berich's computations, will soon commence to decrease in brightness.

Berlin, Midnight.

1892–93.	R.A. h. m. s.	Decl. ° ′	Log *r*.	Log Δ.	Br.
Dec. 30	15 57 15	58 31·0			
31	16 16 30	60 21·3	0·0820	9·8589	7·66
Jan. 1	16 38 18	62 1·9			
2	17 2 46	63 29·7	0·0812	9·8530	7·89
3	17 29 49	64 41·7			
4	17 59 0	65 34·5	0·0807	9·8521	7·95
5	18 29 40	66 5·4			

COMET HOLMES (NOVEMBER 6, 1892).—The following is a continuation of the ephemeris of this comet for the present week :—

Berlin, Midnight.

1892–3.	R.A. (app.). h. m. s.	Decl. (app.). ° ′	Log *r*.	Log Δ.
Dec. 30	1 2 22	+33 59·5		
31	3 24	57·2		
Jan. 1	4 27	55·1	0·4096	0·3284
2	5 31	53·1		
3	6 36	51·3		
4	7 42	49·6		
5	1 8 50	33 47·9	0·4119	0·3400

THE MARKINGS ON MARS.—In No. 25 of the Publications of the Astronomical Society of the Pacific, Mr. Schaeberle has a preliminary note on the question as to whether the darker and the brighter areas on Mars are water and land or *vice versâ*. Having observed the planet from June 11 up to the present time he has been led to the conclusion opposite to that of Schiaparelli, Flammarion, and other observers, and considers that after all the dark portions should be considered as land and the bright as water. In raising such a question as this Mr. Schaeberle has been very reserved, for should his opinion receive due attention, as of course it should do, and be corroborated, the planet's surface will be looked upon in quite a different light than formerly. In this note he sets forth a few of his reasons for coming to such a conclusion, and it may interest many of our readers if we state some of them briefly. If the dark markings be taken as land, would not the irregular gradations of shade be more naturally expected than if we consider them as fixed surface features? "Light reflected from a spherical surface of water in a slight state of agitation would vary uniformly in intensity. At opposition, the centre of the planet would, for a water surface, appear brightest. Observations show that within a certain distance from the edge of Mars there is a gradual increase in the steady lustre of the brighter areas towards the centre of the planet." Assuming these dark areas to be water, then they should thus be least dark near the centre, which is somewhat contrary to observation. With reference to the "canals," he says that they on this hypothesis "correspond to the ridges of mountains which are almost wholly immersed in water," while with regard to their observed doubling he remarks that they can be explained as "representing parallel ridges of which our own earth furnishes examples." As a concluding argument he takes an observed terrestrial observation, the view of the lower end of San Francisco Bay from Mount Hamilton, San Francisco being fifty miles away. At all hours of the day, he says, "the surface of San Francisco Bay (as seen from the top of Mount Hamilton) is much *brighter* than the neighbouring valley and mountains at the same distance." He further adds that the line of sight makes an angle of more than 87° with the normal to the surface of the bay, while the observer's position "varies all the way from being nearly in a direct line between the bay and the sun to the position in which the sun is nearly in the direction of the bay."

THE LICK OBSERVATORY.—Miss Milicent W. Shinn is the writer of a very interesting pamphlet on the history of the Lick Astronomical Department of the University of California. In these few pages she brings together much with regard to the early events connected with the founding of the giant refractor that is not generally known. For instance, it is curious to read how Mr. Lick wished to be immortalized by leaving bequests for costly statues of himself and his family, and when urging that such statues would be preserved for all time, was answered by Mr. Staples that "more likely we shall get into a war with Russia or somebody, and they will come round here with warships and smash the statues to pieces in bombarding the city." Mr. Lick was so struck by this, that he asked, "What shall I do with the money, then?" How this question was answered is now well known, and astronomical science was presented with the finest object-glass that was ever made.

Mr. Lick's deed prescribed that the Observatory should be "made useful in promoting science," and up to the present these words have been carried out to the letter. The big telescope has not been preserved for one side of astronomical science, but has dived into all branches, as every astronomer is aware Not only have minute double stars been observed and measured, but the spectroscope has been employed, from which excellent results have been published, while lunar photographs, equalling, if not excelling, those that had been previously obtained, have brought to light much to set us thinking about. Jupiter's fifth moon is perhaps the latest arrival of which we have heard, and this, following just 300 years after Galileo's discovery, would alone render the Observatory famous. That the Lick Astronomical Department, during the few years of its existence, has done an immense amount of good work, especially when one takes into account the comparatively small staff on hand, cannot be denied, and we hope the day will come when the number of such telescopes will be increased, for the ever-opening fields of research point out how necessary they are.

