M. Celoria remarks that possibly from the advanced age which Toscanelli had attained, and the inclement season at which the comet was visible, the Florentine astronomer has not left for the comet of 1472 a representation of its track relatively to the stars as he has done for those of 1433, 1449, and 1457, nor an ephemeris of positions as in the case of the comet of Halley at its appearance in 1456; but two pretty definite places are assigned in Toscanelli's manuscript for January 9 and 17, and with the help of provisional elements a third position for January 22 is deducible. Still, in determining the most probable orbit, M. Celoria has found it desirable to utilise the one definite observation on January 20 which has been left by Regiomontanus. The principal available data are :—

Paris Mean Time	Comet's Longitude	Comet's Latitude
	° ′	° ′
January 9·6326	193 0	+13 0
17·6007	190 20	26 30
20·4021	185 12	46 3
22·2347	110 30	+80 32

Two orbits result from the discussion of these positions, and M. Celoria concludes that it is difficult to decide which is preferable. These orbits are as follows :—

	Orbit II.	Orbit III.
Perihelion passage } Paris mean time }	1472, Feb. 29·89097 ...	Feb. 29.94555
	° ′ ″	° ′ ″
Longitude of perihelion ...	39 14 56 ...	39 46 27
,, ascending node	296 7 49 ...	285 53 25
Inclination ...	14 11 46 ...	9 9 54
Log. perihelion distance	9·68072 ...	9·68654

Motion—Retrograde.

Both sets of elements have the degree of precision compatible with the nature and number of the observations, and beyond doubt afford a closer approximation to the true orbit than either of the previous computations. Perhaps we may attach a slightly greater weight to M. Celoria's orbit II., from which it appears that the nearest approach to the earth took place at midnight on January 22, when the comet in right ascension 293°·5 and declination +76°·6 was distant 0·0652, with an apparent motion of 40° of a great circle daily. On this day Toscanelli refers to the interference of moonlight, and it appears certain that the presence of the moon must have greatly diminished the imposing aspect of such a comet while in the earth's vicinity. In fact we find that the moon was at the first quarter on January 18, and consequently at full soon after the nearest approach of the comet, when the theoretical intensity of light was one hundred times greater than at the end of the first week in January.

One of the European chronicles dates the first appearance of the comet on December 25, 1471, when it will be found from elements (II.) that it was in right ascension 194°·4, declination + 5°·5 at 6 a.m. in London; intensity of light, 0·38. In a quaint description of the comet's track by John Warkworth, Master of St. Peter's College, Cambridge, and a contemporary, which was published in the *Philos. Mag. and Journal of Science*, vol. xiv. (1839), we read: "And some men saide that this sterre was seen ii or iii oures afore the Sunne rysynge in Decembre iijj days before Chrystynmasse in the Southwest . . . ;" calculating for 6 a.m. on December 21 we find the comet was in right ascension 193°·8, declination + 5°·2: it would consequently be near the meridian two hours or so before sun-rise, instead of the western quarter of the sky. It is clear that as regards position it might have been found three weeks earlier than Toscanelli's first observation. Warkworth says the comet disappeared on February 22. The Chinese saw it on February 17 approaching one of their constellations composed of α, δ, &c., in Pisces, and it is added in Biot's translation "elle fut longtemps à s'effacer;" calculation gives the place in right ascension 11°·9, declination +0°·7, intensity of light 3·3, in the early evening at Pekin on that date.

M. Celoria's notice contains the geocentric track of the comet, according to both sets of elements, from January 9 to February 27. There is some reference in Pingré to a comet at the beginning of May, 1472, when the comet of Regiomontanus and Toscanelli would rise in Central Europe before 2 a.m., with an intensity of light about equal to that it possessed at the previous Christmas.

ASTRONOMICAL PHENOMENA FOR THE WEEK, 1885, JULY 12–18

(For the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on July 12

Sun rises, 3h. 59m.; souths, 12h. 5m. 20·7s.; sets, 20h. 11m.; decl. on meridian, 21° 56′ N.: Sidereal Time at Sunset, 15h. 35m.

Moon (New on July 12) rises, 4h. 31m.; souths, 12h. 20m.; sets, 20h. 2m.; decl. on meridian, 16° 47′ N.

Planet	Rises	Souths	Sets	Decl. on meridian
	h. m.	h. m.	h. m.	° ′
Mercury ...	5 18 ...	13 14 ...	21 10 ...	20 23 N.
Venus ...	5 35 ...	13 25 ...	21 15 ...	19 30 N.
Mars ...	1 28 ...	9 40 ...	17 52 ...	22 54 N.
Jupiter ...	8 5 ...	15 4 ...	22 3 ...	10 52 N.
Saturn ...	2 32 ...	10 42 ...	18 52 ...	22 32 N.

