to say of the present edition that it has been revised and has added to it a chapter on modernism, which is also issued separately, price 6*d.* net.

A SECOND edition of their List No. 52 has been issued by Messrs. A. Gallenkamp and Co., Ltd., of Sun Street, Finsbury Square, London, E.C. The catalogue deals in an exhaustive manner with charts, diagrams, lanterns, and lantern slides, botanical and hygenic models, and other requirements of lecturers and teachers. The list brings together in a convenient manner the publications, and so on, of a great variety of firms, and will save intending purchasers much time and trouble. Even a glance through these well-illustrated 200 pages is enough to show the wealth of pictorial illustration now at the disposal of lecturers.

## *OUR ASTRONOMICAL COLUMN.*

ASTRONOMICAL OCCURRENCES FOR JULY:—

July 2. 11h. om. Earth at greatest distance from the Sun.
8. 23h. 27m. Uranus in conjunction with the Moon (Uranus 1° 42′ N.).
9. 19h. 14. Jupiter in conjunction with the Moon (Jupiter 0° 32′ N.).
16. 6h. om. Mercury in inferior conjunction with the Sun.
20. 2h. 43m. Saturn in conjunction with the Moon (Saturn 5° 59′ S.).
21. 2h. om. Neptune in conjunction with the Sun.
,, 19h. 46m. Mercury in conjunction with the Moon (Mercury 8° 37′ S.).
22. 10h. 50m. Neptune in conjunction with the Moon (Neptune 3° 43′ S.).
25. 18h. 24m. Venus in conjunction with the Moon (Venus 1° 52′ N.).
26. 4h. 33m. Mars in conjunction with the Moon (Mars 2° 7′ N.).
,, 17h. om. Mercury stationary.

THE RADIATION OF THE SUN.—The Journal of the Franklin Institute for June (vol. clxxvii., No. 6, p. 641) publishes an article on the "Radiation of the Sun," being an address presented by Prof. C. G. Abbot at the meeting of the section of physics and chemistry. The article is popularly written, and displays the general nature of the problem of solar radiation, and the different researches which have and are being pursued to elucidate the knotty points. Interesting photographs, diagrams, and curves accompany the text, and the name of the distinguished author is a guarantee of the accuracy of the information given. Articles such as the above are most valuable to those whose work in astronomy lies along other lines, but who keenly desire to be posted on the progress of the researches of workers in other branches of the subject.

DISPLACEMENT OF THE LINES TOWARDS THE VIOLET IN THE SOLAR SPECTRUM.—Dr. T. Royds, acting director of the Kodaikanal Observatory, gives the results of his researches (Bulletin No. 38) in the form of a preliminary note on the displacement to the violet of some lines in the solar spectrum. While the majority of the metallic lines in the solar spectrum are shifted towards the red when compared with their positions in the electric arc, there are, however, many exceptions, and some of these are specially dealt with in this paper, the iron arc spectrum being compared with that of the sun's centre. A full list of the wave-lengths of the lines employed and their intensities in long or short arcs, with other data, accompany the discussion. Summarising briefly the results, it may be stated that the iron lines which are unsymmetrically widened to the red in the arc are displaced to the violet in the sun relative to a short iron arc, and those unsymmetrically widened to the violet are displaced to the red. Symmetrical lines give normal displacement to the red. The change of wave-length of certain classes of iron lines is caused in a way other than by pressure or motion in the line of sight. The unsymmetrical iron lines are displaced in the short arc compared with the long arc. Those widened towards the red are displaced to the red in the short arc, and those widened towards the violet to the violet, whilst symmetrical lines have mostly small displacements. Differences in the density of vapour is suggested as a possible cause of the displacement between the different kinds of arc; but the matter, as Dr. Royds remarks, requires further investigation. The longer the iron arc, the more nearly do the conditions approach those in the reversing layer of the sun. Lines of other elements than iron also have sun minus arc displacements, which cannot be explained as due to pressure or line of sight motion.