WASHINGTON MAGNETIC OBSERVATIONS.—The United States Naval Observatory has quite recently published their magnetic observations that were made during the past year, prepared on the same plan as that for 1889–90. The observations for 1891, as Mr. Hoogewerff (who was in charge for the greater part of the year) informs us, are better than those of former years, owing to the fact that the reductions took place at no very distant dates from the observations, the experience thus gained helping to correct and guard against conditions which might have tended to give rise to errors. The introduction contains a description of the buildings, methods of observing, together with the personnel during the year, concluding with a description of the tabular results. The tabular results, as usual, show the mean hourly readings for the elements for each month, Table I. containing the mean values for the four years 1888–91.

Simultaneous with this volume was also issued the meteorological observations and results for the year 1888.

GEOGRAPHICAL NOTES.

A SPECIAL number of the *Mouvement Géographique* is devoted to a series of important despatches from M. Alexandre Delcommune, chief of the Lomami expedition of the Katanga Company. Entering the Lomami from the Congo, the party left the river on May 13, 1891, and explored the entirely untraversed territory between its upper valley river and that of the Sankuru as far as 8° S. Thence they turned eastward and reached Lake Kassali on the Lualaba, and struck south through Garenganze's country to Bunkeia. Making a circuit through Katanga and westward, they found the Lualaba near its source, and following it for 200 kilometres, discovered a grand gorge at Nzole, where the river flowed in a succession of wild cataracts between cliffs nearly a thousand feet high, and not more than forty yards apart. From the rapids they returned to Bunkeia, travelled north-eastward over the plateau, crossing the Luapula at its outflow from Lake Moero, and ultimately reached Lake Tanganyika. The difficulties overcome were very great, and the sufferings of the caravan have rarely been surpassed even in the grimmest records of African travel.

AMONGST the English travellers who have recently arrived in London are Mr. Selous, the famous South African hunter, and Mr. Conway, who has probably climbed higher than any other European in the Karakoram range. Both gentlemen will read papers to the Royal Geographical Society early next year.

THE arrangements for the Royal Geographical Society's evening meetings after Christmas are unusually varied. Mr. Hose will describe his journey up the Burram river in Sarawak to Mount Dulit, at the first meeting in January. The second meeting will be devoted to the Island of Yezo, when Prof. Milne and Mr. Savage Landor will read papers. Papers by Captain Bower and the American traveller, Mr. Rockhill, on Tibet, will be given later; and Lieutenant Peary will personally describe

his experiences in the north of Greenland. In March Prof. Bonny will lecture on the action of ice in producing geographical forms, and there will be other papers dealing with the scientific basis of geography.

THE death of Cardinal Lavigerie on November 24 removed one of the most powerful personages who have recently influenced the geography of Africa. It is very largely on account of his labours that the French Roman Catholic missions have played so conspicuous a part in combating the slave trade, and to him also is due the formation of a much-needed Belgian Anti-slavery Society.

THE British Government having decided to relieve the East African Company from the responsibility of occupying Uganda, an Imperial commission, under the charge of Sir Gerald Portal, will set out from Mombasa as soon as it can be got ready to take over the administration of the country. Another fact of some interest is the revival by Mr. Cecil Rhodes of the idea of exploring Africa by telegraph. He proposes to lay down a line from the Cape to Uganda, and ultimately to extend it to Egypt. In a few months the South African Company's wires will have reached the mission station of Blantyre north of the Zambesi, and there are no serious physical difficulties in continuing the line to the head-waters of the Nile. The effect on the exploration of Africa will be enormous, not the least important result being the possibility of arriving at the true longitudes of places in the interior of the continent.

DEW AND FROST.

A PAMPHLET recording some interesting "Observations on Dew and Frost," by the Hon. R. Russell, has just been published by Mr. Edward Stanford. We reprint Mr. Russell's "Summary of Results" :—

The observations were begun with the object of verifying the commonly received theory of dew, and with a strong feeling that the results obtained by Col. Badgeley, described in the *Proceedings of the Royal Meteorological Society* for April, 1891, opposed as they were in some measure to the accepted teaching on the subject, would not be corroborated. When, after exposing inverted glass tumblers and pans on grass and bare earth in the summer of 1891, dew was often found in surprising amount in the interior, I attributed the deposit to vaporous air which might have entered under the rim and parted with its moisture in the calm of the inclosed space. But when it was found that a tumbler pressed down into dry earth, and other vessels admitting little air from outside, were considerably bedewed in the interior ; and when, further, similar vessels inverted on earthenware or metal plates were found to be very slightly or not at all bedewed inside, it became more probable that the vapour condensed in the interior of vessels over grass and garden earth had proceeded from the earth beneath. Next, it was found that china plates, admitting a flow of air between their lower surfaces and the ground, were more heavily bedewed on their lower than on their upper surfaces, and that a cylinder of glass was most bedewed on the lower outer and upper inner surfaces. These observations confirmed the suspicion that the dew on the inside of the hollow vessels was derived from the ground. It was for a long time a matter of doubt and difficulty that vessels inverted over dry, dusty earth and dry turf were found copiously bedewed within on the morning following exposure. On many mornings the amount of dew in the interior increased in some proportion to the precautions taken to exclude free air, and it seemed highly improbable that moist air penetrated, without depositing on its way much of its moisture, either through the dusty earth banked round the edges of the vessel, and exposed to the sky, or else through the dusty covering of earth below the vessel from lower layers.