Occultation of Star by the Moon

July	Star	Mag.	Disap.	Reap.	Corresponding angles from vertex to right for inverted image
			h. m.	h. m.	° °
18 ...	*m* Virginis	... 6 ...	10 10 ...	10 27 ...	184 215

Phenomena of Jupiter's Satellites

July	h. m.		July	h. m.	
13 ...	20 50	II. occ. disap.	15 ...	21 15	I. tr. egr.
14 ...	21 38	I. occ. disap.			

The Occultations of Stars and Phenomena of Jupiter's Satellites are such as are visible at Greenwich.

July	h.	
13 ...	12 ...	Mercury in conjunction with and 5° 39′ north of the Moon.
13 ...	15 ...	Venus in conjunction with and 5° 22 north of the Moon.
15 ...	7 ...	Jupiter in conjunction with and 3° 7′ north of the Moon.
17 ...	14 ...	Mercury in conjunction with and 0° 11′ south of Venus.

GEOGRAPHICAL NOTES

Dr. Gottsche, formerly a professor in the University of Tokio, has, as we have already intimated, returned to Europe after a long journey in Korea, during which he acquired much information with regard to that country. The length of his journey was over two thousand miles, and he visited all the eight provinces of Korea, as well as 84 out of the 350 districts. The main object of Dr. Gottsche's explorations was to ascertain whether coal and other useful minerals existed in the country; but, on account of influential support which he received he was able to obtain from the native authorities information with regard to the population, taxation, harvests, trade, &c. He has also collected much statistical information which is wholly new and which it is expected will show that the recent English consular reports are quite incorrect. Amongst others the population of the peninsula has been greatly underrated. It has generally been put down at nine millions, whereas it really is over twelve millions, for the official census from which the former estimate is taken only takes into account adults. Dr. Gottsche's principal stations on the journey were Söul, Ichhön, Kwisan, Mangyöng, Kyöngyn, Pusan, Changwön, Cwangyn, Chinsan, &c. He was 138 days *en route*, and, although this was not rapid, he was compelled to neglect some branches of investigation, such as botany and zoology, for his main business was with geology. In this respect Korea appears to belong to the bordering Manchuria. He found but few traces of the high development which the art and science of the country reached in early ages, and which made it the instructress of Japan. Dr. Gottsche, it is said, intends publishing an account of his journey.

Prof. Blumentritt, in an article in *Globus* on the Negritos of the Philippines, points out that the notion which was general at one time that these aborigines of the Archipelago were almost extinct, or absorbed into the Malay population, is an error. It may be said with certainty that they no longer exist in the Babiuyanes, Batanes, and other groups lying to the north of Luzon: but we know too little of the interior of Sámar and

Leyte, as well as of the great island of Mindoro, to say this. We know from Montano's explorations that they live in great numbers in Mindanao and elsewhere; but nevertheless. the *Negrito puro* sooner or later adopts the dress and customs of his Malay conqueror. All the efforts of the Spanish Government and of the Catholic missionaries tend to efface the peculiarities of the Negrito; and the Professor therefore states that, before it is too late, some scientific traveller should visit Mindanao to study the Atás and Mamanuas thoroughly; likewise an investigation of the Negritos of Panay and Negros is much to be desired.

M. LE MONNIER contributes to the last number of the *Deutsche Rundschau für Geographie*, &c., an article on the Island of Hainan, off the coast of China, to which some attention was recently directed on account of the rumoured occupation of it by the French. It has been known to the Chinese since 110 B.C., but it was not till the 13th century that it received its present name. From the earliest times to the present the aborigines, the Li, who inhabit the mountains in the centre, have maintained a struggle against the Chinese. It is even less known than Formosa, for no Europeans have travelled in it. One port, Kiungchow, has recently been opened to foreign trade, the north and south coasts have been surveyed, but there is no survey of the east coast. As to size, it is a little smaller than Formosa, and is larger than either Sicily or Sardinia. The centre is exceedingly mountainous, and from it rivers radiate in all directions to the sea. It is so near the mainland that its flora and fauna are in all respects continental. The direction of the mountain system is from south-west to north-east. Volcanoes have been examined there, but they appear to be now extinct. Earthquakes are frequent. As in Formosa, the population consists of three elements—the Chinese, the subjugated and the independent natives. Amongst the former are the Miaotsze, who have crossed over the narrow strait from time to time from Kwangsi and We tern Kwangtung, and have taken possession of some of the smaller hills. Their language is said to be similar to that of the Li; they are good husbandmen, and are on friendly terms with both the Li and the Chinese. The independent Li appear to be an aboriginal race which has been driven back to the hills by the Chinese immigrants. Information with regard to them is very scanty, but they appear to have a reddish skin and to be of small stature; their language resembles that of the Miaotsze of the mainland. The women are tattooed after their marriage, and they paint their faces with indigo. The Li are expert hunters and shots; the weapons are bamboo bows and arrows and a short sword in a sheath. The main sources of information with regard to Hainan are a paper by the late Mr. Mayers in the *Journal* of the North China Asiatic Society (No. vii., 1873); one by Mr. Swinhoe, entitled "Narrative of an Exploring Visit to Hainan," in the same periodical (No. vii., 1871–2); and a map of the Kwangtung Province, and other publications by Dr. F. Hirth.

