helmholtz dispersion formula for the middle of the absorption bands, in each case the observed value for quartz is 10 per cent., and for fluorite 20 per cent. less than the computed. As inaccuracies may arise from the computed values, and there may be errors in the experimental values, such as, for instance, a variation in the absorption of platinum black with the wave-length, yet "one is justified in regarding the agreement between the observed and computed wave-lengths as close enough to confirm the utility of the theories involved."

The rays corresponding to the infra-red absorption band in fluorite lie thus almost exactly midway between the shortest ultra-violet rays of Schumann ( $\lambda = 0^{\circ}0001$  mm.) and the 6 mm. electrical waves of Lebeden, reckoning the interval according to octaves, as is customary in acoustics.

The authors hope, moreover, to be able to refine the present method of observation, and study waves of greater wave-length; and, by means of an improved radiometer, obtain a much higher degree of sensitiveness.

THE VALUE OF PATHOLOGICAL RESEARCH.<sup>1</sup>

ON the occasion of the jubilee of Queen's College, Belfast, last month, the new physiological and pathological laboratories were formally opened by the Lord Lieutenant. On the following day an address of welcome and congratulation was presented by the North of Ireland Branch of the British Medical Association and the Ulster Medical Society to Lord Lister, who, after receiving it, spoke as follows:—

It gave me very great pleasure to witness the opening of the physiological and pathological laboratories yesterday by His Excellency the Lord Lieutenant. Such an establishment is calculated to be of enormous advantage to the North of Ireland. The benefits which it will confer will be of various kinds. In the first place it will be of very great assistance to the medical practitioner in forming his diagnosis of the disease of the patient he has to treat. In these days the knowledge of pathology has made immense advances; and, at the same time, along with those advances in pathological knowledge, there has arisen increased complexity in the methods of examining pathological objects. Section cutting, staining, microscopic examination—these are matters of the utmost moment; and yet for the general practitioner there may be neither the apparatus nor the time requisite for that kind of investigation. It will, therefore, be of great advantage to the practitioner, when he has removed or in any way obtained a portion of a morbid growth, to send it to a central institution, and have absolutely definite informa-

<sup>1</sup> An address delivered January 20, in connection with the opening of the new physiological and pathological laboratories in Queen's College, Belfast, during the celebration of the jubilee of the College, by Lord Lister, P.R.S.

tion as to the precise nature of the disease with which he has to deal. Then, as regards the bacteriological department—there, again, diagnosis will be greatly facilitated. You are most of you aware that the diagnosis of diphtheria can now be made by bacteriological examination. It is of the utmost importance in the treatment of a case of diphtheria that its nature should be distinctly defined; that it should be known with certainty whether it is true diphtheria or a disease which closely simulates it, and may deceive the most experienced practitioner, and yet have none of the deadly characteristics of true diphtheria. Now for the future any medical man in the North of Ireland will only have to send, in a suitable tube, which will be provided by the institution, a little of the false membrane in the case with which he is dealing, and in a very short time he will have sent to him a bacteriologically made diagnosis of whether it is a case of true diphtheria or not. Again, with reference to what is more immediately connected with the objects of this College, such an institute will be of very great help in the training of students in their education for the medical profession. In it the student will have the opportunity of practically studying the various forms of morbid growths and the diseases which are of the nature of microbes. These are days when the subjects of medical examination are becoming more and more complex, and the student is too much tempted to get up his knowledge in a superficial way, cramming to satisfy the examiner, rather than to obtain thorough-going practical information. That is more especially the case when the student is not examined by his own teachers, under whom he might work with some confidence that his labour would not be thrown away with reference to that really subordinate, but in his eyes vastly important, matter of the passing of his examination. May I venture to interpose a remark on that point, and to express the hope that the time is not very far distant when the great northern metropolis of Ireland will have its own university, a true teaching and graduating university on the same lines as most of the German universities and the Scotch? But passing from that, independently altogether of the difficulty a student may have in preparing for examination by strangers, the great complexity of the subjects of medical education makes it extremely important that there should be afforded ample opportunities of practical study. The bacteriological department will be of peculiar value in the education of the student. It will in the first place convince him of the reality of the microscopic foes with which we have at the present day so largely to deal—the microbes, which are the cause of so large a proportion of human disease. He will not only read that such things are, and when he gets into practice perhaps forget that they exist, but he will know them as acquaintances. He will see the evidence not only of their existence, but also of their effects. The bacteriological training will besides be of special advantage in teaching the student accurate observation and also dexterity of manipulation—both most important matters in a medical man's practice. If a student is told to prepare a culture of a particular microbe in a state of purity, in order to do that he must be very sharp indeed in his observations, and very clever, too, in his manipulations; and if he fails, the fact will very soon declare itself. There will be an impure culture, and instead of having only the one microbe he wished to cultivate, with its well-known special characteristics, it will be seen that he has allowed others to get in at the same time. His own imperfections will thus declare themselves; but he will persevere, and go on and on until he becomes perfectly competent to produce a pure culture. This will be of great importance in his education. There is another aspect of a pathological institute which I feel some delicacy in alluding to, because there are some people who take strange views with regard to these matters—exaggerated views. There are people who do not object to eating a mutton-chop—people who do not even object to shooting a pheasant with the considerable chance that it may be only wounded and may have to die after lingering in pain, unable to obtain its proper nutriment—and yet who consider it something monstrous to introduce under the skin of a guinea-pig a little inoculation of some microbe to ascertain its action. Those seem to me to be most inconsistent views. With regard to all matters in which we are concerned in this world, everything depends upon the motive. A murderer may cut a man's throat to kill him; any one of you medical students may have to cut a man's throat to save his life. The father who chastises his son for the sake of the good of his morals is a most humane man: a father who should beat