In December, 1891, during hard frost and very fine weather, with calm or very light airs, the ground being frozen hard, leaves of bushes, ferns, &c., were seen to be frosted both on their upper and lower sides, though much less on the lower sides facing the bare ground than on the upper sides facing the open sky. Where thick fern grew between the observed leaves and the ground, there was no rime on the lower sides of the overhanging ferns or leaves. This seemed to show that the rime on the lower sides of ferns was due to exhalation from the ground, for the interruption of radiant heat from the earth by dry litter would rather favour than reduce the frosting of the under sides. Live leaves on bushes, and dead leaves on the ground, were whitened with frost on their upper sides, and had a thin film or coat of transparent ice on their lower sides. Leaves and sticks on the ground were less frosted on the sides facing the ground than on the top. Thick planks between a few inches and one foot above the ground were about a third as much frosted on the lower as on the upper sides. Considering that the upper side of a plank 1 inch thick would fall to a considerably lower temperature by radiation than the lower side, it may be supposed that the deposition would have been largest on the lower side if they had been at the same temperature. That much frost came from the air independently of the ground, was shown by the white roofs 12 feet above the surface of the earth. On the other hand the grass was much more heavily frosted. Moreover, tumblers inverted and pressed down on dry, hard, bare earth, on sand, and on hard turf, were moderately frosted inside, besides being thickly frosted outside. The indications, on the whole, seemed to resemble those of the previous June, but the vapour condensation attributable to exhalation from the earth bore a much smaller proportion to the total deposit than in the case of dew on interior surfaces observed in summer

Boards, tiles, and stones (sandstone) in heaps were frosted on the top, and especially in cracks and indentations of the top surface, but not in the interstices between the separate pieces. Stones on the ground were sometimes not frosted at all on the top, but much on the parts against the sandy earth, and where bedded in the ground.

Further experiments in May and in the summer months of 1892 gave strong confirmation of the evidence that much dew and frost are caused by exhalation of vapour from the earth, even in dry weather.

The facts that—

(1) A large quantity of dew was invariably found on clear nights in the interior of closed vessels over grass and sand.

(2) Very little or no dew was found in the interior of vessels inverted over plates on the ground.

(3) More dew was found on the lower side of a square, slightly raised, china plate over grass or sand than on the lower side of a similar plate placed upon the first.

(4) The lower sides of stones, slates, and paper on grass or sand, were much more dewed than the upper sides. The flat wooden back of the minimum thermometer on clear evenings when lying on earth, sand, or grass was almost invariably wet before the upper surface.

(5) The lower side of plates of glass, 1 or 2 in. above grass, were as much or more bedewed than the upper sides.

(6) Leaves of bushes, leaves lying on the ground, and blades of grass were about equally bedewed on both sides.

(7) The interior of closed vessels inverted on the grass and covered with two other inverted vessels of badly-conducting substance was thickly bedewed, and the grass in the three circular inclosures also thickly bedewed.

(8) The deposit of dew on the interior of closed vessels inverted over dry garden earth was much less than over sand or turf, although the powdery condition of the earth in the morning showed that no deposit from the air had taken place on its surface during the night.

(9) Usually a greater amount of dew was deposited in the interior of vessels when the earth was moist at a little depth below the surface than when the earth was at its driest.

(10) The temperature of the space under a glass plate or other object suspended near the surface of the ground was higher than that of the upper surface of the object, and, nevertheless, a cloudy film was produced first on the lower surface,—amounted to a proof that a large part of the dew formed is derived from vapour from the earth.

Moreover, the large difference often observed between the quantity of dew deposited in the interior of a vessel inclosing a plant, and the quantity of an empty vessel, proved that much dew may be derived from the earth through plants.

Drinking glasses inverted over grassy turf, and over turf close by, from which the grass was removed, showed a similar excess of deposit on the glasses inclosing grass. More vapour was condensed on plates suspended over grass than over bare earth. In these cases the conditions are somewhat artificial, and the grass, which was covered by a suspended plate or inclosed by a glass, would be warmer than if the exposure to the sky were free, but the disturbance thus caused would tell as much against as in favour of deposition on the interior surface. It may be objected that the air in and above the grass would be colder, owing to the radiating grass, than over the bared spot, and that