members on excursions up and down the Tyne, the first steamer proceeding up the river as far as the New Cut, for the purpose of affording members an opportunity of witnessing the extensive dredging operations of the Tyne Improvement Commissioners, and thence sailing down again to the shipping spouts, the new Coble Dene Dock, and the piers, while the second steamer will take another party to some of the most important works down the river, as Leslie's and Mitchell's ship-building yards, Forster and Co.'s lead-works, the Jarrow chemical works, &c. On Wednesday evening a *conversazione* will be held in the Town Hall, Newcastle, when it is hoped that the telephone will be exhibited.

Doubtless one of the most interesting excursions will be that of Thursday afternoon, when a special train will convey the members to the Elswick Works (Sir W. G. Armstrong and Co.), thence proceeding to the Steel Works of Messrs. John Spencer and Sons, at Newburn. Friday will be entirely devoted to an excursion to Middlesbrough and the works on Tees-side. In the forenoon the new Browney Colliery Works and the Clarence Works of Messrs. Bell will be visited, and the Eston Steel Works and Blast Works of Bolckow, Vaughan and Co. After luncheon in the Royal Exchange, Middlesbrough, ten different works will be visited, including the Tees-side Iron Works, where the first Danks' rotary furnaces constructed in this country will be seen in full operation; the Ayresome Iron Works; the Tees Iron Works; the Tees-side Engine Works (Hopkins, Gilkes, and Co.); the Linthorpe Iron Works (Lloyd and Co.); the Newport Rolling Mills (Fox, Head, and Co.); the Ayrton Rolling Mills (Jones, Brothers, and Co.); the Middlesbrough Wire Works (Hill and Co.); the Newport Ironworks (B. Samuelson and Co.); the Middlesbrough Tube Works.

Among the papers to be read are the following: I. L. Bell, M.P., F.R.S.—Part II. of paper on the Separation of Carbon, Silicon, Sulphur, and Phosphorus in the Refining and Puddling Furnace and in the Bessemer Converter. Dr. Percy, F.R.S.—On some Scientific Facts connected with the Manufacture of Iron, &c. R. Howson.—On Mechanical Puddling. T. W. Plum, Old Park, Salop.—On Improvements in Blast Furnace Water-Cooled Tuyeres. A. L. Steavenson.—On the Manufacture of Coke in relation to the Iron Trade of the North of England. Mr. Greenwell.—On the Geological Features of the Great Northern Coal Field. Chas. Wood.—On Four Years' Improvements in the Utilisation of Slag. F. Giesbers.—On the Removal of Phosphorus from the Materials used in Smelting Pig Iron under M. Stein's Patent. A. Thomas.—On the Latest Improvements in Belgian Merchant Rolls. William Walker.—On a New Machine for Drilling Ironstone. M. Gautier, C.E.—Results of Experiments with Cannon manufactured from Steel without Blows.

When we state that in addition to what we have mentioned, an exhibition of various objects connected with the Iron and Steel Trades will be held in the Wood Memorial Hall, it will be seen that the members of the Institute have plenty of work before them, and that the meeting is likely to be one of great interest and practical importance.

OUR ASTRONOMICAL COLUMN

THE OUTER SATELLITE OF MARS.—As a guide to those who may be examining the immediate vicinity of Mars, with the view to detecting the exterior satellite, an ephemeris of its positions from September 8 to 18, for 8h. 30m. and 11h. 0m. each evening is subjoined. It will enable an opinion to be formed as to the chance of any object glimpsed within ninety seconds' distance from the centre of the planet, being the satellite or not. The elements employed in the calculation are the following:—

Passage of Ascending Node, 1877, Aug. 11·7495 Greenwich M.T.

Longitude of the node	82° 48′
Inclination of orbit to ecliptic	25 24
Daily motion in orbit	285 26·928
Logarithm of the radius of orbit in seconds, at the mean distance of Mars from the sun	1·32795

The angles of position in the ephemeris are reckoned as in double-star measures—

		At 8h. 30m. P.M.		At 11h. 0m. P.M.	
		Pos.	Dist.	Pos.	Dist.
		°	″	°	″
Sept.	8	82	76	71	85
,,	9	199	30	125	40
,,	10	251	85	240	74
,,	11	298	37	269	65
,,	12	60	73	40	46
,,	13	89	66	76	83
,,	14	218	44	149	28
,,	15	256	82	246	79
,,	16	325	28	277	53
,,	17	65	77	50	56
,,	18	96	54	81	76

The apparent diameter of Mars according to Kaiser's measures is 25″·0 on the 8th and 24″·0 on the 18th.