HERR GLASER, the Arabian traveller, has returned to Arabia to resume his explorations. This second journey is to be mainly geographical, but archæology will also receive attention. Besides visits to Marib and Nejdran, Herr Glaser contemplates a long journey through the interior from Hadramant to Omaun, and a second across South Arabia.

M. BAUX, member of the Geographical Society of Paris, has been despatched on an ethnographical mission to China; and M. Guerné proceeds to Kiel to take part in the labours of the commission for the scientific examination of the German coasts. These missions are undertaken by direction of the Minister of Public Instruction of France.

PROF. SEELSTRANG, of the University of Cordoba, has been appointed by the Argentine Government to superintend the publication of an atlas of the Republic, and a considerable sum has been appropriated for the work. It is to consist of twenty-seven parts, and four of these are already in hand.

AT the last meeting of the Geographical Society of Paris, M. Alphonse Milne-Edwards in the chair, M. de Saint-Pol-Lias, who is now in Cochin China, presented a map of the upper course of the Red River, prepared by the Annamites. Another map of importance is that of the navigable water-ways of southern Indo-China, prepared by M. Rueff, who has established a company for navigating these waters. A letter was read from Jeddah stating that the collections of the unfortunate M. Huber, including his remarkable examples of Semitic epigraphy, were safe in the hands of the French Consul, and that the explorer's remains were buried in Jeddah on May 27.

THE last number (Band viii. Heft 2) of the *Geographische Blätter*, published by the Bremen Geographical Society, contains a study on the Congo region by Dr. Oppel, dealing with the scientific and economieal importance of this district. The paper is divided into two main sections: (1) The discovery and investigation of the Congo (*a*) between 1484 and 1872, (*b*) the systematic exploration since 1872; (2) The extent and boundaries, geology, &c., of the Congo region. Prof. Seelstrang writes on the Argentine province of Buenos Ayres, its geography, fauna, flora, climate, inhabitants, trade, industry, &c., in short, a kind of encyclopædic article on the province. Another paper on South American geography, or rather geology, is that by Dr. von Thering on the Lagoa dos Patos, in the province of Rio Grande do Sul, the largest lake in Brazil. This is accompanied by a map of the extent of the sea in the province at the beginning of the alluvial epoch. Herr Zöller writes on the Batanga River; the number also contains a report of the late *Geographen-tag* at Hamburg.

ON A RADIANT ENERGY RECORDER

SUNSHINE-RECORDERS may be divided into two classes, viz., those which roughly measure solar energy by the burning of card and wood, and those which, by means of some photographic process, yield a record of the relative intensity of some more or less definite ray. The principle of the instrument which I am about to describe differs from those referred to in this respect—that it depends upon the evaporation of water *in vacuo*, and its indications are therefore readily expressible in heat-units.

The form of instrument with which I have sought to test the applicability of the method consists of a Wollaston's cryophorus (of the form pictured in Ganot's "Physics," p. 272, edition 1872), in which the vertical tube and lower bulb are replaced by a simple glass tube graduated in cubic centimetres. The bulb containing the water to be evaporated is blackened by holding it in the smoke of burning camphor, and is then exposed to the sun, the rest of the apparatus being silvered or properly protected by bright sheets of tin. At sunset the quantity of water which has distilled over can be read off on the graduated tube.

An experiment on June 6 showed 1·8 cc. to have passed over from a bulb of about 2 inches in diameter, and to have condensed in a narrow measuring tube between the hours of 10.40 and 3.20. The instrument seems very sensitive, and may well find many applications. In a suitable form of instrument the total nett solar energy gained by the blackened absorbing surface will be almost exactly represented in heat-units by multiplying the number of cubic centimetres of water distilled by the latent heat of steam. To measure the loss of the earth's radiation at night a similar instrument containing alcohol or some other liquid of low freezing-point might be employed. In either case, when a continuous time record is required, the graduated tube might be used as a cylindrical lens to condense light on photographic paper.

The following are the more important conditions which the apparatus in a future form should probably fulfil:—

(1) To present a constant and known absorbing surface to the sun.

(2) To preserve a constant surface for evaporation which should be the same in the condenser, so that a reversal of the direction of distillation can take place under the same conditions when the black bulb is losing energy.

(3) To give rise to the minimum of reflection and convection currents on the absorbing surface.

(4) The apparatus should be so screened as to be at the temperature of the air apart from the gain of energy at the blackened surface.

Some of these conditions seem likely to be more or less fulfilled in an apparatus consisting of two glass bulbs of equal diameter connected together by a tube bent through an angle of about 150°, to bring the bulbs near together, and thus keep them in air of the same temperature. In the bulb containing the water to be evaporated, a black bulb might be fixed to absorb the solar radiation, whilst to the upper part of the second bulb should be sealed a graduated tube in which the distilled water might be measured by inclining the instrument. If metal globes were employed the connecting tube might be made to form the beam of a balance.