his son for the mere sake of inflicting pain upon him would be an inhuman monster. And so it is with the necessary experiments upon lower animals. If they were made, as some people seem to assume, for the mere sport of the thing, they would be indeed to be deprecated and decried; but if they are made with the wholly noble object of not only increasing human knowledge, but also diminishing human suffering, then I hold that such investigations are deserving of all praise. Those little know who lightly speak on these matters how much self-denial is required in the prosecution of such researches when they are conducted, as indeed they always are, so far as I am aware, with the object of establishing new truth. The exercise of a little charity might lead those who speak of us as inhuman to reflect that possibly we may be as humane as themselves. The profession to which I have the great honour to belong is, I firmly believe, on the average, the most humane of all professions. The medical student may be sometimes a rough diamond; but when he comes to have personal charge of patients, and to have the life and health of a fellow-creature depending upon his individual care, he becomes a changed man, and from that day forth his life becomes a constant exercise of beneficence. With that beneficence there is associated benevolence: and, in that practical way, our profession becomes the most benevolent of all. If our detractors knew this, common sense would enable them to see that our profession would not be unanimously in favour of these researches if they were the iniquitous things which they are sometimes represented to be. I was reading the other day a very interesting account of Pasteur's work on rabies, written by one who was associated with him from an early period (M. Duclaux). It had been established that the introduction of a portion of the brain of a mad dog under the skin of a healthy animal was liable to cause rabies, and Pasteur had reason to believe that it was principally in the nervous centres that the poison accumulated. He felt a very strong desire to introduce some of the poison into the brain of an animal; but he was a peculiarly humane man. He never could shoot an animal for sport. He was more humane than the great majority of human beings; and for a long time he could not bring himself to make the experiment of trephining an animal's skull, and introducing some of the poison of rabies into the brain. He was exceedingly desirous of doing it to establish the pathology of the disease, but he shrank from it. On one occasion, when he was absent from home, one of his assistants did the experiment, and when Pasteur came back he told him that he had done so. "Oh!" said Pasteur, "the poor creature! His brain has been touched. I am afraid he will be affected with paralysis." The assistant went into a neighbouring room and brought in the animal, which was a dog. It came in frisking about and investigating everything in a perfectly natural manner; and Pasteur was exceedingly pleased, and though he did not like dogs, yet he lavished his affection upon that particular animal and petted it; and from that time forth he felt his scruples need no longer exist. The truth is that the pain inflicted by this process of trephining is exceedingly slight, and yet the operation is sometimes described as being a hideously painful one. That is a mistake. In point of fact the operation is always done now under anaesthetics, so that the animal does not feel it at all; but even without that the operation is not seriously painful. I look forward to the time when there will be an institute in connection with this College, where investigations of the kind to which I have referred can be carried on, and where pathological knowledge of the first importance may be promoted. Think also of the practical advantages of an institution where the materials can be provided for the treatment of diseases on the principles which have been recently established. It appears to be now placed beyond doubt that that dreadful disease diphtheria may by the antitoxic treatment be reduced in mortality from about 30 per cent. to about 5 per cent. if the proper material is promptly used. It is exceedingly important that in a city like Belfast the supply of such material should be within easy reach of the practitioner—that he should not be compelled to send to London for the requisite serum, and thus lose much valuable time. Every hour that is lost in the treatment of a case of this nature is a very serious loss indeed. But it is by no means only in diphtheria that such an institute is likely to confer benefits of this kind. In the case of the streptococcus, which is the cause of erysipelas and kindred disorders, including that very terrible disease, puerperal fever, there are very promising indications that the use of antitoxic serum will

