of address as would be literally appropriate only from children of the master of the house. Many have houses and farms of their own, giving a share of the crop to the master, who can, but rarely does, claim the whole of it. Slaves can use their earnings to buy their freedom if they can accumulate enough to do so, and they are frequently owners of other slaves. They generally make their own bargains for wages if they go out as porters or domestics, and reckon with their owner themselves. The condition of the slaves is much harder, however, among the Sakalavas, in the north-east part of the island, — a tribe hostile to the Hovas, and still pagans, by an alleged treaty with whom the French have acquired those 'rights' which they have for some years been vainly endeavoring to enforce upon the Hovas. With the latter, since their conversion to Christianity, a gradual and important amelioration has taken place in the matter of slave-holding, and the families of criminals are now no longer liable to be sold into a state of servitude.

ASTRONOMICAL NOTES.

The zodiacal light. — Professor Searle of Harvard college observatory, in a paper recently published, has continued his interesting investigations on the zodiacal light. This peculiar phenomenon is supposed to be due to finely divided matter of some kind illuminated either by direct sunlight or by the result of electrical or chemical action. This matter may be only a portion of the atmosphere or of some cosmical mass more or less homogeneous, but illumination is presumed to be confined within certain limits; and the difficult task of the observer has been to attempt to define these limits. As a result of the present inquiry, there would seem to be reason to think, that after allowing for atmospheric absorption, which probably affects the apparent position largely, the zodiacal light, as seen during the second half of the nineteenth century, has had a more northern latitude near the longitude 180° than near the longitude 0°. Furthermore, from a careful study of the distribution of the stars in the Durchmusterung, Professor Searle shows, that, "upon the meteoric theory of the zodiacal light, it is to be expected that a continuous zodiacal band should be present; but the question of its actual visibility is complicated by the slight maxima of stellar density which are situated along those parts of the ecliptic most readily accessible to observation from stations in the northern hemisphere." And finally, from an examination of the elements of the first 237 asteroids, it would seem that the belt of sky occupied by the projections of their orbits presents certain peculiarities which correspond to those of the zodiacal light, and suggest the hypothesis that the light may be partly due to minute objects circulating in orbits like those of the smaller planets.

U. S. naval observatory. — Vol. xxix. of the publications of the Naval observatory, now in press, will contain, in addition to the regular series of astronomical and meteorological observations for 1882, a valuable appendix by Professor Hall on the orbit of Iapetus, the outer satellite of Saturn; an appendix by Professor Harkness on the flexure of transit instruments; and a third appendix by Commander A. D. Brown, giving the observations of the partial solar eclipse of 1885 March 16, made at the observatory, and also observations made by several volunteer parties near the line where the annular phase was visible.

Lord Rosse's observatory, Birr castle. — We have recently received two papers communicated by the Earl of Rosse to the Royal Dublin society, and reprinted from vol. iii. (second series) of the Scientific transactions of the society. The first of these papers is a series of notes by Dr. Boeddicker, on the aspect of the planet Mars in 1884, accompanied by a lithographed plate giving thirteen sketches of the markings on the planet's surface. The second paper is also by Dr. Boeddicker, and contains the results of observations made on the changes of heat from the moon during the total eclipse of 1884 Oct. 4. From these observations it would appear that the amount of heat radiated to us from the moon itself, as distinguished from that merely reflected or diffused by it, is almost insensible; and the minimum of the heat effect falls decidedly later than the minimum of illumination.

NOTES AND NEWS.

FOR many years the exorbitant tax on salt in India has oppressed the lower classes, almost extinguishing some branches of industry. The Indian government has at last become alive to certain objections to the present rates of the salt-tax; namely, that cattle are stinted of a supply of salt, and that the same duty is charged on salt employed in manufactures or agriculture as for that used for other purposes. Experiments, for some time unsuccessful, have been prosecuted with a view of discovering a process whereby salt, while still useful for manufactures and agriculture, could be rendered unfit for human consumption. The government has now offered a reward, not exceeding five thousand rupees, to the inventor of a process satisfying the following condi-

tions: first, that its cost shall not exceed four annas per eighty pounds; and, secondly, that the preparation shall be such that edible salt cannot be extracted from it by the ordinary processes used by native salt-workers.

— The vaccine from revaccinated children is of doubtful protective potency, according to the observations of M. Blot, recently reported to the *Académie de médecine.*

— According to *La nature* of Jan. 2, an interesting ethnological discovery has just been made at Dampont, near Paris. An ancient burial-place of the polished-stone age has been there exhumed, and found to contain various portions of skeletons, implements, pottery, etc. Three crania had been trepanned, and so skilfully that it appears like the work of a surgeon.

