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.

The completion of other work will prevent my return to this subject at present—perhaps altogether—but I have ventured to publish this incomplete account of an apparently promising method for the measurement of solar radiation, in the hope that it may be of use and interest to others.

University College, Liverpool. J. W. CLARK

P.S.—It may perhaps be found advantageous to use an apparatus like an inverted cryophorus, in which the absorbed radiant energy generates a vapour-pressure, and is made to lift a column of water in the tube—the height of the column and the time being registered photographically.

THE GROWTH OF CEREALS

PERHAPS nowhere is the influence of the different climatic factors on the rapidity of growth so well illustrated as on the plains of Russia. Therefore W. Kowalewski's careful researches into this subject, summarised in the *Memoirs* of the St. Petersburgh Society of Naturalists (xv. 1), are especially worthy of attention. The author has gathered all necessary information for showing the periods of growth of various cereals on the soil of Russia, from the far north of Arkhangelsk, to the southern province of Kherson, and he has arrived at most interesting results, of which the following is a summary. If the periods of growth of the same cereal be taken throughout Russia, it appears that, altogether, it is in the higher latitudes that it ripens fastest. Oats and spring wheat take 123 days and barley 110 days to ripen about Kherson, and only 98, 88, and 98 days at Arkhangelsk, the difference in favour of the north being respectively thus: 25, 35, and 12 days. The intermediate regions show also intermediate differences, while for each latitude the growth of cereals proceeds faster in the eastern parts of Russia than in the western. It is obvious that if the rapidity of growth were due to temperature, the phenomena would be the reverse of what they are. Moreover, the want of moisture in the southern steppes is also a condition in favour of the rapidity of growth: so that it is in the insolation that we must seek for the cause of the above-stated difference. In fact, oats being usually sown about May 17 at Arkhangelsk, and the harvest usually occurring about Sept. 1, the insolation continues there for 2000 hours in 98 days, not to speak of the 240 hours of bright nights; while at Kherson, during 123 days (from April 1 to Aug. 1) the insolation lasts only for 1850 hours. The difference in favour of Arkhangelsk is thus equal to 150 hours (to 400 hours, if the bright nights be added), and it compensates for the influence of temperature. It is useless to add, moreover, that the cereals cultivated in the north have already undergone a certain accommodation to their conditions. As to the intensity of light, Prof. Famintzin's work on the subject, corroborated by ulterior researches, shows that the great intensity of light in Southern Russia, combined with the great transparency of the atmosphere, is rather a condition against the rapidity of growth, the intensity of light exceeding the limits of the maximum of decomposition of carbonic acid. Winter rye shows the same differences as the spring cereals. It appears from M. Kowalewski's tables that in the Arkhangelsk district winter rye takes 375 days to arrive at ripeness, of which there are 202 days of winter rest, 68 days of autumn growth, and 105 days of spring and summer growth, making thus a total of 173 days of growth. At Kherson the total growth lasts for 290 days, of which only 101 days of winter rest and 189 days of productive growth (63 during the autumn and 126 during the summer). The difference reaches thus 16 days in favour of the north, and it would rise to 20 or 25 days if only spring and summer be taken into account. The graphical representation of all these data is most interesting. Thus the lines of simultaneous sowing of winter rye from north-west to south-east correspond to the isochimenes, while the lines of simultaneous ripening of the spring cereals—oats, barley, sarrazin, wheat—run from south-west to north-east, corresponding to the lines of equal summer temperatures. The retarding influence of rain comes out also pretty well.