rescue patients from otherwise hopeless conditions. Let any one picture to himself the case of a young wife after her first confinement afflicted with this dreadful puerperal fever, and doomed under ordinary treatment to certain death. The practitioner makes an injection of this serum under the skin, with the result that the lady rapidly recovers, and in a few days is perfectly well. Let any man conceive such a case as this, and all objections to the investigations necessary to bring about such a state of things must vanish into thin air. So soon as our poor selves are directly concerned our objections disappear. If a tiger threatened to attack a camp, who would care much about what kind of a trap was set for it, or what suffering the trap caused the animal, so long as it was caught? When the matter affects only the welfare of others, including generations yet unborn, the good done does not appeal to the individual, and the objector sees only the horrors of modern scientific investigation; of which horrors, however, he quickly loses the sense as soon as he becomes personally concerned.

On the occasion of the funeral of that illustrious investigator to whom I have before referred, I visited the Institut Pasteur, and there was shown preparations of the microbe of the plague discovered at Hong Kong in 1894 by M. Yersin. And I was told by M. Roux, that Yersin, whom he knew intimately as formerly his colleague, had lately been treating in China several cases of that fearful disease with serum prepared at the Institut Pasteur on the same lines as that used for diphtheria. Cultures of the plague bacillus had been taken to Paris, and at the Institut, under the most rigorous precautions, the serum had been prepared. At the Institut they did not think they had succeeded in producing a very powerful serum, judging from its action on animals; but in the human subject it seems to have proved most potent. M. Yersin obtained serum sufficient for the treatment of twenty-six cases of the plague. The mortality from the disease at the time was above 80 per cent. The first case which he treated was that of a young man, in whom a "bubo," characteristic of the disease, was present, and the patient, already delirious, was completely despaired of. A little of the serum was introduced, and, to M. Yersin's absolute amazement, on the following day the young man was well, the bubo having almost entirely disappeared. And, moreover, of the twenty-six cases in which M. Yersin used the serum, twenty-four recovered; while in the remaining two Yersin felt that he was called in so late that their cases were hopeless. I would not have referred to these facts did I not know that the person from whom they were obtained was absolutely trustworthy. We cannot tell how soon the plague may visit these shores. We know that in one of our great dependencies—Bombay—it is already prevalent in a very severe form, and has already cost many lives. We know that a ship may carry the disease; that rats are liable to contract it, and that a rat making its escape from a ship coming from Bombay, say, to the Thames or to Belfast Lough, may carry the plague ashore, and that the taint may be communicated to human beings, with dreadful results. I would not say that there are not slums in the city of Belfast which might harbour the plague. So you can easily recognise how vastly important it would be to have means at hand whereby, in the simple way I have described, the disease may be combated. I have, I think, said enough to show the vast importance of an institute of such a character, and I look forward to the time when you will have such an establishment thoroughly equipped for its beneficent work.