— Within late years surgical operations upon the stomach for the extirpation of tumors or the removal of foreign bodies have been attempted a number of times, but almost invariably with unfavorable results. A case, the second on record, is just reported from England, where a large mass of hair, weighing about a pound, was removed from the stomach of a young lady, through an incision five inches in length, with recovery.

— Two editions of Coulter's 'Rocky Mountain botany' (New York, *Ivison, Blakeman, Taylor & Co.*) are offered to the public: one of them is uniform with Gray's manual of the botany of the eastern United States; the other is printed on thin, strong paper, and bound in a flexible and durable cover for the needs of the tourist. Of the merits of the work, it is of course too early to speak. The special descriptions which have been carefully and laboriously brought into a compendious arrangement for practical use by every-day students, must now be subjected to criticism in the fields and parks, and on the slopes of the mountains of the central chain. It will not be surprising if some of the work done in the study will have to be modified by repeated examinations of the specimens in their homes. But, so far as a careful inspection of the attractive pages of this volume can at present show, the work has been conscientiously and thoroughly done, and is a substantial boon to our students of botany.

— The preparation of a new geological map of France, on the scale of 1: 500,000, has been undertaken by Messrs. G. Vasseur and L. Carez, according to *Comptes rendus* of Dec. 28. The first parts have been already presented to the academy. The work will comprise forty-eight parts, and will require five years for its completion. Five plates are already printed, mostly of the northern regions. Each large stratigraphic group will be represented by a single color, with shadings for the subdivisions, as proposed by the international congress at Bologne. The work will be accompanied by a volume of explanatory text.

— The university of Basle, Switzerland, possesses a human skeleton, prepared in 1543 by the founder of anatomy, Andreas Vesalius. It is the only known relic of this greatest of all human anatomists; which fact, together with its great age, makes it especially precious. In the times of Vesalius the dissection of the human body was permitted by the authorities only with the greatest reluctance; and the history of the present skeleton, as recently given by Professor Roth, is particularly interesting. On the 12th of May, 1543, the body of one Jacob Karrer, who had been beheaded, was handed over to the university for dissection by Vesalius. Not for two years had such an opportunity occurred, and one can imagine the interest with which for many days the students and teachers followed the words and demonstrations of the great master. At the completion of the dissection the skeleton was prepared by his own hands, and presented to the university. It was in this year that his great work on human anatomy, the foundation of the modern science, appeared. Who knows how much we are indebted to this very subject for the discovery of much that is taught to-day, — discoveries for which the author was condemned to death, and escaped only to die in exile from starvation?

— The trustees of Cornell university have filled the newly established Sage professorship of ethics and philosophy by the election of Prof. J. Goold Schurmann, Ph.D., at present professor of philosophy at Dalhousie college, Halifax, N.S. Professor Schurmann is thirty-two years of age, and has studied at London, Edinburgh, and in Germany. As Hibbert travelling scholar, he collected the materials for an essay on 'Kautian ethics and the ethics of evolution,' which attracted some attention among specialists in philosophy when it was published, in 1881.

— Prof. Charles E. Hamlin, of the Agassiz museum of natural history, died at Cambridge, Jan. 3, aged about sixty years.

— Prof. A. M. Mayer, by the use of a simple form of vitroscope with electric registration of seconds, has reached some valuable and interesting results as to the conditions and limits of accuracy in this method for determining the rate of standard forks (*Mem. nat. acad. sc.*, iii.). He has also investigated the amount of change in the

rate of a fork caused by changes in temperature, in the amplitude of vibration, and by the pressure of the style against the paper on which the vibrations are recorded.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

An early prediction of the decay of the obelisk.

I GIVE below a translation of a portion of a letter from Dr. Alfred Stelzner of St. Petersburg.