M. Leverrier characterises Prof. Asaph Hall's discovery of the satellites of Mars as "une des plus importantes observations de l'astronomie moderne." It is in the highest degree an honour to American science. The magnificent instrument with which they have been detected, a masterpiece of mechanical skill, is of American construction, and we think every astronomer must admit that since it was mounted at the Naval Observatory, Washington, the national astronomical institution, admirable discernment has been shown in the selection of a class of observations upon which its extraordinary optical power could be brought to bear with the greatest advantage in the actual state of the science. Already our knowledge of the motions of the four satellites of Uranus and of the satellite of Neptune has been greatly advanced, and tables to facilitate the calculation of their positions have been skilfully prepared by Prof. Newcomb, with the aid of measures made with this instrument. The period of rotation of Saturn has been determined, and a series of observations of all the eight satellites of this planet has been vigorously prosecuted, which must soon allow of a much more intimate acquaintance with their motions than we yet possess. The notable discovery of two satellites of Mars is a fitting achievement in the same interesting branch of astronomy.

In striking illustration of the truth of the assertion of Sir W. Herschel, that when a very faint object has been once discovered with a large telescope, it may be seen with a much smaller one, we receive, since the above was written, a communication from Mr. Wentworth Erck, of Sherrington, Bray, dated September 8, in which he writes: "The outer satellite has been seen here three times; 1st, on September 2, at 22h. 40m. G.S.T., when the position was about 290°, and distance from limb something less than three diameters of the planet; 2nd, on September 3, at 23h. 0m. G.S.T., when the position was 64°; this position is pretty accurate; on this occasion I watched the satellite for two hours, during which I saw it move from 64° to 55°; at the latter position its distance from limb was equal to two diameters of the planet; 3rd, on September 8, at 22h. 35m. G.S.T., when the position was about 78°. It was steadily visible with 7-inches aperture on my Alvan Clark, and was, I should say, something brighter than Enceladus, the second satellite of Saturn."

On comparing these observations with positions calculated from the above elements (which closely represent the Paris observation of August 27), it is evident the object observed on September 2 was a star, the satellite at the time being on an angle of 325°, and only fifteen seconds from the limb, but it appears beyond doubt that

Mr. Erck observed the outer satellite on the following night, when the position at the time named would be 65°, distance from centre of planet seventy-nine seconds, and two hours later the angle would have diminished to 53°, and the distance to sixty-one seconds, or roughly two diameters from the planet's limb as observed. On September 8 the angle was 71°, distance eighty-five seconds, so that the satellite may have been seen again this evening. So far as we know these are the first observations of a satellite of Mars in these islands, and it is singular that they have been made with an instrument constructed by the same optician as the great Washington telescope with which the satellites were discovered.

In the elements of the satellites transferred to this column last week from the Washington Circular, for major and minor axes of the apparent orbit it is necessary to read semi-axes.

VARIABLE STARS. — The following are geocentric minima of Algol and S Cancri, which will be observable in this country during the last quarter of the present year. The epochs are in Greenwich time, and depend upon Prof. Schönfeld's elements.

ALGOL.

	h.	m.		h.	m.		h.	m.
Oct. 2 ...	15	19	Nov. 11 ...	18	42	Dec. 4 ...	17	14
,, 5 ...	12	8	,, 14 ...	15	31	,, 7 ...	14	3
,, 8 ...	8	57	,, 17 ...	12	20	,, 10 ...	10	52
,, 11 ...	5	45	,, 20 ...	9	9	,, 13 ...	7	41
,, 22 ...	17	0	,, 23 ...	5	58	,, 24 ...	18	57
,, 25 ...	13	49				,, 27 ...	15	46
,, 28 ...	10	38				,, 30 ...	12	36
,, 31 ..	7	27						

S CANCRI.

	h.	m.		h.	m.
Oct. 16 ...	13	27	Dec. 12 ...	11	6
Nov. 4 ...	12	40	,, 31 ...	10	20
,, 23 ...	11	53			

MINOR PLANETS.—On August 11 M. Borrelly detected a new planet, which, it may be presumed, is identical with one seen by Prof. Watson on the 8th, though not identified as a planet until the 16th; this will be No. 174. The latter astronomer has since announced the discovery of No. 175 on September 3, in R.A., 23h. 10m., N.P.D. 89° 15′, eleventh magnitude.