METEORS ON JUNE 25–26.—Mr. W. F. Denning writes us that, though meteoric phenomena are seldom displayed abundantly on a June night, he observed some strikingly brilliant and interesting meteors on Thursday, June 25. At 10.39 a 2nd magnitude was seen nearly stationary, and close to its radiant at 269°+46°. At 10.52 a fine meteor, exceeding 1st magnitude, crossed $\tau$ Herculis and $\theta$ Draconis in a rapid flight, and left a transient streak. Radiant at 260°−24°, and height of object forty-eight to forty-four miles; path, fourteen miles, and velocity twenty miles a second. At 11.28 a bright meteor equal to Venus fell about 6° to the right of $\alpha$ Andromedæ, and left a streak. Its radiant was at 342°+39°, and its height fifty-one to twenty-five miles, path forty-five miles, and velocity thirty miles a second. At 11.52 a meteor equal to Jupiter glided down the eastern sky about 2° to the left of $\alpha$–$\beta$ Pegasi, its flight being as nearly as possible parallel with those stars. Graceful, slow motion, there was no trace or streak, yellow nucleus. Radiant at 354°+77°, and height fifty-nine to twenty-three miles. Path, forty-six miles; velocity, eighteen miles a second. At 11.58 another meteor equal to Jupiter shot swiftly upwards in the eastern region of Cygnus, leaving a bright phosphorescent streak for several seconds. Its radiant was on the eastern horizon at 350°−8°, and its height sixty-seven miles; path, fifty-two miles, and velocity, about fifty-two miles a second. At 12.57 a 3rd magnitude meteor with a streak was directed from a radiant at 24°+42°, and at 12.58 a very slow 2nd magnitude was seen in Camelopardalus moving from the direction of Ursa Major. Others were observed, and the sky remained beautifully clear during the night. The heights, etc., of the several meteors given are computed from duplicate records obtained by those enthusiastic observers, Mr. and Mrs. Wilson, of Bexley Heath, Kent.

REPORT OF THE U.S. NAVAL OBSERVATORY FOR 1913.—The report of the superintendent of the U.S. Naval Observatory for the fiscal year 1913 forms Appendix 2 to the annual report of the chief of the Bureau of Navigation, 1913. Commencing with the interesting statement that "this observatory, being the first institution in the world to have its time signals regularly transmitted by radio-telegraphy," the superintendent proceeds to describe the part played by the delegates appointed to represent the United States at the Inter-

national Time Conference which was held in Paris in October, 1913. Reference is next made to the arrangements for the determination of the difference of longitude between the observatories of Paris and Washington using the Eiffel Tower and Arlington as the radio stations for the transmission of the signals. A suggestion is made that owing to the great range of the signals to be sent out from Arlington, advantage will be taken of these signals by other institutions to determine their own longitude. The replies to the issue of a circular letter giving information concerning the special signals have indicated that a number of institutions widely scattered in the United States will utilise the opportunity offered. The report then describes the work carried out during the past year in the different instrumental divisions. These relate to the 9-in. transit circle, 5-in. altazimuth instrument, 6-in. transit circle, 26-in. and 12-in. equatorials, photoheliograph, etc. The reduction work is next summarised, followed finally by that of the department of compasses, chronometers, and other nautical and surveying instruments.

## *TRADE AND TECHNICAL EDUCATION IN FRANCE AND GERMANY.*[1]

THE interesting and important report recently presented to the Education Committee of the London County Council by one of its officers, specially deputed to make the inquiry, on recent developments in the provision of continued and specialised education in France and Germany, deserves the closest attention of all who are seriously concerned with the educational well-being of the children of the United Kingdom, and with the conditions necessary to the maintenance in the highest state of efficiency of our industries and commerce.

The report confines itself to the educational activities of four great cities, namely, Paris, Munich, Leipzig, and Berlin, dealing especially with measures having for their object the continued education of the child on leaving the elementary school, the thorough technical training of the apprentice, and the adequate preparation of the capable young workman or business man for positions of responsibility and leadership.

