

hole at right angles to its surfaces. The canal rays are received on a plate which is connected to a galvanometer. When a magnetic field parallel to the axis of the tube is established, the "magnetic rays" produced fall on a second plate, which can also be connected to the galvanometer. This plate is found to receive no current whatever from the magnetic field, but the first plate receives a positive current, which decreases as the magnetic field increases.

In laboratories remote from large towns, the absence of a gas supply is the cause of much difficulty; and this applies to chemical, physical, bacteriological, agricultural, and metallurgical laboratory work. Carburetted water gas has been used in some cases, but has been shown to be attended with some drawbacks. We have received a pamphlet from Messrs. Mansfield and Sons, of Birkenhead, describing their oil-gas apparatus for laboratories. For the gas plant great durability and simplicity is claimed. Any kind of oil (mineral, animal, or vegetable) can be used for cracking, and no skilled labour is necessary, since putting a shovelful of coal on the fire every twenty or thirty minutes, and seeing that the oil is flowing in, is all the attendance required. The oil gas produced is permanent, has a very high calorific value, and requires no purification before use. This gas can be used in ordinary burners and appliances for laboratory use, provided that the gas jet is reduced in size to correspond with the higher carbon contents of the gas. Particulars are given in the same list of Bunsen burners, furnaces, drying and sterilising ovens, blow-pipes, and water heaters modified to burn oil gas.

THE memorandum of the Manchester Steam Users' Association for the year 1910 contains some interesting investigations by their chief engineer, Mr. C. E. Stromeyer, on the trustworthiness of mild steel. Some of the results have been presented at the Iron and Steel Institute; and in the present paper Mr. Stromeyer gives subsequent data confirming the view that the presence of nitrogen gives a bad steel likely to crack in undergoing the necessary workshop processes or in subsequent working of the boiler of which it forms a part. The evidence points to the fact that steels in which the percentage of phosphorus added to five times the percentage of nitrogen exceeds 0.08 will be untrustworthy in working. The author has tried many mechanical tests with the view of discovering one which would differentiate between trustworthy and untrustworthy steels, but without success. Except as regards bad heat treatment, chemical determinations, more particularly of phosphorus and nitrogen, are the only available guides when the process of manufacture and the composition of the raw material are not known. Engineers, however, are not likely to place overmuch confidence in a test which they cannot check, and will prefer to continue to rely on the reputations of the manufacturers, combined with a few mechanical tests.

THE third part of the work known as "Harmsworth Popular Science," edited by Mr. Arthur Mee, which is appearing in fortnightly sevenpenny volumes, has been received. In it the story of the evolution of the earth as the abode of plant and mineral life, the appearance of man and his gradual development, and his subsequent conquest of nature and the organisation of human society, is continued in the same popular manner as in previous issues. The work is profusely and excellently illustrated, and the account it provides of the triumphs of science will serve to encourage among ordinary readers an appreciation of the extent to which human progress is indebted to the labours of men of science.

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OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES FOR DECEMBER:—

- Dec. 3. 19h. 39m. Saturn in conjunction with the Moon (Saturn $4^{\circ} 5' S.$).
4. 15h. 55m. Mars in conjunction with the Moon (Mars $0^{\circ} 50' S.$).
6. 22h. 0m. Mercury in conjunction with Lambda Sagittarii (Mercury $0^{\circ} 1' S.$).
7. 7h. 0m. Mercury at greatest elongation E. of the Sun.
10. 23h. 0m. Vesta in conjunction with the Moon (Vesta $0^{\circ} 28' S.$).
15. 15h. 0m. Mercury stationary.
16. 2h. 58m. Venus in conjunction with the Moon (Venus $3^{\circ} 39' N.$).
22. 10h. 54m. Sun enters sign of Capricorn. Solstice.
- „ 14h. 43m. Uranus in conjunction with the Moon (Uranus $4^{\circ} 36' N.$).
25. 4h. 0m. Mercury in inferior conjunction with the Sun.
29. 9h. 0m. Mars stationary.
31. 3h. 59m. Saturn in conjunction with the Moon (Saturn $4^{\circ} 1' S.$).
- „ 20h. 10m. Mars in conjunction with the Moon (Mars $0^{\circ} 1' S.$).