THE ROYAL SOCIETY OF NEW SOUTH WALES

THE annual general meeting of the members of the Royal Society of New South Wales was held on May 7. The president, Mr. H. C. Russell, B.A., F.R.A.S., occupied the chair, and delivered an address, from which we give the following extracts:—

"There is a very general impression, borne out by the evidence which geology has furnished, that at least the east coast, if not all Australia, is rising in relation to the mean level of the sea. The late Rev. W. B. Clarke, in a report to the Port Jackson Harbour Commission, said 'that the coast has risen in former geological epochs, and that it has risen during the present epoch is capable of distinct proof.' 'Raised beaches of shells, which are not kitchen middens, may be seen about twenty-five feet above the sea, near Ryde, on the Paramatta estuary, and at Mossman's Bay, in Port Jackson, at a height of 132 feet above high-water.' Again, 'regarding the whole coast from Broken Bay to Botany Bay as mere peninsulatic fragments, united only by low isthmuses, bare or covered with sand, as they actually are, one may still see that there must have been oscillations of level, and finally elevation.' Speaking of other portions of the coast, Mr. Clarke says:—'At Adelaide in 1855 the railway between the city and the port was being constructed, and Mr. Babbage has since shown that in four years a difference of four inches of rise between the levels of those places has taken place.' And again, 'according to Mr. Ellery, the accomplished and accurate Williamstown observer, the self-registering tide-gauge at that place indicated a rise of the bottom of Hobson's Bay of four inches in twelve months, and a deposit of recent shells and imbedded bones of sheep and bullocks which had been thrown into the bay is now seen at a level above the reach of the sides.' Again, quoting from a letter by the late Mr. John Kent, of Brisbane:—'A survey was made of a shelf of rocks in Brisbane River in 1842 by Captain Gilmore, Mr. Petrie, and myself, and in making a re-survey in 1858 Mr. Roberts found the relative depths were singularly correct, but that the general depth of water over the shelf of rock had decreased eighteen inches in sixteen years since the first survey was made.' Sir Roderick Murchison, in the *Proceedings* of the Royal Geographical Society of London (vol. vii. p. 42) quotes from a letter he had received from the late Mr. Kent, of Brisbane:—'I have lately drawn the attention of the Rev. W. B. Clarke to the fact that the eastern coast of New Holland is rising at the rate of (say) one inch per annum, as ascertained by the height of rocks in the river Brisbane above tide levels, through a period of twenty years, and he assures me that to the south the same result has been inferred, though the observations have not extended over so long a period. At what rate the rise is now going on there are no data to establish. Till a series of mean tidal levels are marked on the rocks of the harbour, and the alteration made as distinct as that in Hobson's Bay, any deduction as to the rate of rise must be conjectural and unreliable.' I have but taken a few extracts from a great mass of evidence which Mr. Clarke brought forward in proof of the rapid elevation of the coast of Australia. I was deeply interested in this report when it was published in 1866, and as soon as I had opportunity determined to make such observations with a self-registering tide-gauge as would determine the rate of rise, if any, and in collecting information bearing upon this subject during the past thirteen years. I wrote to Mr. Ellery and asked him for further particulars of the rise going on in Victoria, and in reply he said that Mr. Clarke had in some way misunderstood his remarks, which had reference to the silting up of the harbour, not the elevation of the land; and he at the same time sent me a copy of his paper on 'The Tidal datum of Hobson's Bay,' read before the Royal Society of Victoria, August 14, 1879. After giving the history of the tide-gauge, which was started in 1858 under the Harbour Department, and was not under his control till 1874, Mr. Ellery says:—'It is to be regretted that no precise references to mean tide level in the earlier days can be found. Where measurements do exist in Hobson's Bay they are lacking in accurate information as to the state of the tides, and I find nothing trustworthy upon which to base any statements as to change of sea level since surveys have been made. I think it desirable that permanent bench marks on the natural faces of the rock *in situ* should be established around our bay, carefully connected by accurate levelling with one another and with the tide-gauge, for it is very doubtful if bench marks on buildings can be assumed to afford a permanent datum.' The first self-registering tide-gauge in Sydney was erected on Fort Denison by the late Mr. Smalley in 1867. Unfortunately the design was so faulty that all the records of the heights of tides made by it are of no value, although the times of high and low water are correct. The reason for this fault in its records was that an ordinary hempen cord was used