"At first I wanted to add to my remarks a comparison between the New York Needle and the Alexander column in St. Petersburg; for the rock of both is very much alike: it agrees even down to the occurrence of handsome little zircon crystals. This comparison would have been made but that it would have been a mournful and unpleasant croak in the triumphant report of Mr. Gorringe, and therefore it had to be abandoned; but privately let it at least be put on record. You know, perhaps, that the Alexander column in St. Petersburg was transported from Finland to St. Petersburg in the thirties of this century at a senseless cost, and, with the assistance of thousands of men, was erected, — a monument for eternal ages, which should remind the beholder of a Russian monarch. But even in a few years the granite did sad honor to its Finnish name of 'Rappakivi,' i.e., the lazy-stone. The granite commenced to weather, and weathered merrily on in spite of all technical and scientific commissions; and one can well say that the years of the proud monument are numbered. It is possible that they chose unsound stone, and that they shook it about too much; so that, in quarrying and transporting it, it became filled with little clefts, and thus gave free play to its disintegration. But General Helmersen explains the affair differently. The granite, he says, contains many large felspar crystals. But the felspar is triclinic, and therefore expands, under the great differences of temperature between the St. Petersburg summer and winter, differently in the directions of its three axes: hence comes the crumbling, owing to the unequal molecular movement throughout the entire mass of the monolith. If this explanation is correct, then from the similarity of the rocks from Finland and Syene, and the great differences between the summer and winter temperature which exist also in New York, an unsuspected danger threatens the old Egyptian monolith, which has always hitherto stood in a mild and equable climate. Perhaps, also, it will succumb to the weakness of old age, for the London Needle of Cleopatra is said to be beginning already to crumble in its new home. You may regard this statement as pessimistic, but a knowledge of the experiences made elsewhere will not injure the New-Yorkers. Perhaps it will lead them to cover up the Needle there with bad conductors of heat during the winter, and thus preserve the venerable old stone monument. In any case, you will agree with me that this comparison should be taken into consideration; but it will not do to insert it into Mr. Gorringe's book, where it would produce a discordant tone. But it is worthy of consideration. . . . Thus I wrote in 1882, and I regret that I was not mistaken. But the children of the tropics, be they palms or granite columns, will not stand a northern winter in the open air. For the rest, one will interest himself now more than formerly in the observations which have been made in other places. I take the liberty, therefore, of calling your attention to the memoir by Struve: 'The Alexander monument and the Rappakivi. A contribution to the better knowledge of the Finnish granites. St. Petersburg, 1863–64.'"

F. R.

Sea-level and ocean-currents.

The recent important determination of the coast and geodetic survey, by levelling up the Mississippi valley and across to the Atlantic coast, that the mean level of the Gulf of Mexico at the mouth of the Mississippi is about one metre higher than that of New York harbor; and the similar result obtained by Bourdalone, by levelling across France, namely, that the mean level of the harbor of Brest is 1.02 metres higher than that of the Mediterranean at Marseilles, — furnish an interesting subject for study, and important facts for explanation by physical geographers. If, as it seems, the surface of the ocean is not level and at rest, what are the forces which cause it to deviate from a perfect level, and to have ascending and descending gradients in different parts, and currents running in various directions?

There are two principal causes for this disturbance of sea-level, — the one, the difference of level between the equatorial and polar regions, arising from a difference of temperature of the sea in the two regions; and the other, the deflecting force depending upon the earth's rotation. The first is the real cause of disturbance, the latter being simply a modifying influence of the effects of the former, which changes, or tends to change, the directions of motion, but does not give any addition of real force.

According to Mr. Croll (*Climate and time*), as deduced from the soundings of the Challenger expedition, if the water of the upper strata were prevented from flowing away toward the poles, the level of the ocean at the equator, on account of its greater temperature, would be 4.5 feet higher than the level at the parallel of greatest diversity of sea-water, a little beyond the polar circle. This greater upward expansion in the equatorial region, however, does not change the pressure at the bottom of the sea; and its initial effect is to give rise in the upper strata to gradients of pressure decreasing from the equator toward the poles. This causes a flow of the water of these strata from the equatorial to the polar regions, and this decreases a little the pressure at sea-bottom in the former, and increases it in the latter, and consequently gives rise to a gradient of decreasing pressure, and an under-current, from the polar regions toward the equator. Hence there is now an interchanging circulation, a motion of the water of the upper strata from the equatorial region toward the poles, a very gradual settling-down of the water in the higher latitudes, a return toward the equator in the lower strata, and a very gradual rising-up again in the lower latitudes.

If the earth had no motion of rotation on its axis, this would be simply a vertical circulation without any motion either east or west. But, in consequence of the deflecting force of the earth's rotation, the water of the upper strata, in flowing from the lower latitudes toward the poles, is deflected eastward; and it retains this eastward motion until it has settled down in the higher latitudes into the lower strata, and has returned, perhaps, to the parallel of 35° or 30°,