OBSERVATIONS OF MARS.—Nos. 4537-8 of the *Astronomische Nachrichten* contain several important records of recent observations of Mars. Under date November 21 Prof. Lowell telegraphs: "First morning frost Mars observed since November 3, 30° from S. pole on sunrise limb."

M. Antoniadi reports an encroachment of Syrtis Major, since 1909, on the W.S.W. of Libya to the extent of about 100 km., and several other changes. The chief interest of the observations appears to be in the apparent variations wrought by changes in the Martian atmosphere. M. Antoniadi suggests that, with these eliminated, the actual changes in the majority of the small details of the planet's surface would be very few. The intrinsic colour of such "iles" as Argyre 1, Noachis and Hellas, it is deduced, is red, and their apparent bronze hues are produced by the passage of yellow cloud screens.

M. Comas Sola records observations made at the Fabra Observatory, Barcelona, during October 9-16. A new canal was seen on October 9 to the east of Syrtis Major; it appeared to correspond to a prolongation of Nubis, which, passing L. Mæris, extended as an arc towards Triton. The whole region of Isis and Libya was covered by an immense, oval, brilliant cloud on October 11, the new canal being completely hidden in parts; this veil afterwards moved away at about 30 km. per hour. M. Comas Sola tentatively suggests that volcanic action on Mars would account for the production of these massive veiling clouds.

Important changes are also reported by the Jarry-Desloges observatories at Masegros and Sétif. Nepenthes and Nilosyrtis are said to be enormous, and Ausonia and Hesperia greatly changed; early in November the diameter of the south polar spot was 1.2".

ARE THE WHITE NEBULÆ GALAXIES?—This question is attacked from several directions by Prof. F. W. Very in No. 4536 of the *Astronomische Nachrichten*, and the discussion of the various points is exceedingly interesting. Considering the relative brightness of nebulae of different diameters, he arrives, first, at the conclusion that the light from these extra-galactic bodies does suffer absorption in interstellar space, and therefore one of the great objections to an infinitely extended universe, the apparent darkness of the sky, is explained. Then the apparent sizes and brightnesses of these bodies are compared with those of other celestial bodies of which the distances are approximately known. This leads to results as to the intrinsic brightness of the white nebulae, hence to the question of their star-density, and, finally, it is found that these celestial objects are probably galaxies. Their diameters appear to differ to at least a fourfold extent, and the dimensions and brightness of the component stars are closely allied to those obtaining in our own stellar system. Of course many assumptions are necessary in such a discussion; but it is

interesting to note that Prof. Very deduces for the chief object of this class, the Andromeda nebula, a distance of about 1600 light-years, and suggests that the faintest and smallest of the white nebulae may represent galaxies at a distance of one million light-years.

METEOR STUDIES.—All meteor observers would find Dr. C. P. Olivier's thesis, based on the study of more than 6200 meteors, of great interest. The determination of orbits was the primary motive, and 175 parabolic orbits have been deduced; but the other results would probably interest the average observer more. For example, the orbit of Halley's comet and that deduced for the η Aquarids are so remarkably similar that identity of origin is assured. But the size of the meteoric current is shown to be enormous, and on May 12, 1910, it was 13 million miles' radius. The evidence for stationary radiants is shown to be very weak, and the existence of such phenomena is in doubt. A special study of the so-called α - β Perseids was made, and the result indicates that they exist only in August. Duration of visibility is connected with colour, yellow meteors having the shortest, red and orange longer, and white and green meteors the longest, periods of visibility. The paper is published as an extract from the Transactions of the American Philosophical Society, N.S., vol. xxii., part i.

POPULAR OBSERVATORIES.—From time to time we have in these columns welcomed the establishment of observatories, of which the chief aim is to popularise the science of astronomy. Unfortunately, it would appear that the desire and the means to organise such institutions are greater on the Continent than here. The latest addition to the list, established at Munich, is described in No. 2007 of *La Nature*, and from the excellent illustrations it is evident that this *observatoire populaire* is well equipped. At first the organisers planned to mount the instruments on a high tower, and thus to escape some of the astronomical disabilities of an urban site; but the Commission of Architecture, which looks after the artistic amenities of Munich, decided that this project would mar the town's beauties, so the astronomers have to put up with an observatory placed at a lower altitude.

THE GREEK QUESTION AT OXFORD.