The question of the higher scientific and technical training is only incidentally treated, its ample provision, especially in the case of Germany, being fully recognised.

The report is, therefore, devoted in the main to the facilities offered in specialised and monotechnic schools, whether day or evening, dealing with specific trades and industries, of which the city of Paris affords abundant illustration in its apprenticeship schools and in its schools of applied design, the work of which was a most interesting feature of the educational section of the Paris Centennial Exhibition of 1900.

But the chief interest of the report is to be found in its description of the provision made, in the three important German cities named, for the continued effective education of German youth on leaving the elementary school and entering upon their respective occupations, "blind alley" or otherwise.

Much stress is laid upon the successful working of the Imperial Law of Industry, establishing compulsory continuation schools, applying especially to all boys on leaving school at fourteen years of age and requiring attendance from six to nine hours a week over a session of forty weeks during a period of three or four years—time for which must be provided by the employer within the usual hours of labour.

[1] Trade and Technical Education in France and Germany. Report by J. C. Smail, Organiser of Trade Schools for Boys, London County Council. (Westminster: P. S. King and Son.) Price 1s.

The result has been, notably in Berlin, Munich, and Leipzig, that provision has been made for almost every class of occupation, skilled and unskilled—the instruction dealing not only with vocational needs, but also preparing the boy for his future responsible domestic and public duties.

Evidence is forthcoming that after a period of doubt and difficulty employers are beginning to appreciate the value and advantage of this continued education and training, though it is somewhat disconcerting to learn that in 1912 in Berlin there were proceedings pending, either on account of school neglect or of offences against school laws under this Act numbering 6,448.

In England, not to speak of the girl population, only 13 per cent. of the boys between fourteen and seventeen years of age are continuing their education, and even this small percentage attends the continuation classes on the average only fifty-eight hours per annum, whilst in Munich virtually all boys engaged in occupation are in the continuation classes and receive 375 hours' instruction per annum for a period of four years. Much praise is given to the admirable facilities existing, especially in the cities of Munich and Leipzig, for the effective training of the commercial and industrial rank and file.

The leaders of German thought and business enterprise are persuaded that in the best interests of the nation all ranks of the industrial army must be thoroughly trained, not only vocationally, but as citizens. They do not fear that they will be less able to compete with their industrial rivals, but, on the contrary; and unless we are prepared to better their example we cannot hope to maintain the industrial and commercial pre-eminence we now enjoy.

We have still to abolish half-time for young children now at school, and to adapt our factory and workshop organisation to conditions which shall secure the educational well-being of the children employed therein. J. H. REYNOLDS.

## *MARINE BIOLOGY IN THE TROPICS.*[1]

THE Department of Marine Biology of the Carnegie Institution of Washington has issued in this fifth volume of contributions from its laboratory on the Tortugas, near Florida, a number of important papers. Three of these deal with the origin of Oolitic rocks, such as those of the Bahamas and of Florida, and inferentially with the origin of oolitic structure in other deposits. The first paper is the last work of a brilliant English investigator, Mr. G. H. Drew, whose recent death has deprived marine biology of one of the most original and fertile workers, and to whose memory the director of the department, Mr. A. G. Mayer, contributes a sympathetic and appreciative notice. Drew's memoir deals with the action of denitrifying bacteria in the tropical seas, and also with the precipitation of calcium carbonate by marine bacteria. Though necessarily incomplete, the results are a fine contribution to the difficult subject of marine bacteriology. They show that the reason why marine plankton is less abundant in the tropics than in temperate seas lies in the rapid and complete action of the denitrifying organisms in the warmer parts of the ocean; and Drew was able also to point to the extraordinary interest and importance of *Bacterium calcis* in inducing such precipitation of the calcium carbonates as to give rise to nodules of chalk. He suggests that chalk and oolitic rocks have been formed in shallow seas and are being produced round the Bahamas by this peculiar bacterial action.

[1] Papers from the Tortugas Laboratory of the Carnegie Institution of Washington. Vol. v. Pp. 222+plates+maps. (1914.)