Of the small planets which come into opposition during the last quarter of 1877, Iris attains the greatest degree of brightness, her magnitude in the middle of November being a little higher than the seventh. This planet, from proximity to the earth, will afford a favourable opportunity of applying Prof. Galle's method of determining the solar parallax, and with the view of facilitating observations, an ephemeris from Prof. Brünnow's tables will be given in this column before the end of the present month. The rough ephemeris of the *Berliner Jahrbuch* is not sufficient for practical purposes.

NOTES

THE health of M. Leverrier is so far restored that he is daily expected at the Paris Observatory to resume his official duties. The glass of the large refractor has been put in position, after having undergone repairs, and will be tested again before being silvered. Bischofsheim's transit instrument is in use, and works admirably. The magnetic instruments are also in operation in the new grounds given by the municipality. Magnetical observations are also taken at Montsouris Observatory with similar instruments, and at a distance of two kilometres. Both establishments are satisfied with eye observations.

ON August 14 Denmark celebrated the centenary of one of her most eminent sons—Hans Christian Oersted, born August 14, 1777, known all over the world as the discoverer of the laws of electro-magnetism. It was in 1813 that Oersted first published his investigations.

AT the recent biennial meeting of the German Astronomical Society, which was held at Stockholm, the members received the news of the discovery of the two satellites of Mars with manifestations of grave doubts. The president at their request telegraphed to the Berlin Observatory, and in reply received a copy of the original telegram as it was sent from America. The next meeting of the Society is fixed to take place at Berlin in 1879.

WE have received the "Programme et Règlement" of the International Congress of the Medical Sciences, which commenced its fifth session at Genoa on Sunday and will conclude on Saturday. This programme contains a feature which we have not noticed before in connection with any similar congress. All the usual information as to meetings of various kinds, sectional proceedings, excursions, &c., is given in a well-arranged form. In addition to this, under each section is given along with the titles of the papers to be read, a summary of the conclusions come to by the author on each question treated. These summaries are sometimes of considerable length, and we cannot but think that it is an advantage both to speaker and to hearers that the latter are thus instructed and interested beforehand, and so able to follow intelligently a speaker's line of thought. Although the association is to meet during a whole week, there are only twenty-four papers in all to be read, thus allowing ample time for discussion.

THE inaugural address of the meeting of German naturalists at Munich on the 17st inst. will be delivered by Dr. von Pettenkofer. The following is the latest list of the general lectures announced: —Prof. Dr. Waldeyer (Strassburg), on C. E. von Baer and his influence upon the history of evolution; Prof. Dr. Ernst Haeckel (Jena), on the evolution theory of the present day in its relation to science in general; Prof. Dr. G. Tschermak (Vienna), on the early history of the terrestrial globe; Prof. Dr. Klebs (Prague), on the revolution in medicinal views during the last decades; Dr. G. Neumayer (Hamburg), on meteorology in daily life; Dr. R. Avé Lallemant (Lübeck), on animal life in the Amazon River; Prof. Dr. S. Günther (Ansbach), on the latest researches made on the mathematico-historical domain; Prof. von Virchow has not yet fixed his subject.

THE third annual conference of the Cryptogamic Society of Scotland will be held at Dunkeld during October 10, 11, and 12. The president is Col. H. M. Drummond Hay, C.M.Z.S., and the secretary Dr. F. Buchanan White, F.L.S., Perth. The business of the conference will consist mainly in excursions, *conversazioni*, and an exhibition of specimens. The Society is now prepared to issue a First Century of "Fungi Scotici Exsiccati," which will contain many of the new species and rarities recently discovered. The subscription price is 1*l.* 1*s.*

THE Munich Society of Antiquaries has resolved to hold yearly exhibitions after the manner of those of our South Kensington Museum. Each exhibition will be devoted to a different branch of industry. A commencement will be made with glass articles.

ALTHOUGH the late M. Thiers was not himself a man of science he was anxious to possess some knowledge of the several sciences in order to the writing of a work on philosophy on which he was engaged during a number of years. His teachers were chosen from amongst his brother academicians; M. Leverrier being his instructor in astronomy and M. Charles Saint Claire-Deville in chemistry. He began to write his work under Napoleon's rule, desisted when he resumed his political career, and worked it up again when he resigned his presidentship. It is not yet known whether it will be published in its present imperfect form. At the time of his death he was revising what had been written in order to bring it up to the level of new scientific discoveries. Although Thiers was more than eighty