ON Tuesday, November 28, the statute providing for the exemption of candidates in the honour schools of mathematics and natural science from the necessity of offering Greek in Responsions was submitted to Convocation and rejected by a large majority, the numbers being 360 for and 595 against. The question had been thoroughly discussed by means of letters to the Press and printed fly-sheets circulated more or less widely among members of Convocation. On one side it was alleged that the modicum of Greek required in Responsions, which is practically, though not statutorily, an entrance examination to the University, could be of no service to anyone who did not follow the study further, and only acted as an obstacle in the way of matters more important for the end in view. On the other side it was maintained that even a moderate acquaintance with the Greek language and literature was of value to most men; and the authority of the late Lord Kelvin was invoked in support of the opinion that this applied with especial force to those engaged in the pursuit of natural science.

An argument that was used with some force by the opponents of the statute concerned itself with the effect likely to be produced by the passing of the present proposals, followed, as they no doubt would be, by further measures of a similar nature, upon the facilities for learning Greek afforded in the smaller schools. When Greek is once made optional at the older universities, it was said, a chief inducement for the maintaining of instruction in Greek will be removed, except in the case of the great public schools, the result of which will be that many boys well capable of turning a knowledge of Greek to good account will be deprived altogether of the opportunity of learning it.

There is no doubt whatever that some of the opposition to the statute was due to the fact that many of its supporters openly avowed that they regarded it as a mere

temporary compromise, to be followed in due course by more stringent limitations on compulsory Greek. This deterred many who would have voted for the statute if it had been put forward and supported as a final settlement of the question. On the other hand it is at least highly probable that many supporters of the statute disliked its provisions, but voted for it because they knew that it would not dispose of existing difficulties, and that it might be replaced in course of time by something more to their mind.

Much interest was aroused over the question as to how far a body like Convocation, which is largely non-resident, could legitimately be appealed to against the decision of what was presumably a majority of resident teachers. On one hand it was held that Convocation, the members of which are resident and to a great extent engaged in the actual teaching and examining work of the University, must be best qualified to judge of the educational requirements of different classes of undergraduates. On the other hand it was pointed out that Convocation, consisting for the most part of men who after completing their university education had passed out into the world and joined the ranks of the various professions and public services, would be well qualified to estimate the value of the education which they themselves had received, and desired by them for their own sons. A matter of broad educational policy, it was maintained, might properly come within the purview of the latter body, while questions of detail should be left in the hands of the resident teachers. In addition to this it was pointed out that the majority by which the measure passed Convocation was very far indeed from being a majority of the whole body, less than half of the members of Convocation having actually recorded their votes on that occasion.

Notwithstanding the figures of last Tuesday's division, it would be a mistake to suppose that any considerable number of people are entirely satisfied with the present system of entrance examination. There is little doubt that the question of reform will again be mooted; and it may be hoped that some plan may be devised, perhaps on the lines of a "leaving certificate" to be gained at school, which will secure a reasonable amount of support from all parties.

PAPERS ON INVERTEBRATES.

AMONG a number of papers relating to invertebrates which have recently come to hand, the following are selected for notice:—

Bulletin No. 16 of the Connecticut Geological and Natural History Survey is devoted to the first two parts of a guide to the insects of that State, prepared under the direction of Dr. W. E. Britton. Part i., comprising a general introduction, is by the editor, while in the second part Mr. B. H. Walden treats the Euplexoptera and Orthoptera. Special attention is directed to the economic aspects of the subject.

The British spiders usually included in the heterogeneous group Tmeticus and certain allied genera form the subject of an article by the Rev. J. E. Hall in the third part of vol. iii. (new series) of the Transactions of the Natural History Society of Northumberland, Durham, and Newcastle. It is now shown that the group is divisible into sections, one represented by Centromerus, in which there are only three outer falcate teeth, and the other by several genera (some of which are named for the first time) in which there are four or five of these teeth.

In a note on the Crustacea obtained during the trawling expedition fitted out by the New Zealand Government in 1907, Dr. C. Chilton (Records Canterbury Museum, vol. i., No. 3) states that the shell of a crab of the genus Paramithrax seems to be almost invariably infested by barnacles (*Balanus decorus*), which are in some cases so numerous and so large as to exceed the crab in bulk. A hermit-crab (*Eupagurus stewarti*) was found in some cases inhabiting a massive polyzoan apparently too big for the crab to move; in other cases it sheltered in straight tubes in a Millepora, these tubes, it is suggested, perhaps having been originally formed round sea-weeds, which subsequently rotted.