There is another department in connection with medical education in this city about which I cannot speak in the same terms of praise as I can with reference to the new laboratories, and that is the hospital. No doubt the Royal Hospital, which I had the honour of visiting for the first time yesterday, is a fine institution; but it is altogether inadequate to the requirements of this great and rapidly-growing city. It is inadequate, whether for affording means of clinical instruction to students or for dealing with the diseases of your large and increasing population. But I am glad to know that there is a prospect of better things before long. I understand that it has been not merely contemplated, but determined, to build a large new hospital provided the requisite funds can be obtained; and I have been informed that within six weeks of the initiation of the movement more than half the necessary sum has been raised. I have no doubt that the munificence of the merchant princes of Belfast will soon provide the balance. Therefore, whichever way I look at this jubilee, I feel that the College, more particularly with regard to its medical school, is entering upon a new era of

prosperity. I rejoice with you in the fact, and I have felt it a great privilege to take part in your celebration.

[Since this address was delivered, the last number of the *Annales de l'Institut Pasteur* has appeared, containing a paper by M. Yersin, describing his experience above referred to. The details which he gives of the cases confirm in a remarkable manner the conclusion which the mere numbers suggest. Just as in diphtheria, and exactly as must occur if the antidote is really efficacious, the cure was most rapid when the treatment could be commenced on the first day of the disease; speedy also, but less so, when it was begun on the second day; and so from day to day till the fifth. Four patients were treated at this very late period, and the only failures were in two of these. More of the serum also was required in the more advanced cases.

Equally striking was the manner of recovery. In none of the twelve cases in which treatment commenced within two days of the onset of the complaint did the bubo suppurate. And in those of a later period in which matter did form, the abscess closed rapidly after being opened, instead of healing tediously, as it does when recovery takes place without this treatment. And the patients, instead of having a lingering convalescence, were healthy men and women in a time which was always relatively short, and astonishingly so when the treatment had been commenced early. These details are so extraordinarily confirmatory that, small though the number of cases is, they carry conviction to my own mind.

It gives me the most profound satisfaction to be able to state on the authority of the India Office, that the Bombay Government intend to employ M. Yersin, now on his way to the stricken region, to give a full trial to his method, and I have also learned through another channel that within a fortnight from this time (February 1) the serum treatment will probably have begun in Bombay.

LISTER.

#### UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—The election to the Professorship of Geology will take place during the present term.

This term the usual courses of lectures are being given in the various departments of Natural Science. Prof. H. H. Turner is lecturing on Elementary Astronomy, Prof. Odling on Organic Chemistry, and Profs. Vines and Gotch are continuing their advanced courses in Botany and Physiology respectively.

Prof. H. A. Miers is giving a series of lectures on the Relation between Chemical Composition and Crystalline Form.

In the Department of Comparative Anatomy, Prof. Ray Lankester is lecturing on Reptiles and Birds. Mr. R. W. T. Günther on Brachiopoda and Polyzoa, Mr. Barclay Thompson on the Osteology of the Sauropsida and on Sauropsidan Palaeontology, and Mr. G. C. Bourne is conducting a class for the study of Vertebrate Histology. In the Hope Department, Prof. Poulton will give a series of lectures on the Age of the Earth.

Prof. Tylor is lecturing on the Early Stages of Knowledge, and Mr. Balfour on Realistic and Decorative Art of Primitive Peoples.

Elementary courses in the different departments are being given by Profs. Gotch and Vines, Dr. Benham, and Messrs. Churchill, Baynes, Watts, and Vernon Harcourt.

CAMBRIDGE.—The Gilbey Lecturer in the History and Economics of Agriculture will give four lectures this term on Fridays, at two o'clock, beginning on February 12. His subject is Ancient and Medieval Agriculture.

At the matriculation on January 28, eighteen additional Freshmen were entered, bringing the total for the academic year up to 923.

Mr. W. Gardiner, F.R.S., has resigned his University Lectureship in Botany on his appointment as Bursar at Clare College, of which he is a Fellow.

DR. T. E. THORPE, F.R.S., will distribute the certificates in science subjects to evening students at the East London Technical College, People's Palace, on Monday, February 8.

MR. GARRETT A. HOBART, Vice-President-elect of the United States, has given to his *alma mater*, Rutgers College, 5000 dols. for the general expenses of the college.