to precede the former, and we believe greater care in its technical execution would have been desirable. As the map is intended to explain the meaning of hill-shading, the view of the hills and the map ought to be clear, and it ought to be possible to compare them down to minute details. The fourth plate explains the system of meridians and parallels and the curvature of the earth's surface. The rest of the maps are well selected, and do not call for any special comment. The maps of the British Isles are very good. We think, however, that a hypsometric map like No. 11 is of no great value for educational purposes, as contour-lines, unaided by hill-shading, do not convey to the child a good idea of the physical features of a country. Considered as a whole, the atlas must be commended as a great improvement upon the ordinary school atlas.

NOTES AND NEWS.

THE United States Fish Commission is undertaking an extensive series of explorations of the fish fauna of the rivers of the Alleghany region. The work is in charge of Prof. D. S. Jordan, assisted by Prof. P. P. Jenkins, Prof. B. W. Evermann, and Mr. Barton A. Bean. The basins of the James, Kanawha, Roanoke, Holston, French Broad, Yadkin, and Catawba will be included in the work of the present summer. Similar explorations of the smaller lakes of Michigan are under direction of Mr. Charles H. Bollman.

— The fourth article in the Railway Series now appearing in *Scribner's Magazine* will be contributed to the September number by Gen. Horace Porter, who writes of 'Railway Passenger Travel.' —— 'The Record of a Human Soul' is the title of an anonymous little book to be published shortly by Longmans, Green, & Co. It is the honest account of the struggle of a sceptic, who ardently but unavailingly desired to believe, from the coming of the doubt until the hour when the doubter at last sees a light in heaven. It is introspective and subtle, but not morbid; its language is simple and direct; and the record is likely to be useful to not a few who have only the honest doubt in which there may be more faith than in half the creeds.

— The Canadian Institute, Toronto, Ont., is desirous of collecting, and incorporating in its Proceedings, reliable data respecting the political and social institutions, the customs, ceremonies, beliefs, pursuits, modes of living, habit, exchange, and the devolution of property and office, which obtain among the Indian peoples of the Dominion. It feels that this department of research has not been so fully cultivated in Canada as its importance demands, fears that the opportunity of gathering and carefully testing the necessary facts may with the advancing tide of European civilization soon pass away, and is of opinion that much light may be cast upon the genesis and growth of government as well as upon legal, sociological, and economic thought by an accurate study of the Indian tribes in their existing conditions and organizations. Contributions to the philology of the Indian tongues, and additions to their folk or myth lore, will be welcomed as heretofore. At the same time the institute begs leave, without desiring to contract the field of observation, to direct attention to the sociological matters.

— A new process for protecting iron against corrosion, now employed by a company at Port Chester, N.Y., is said to give satsfactory results. The company is now manufacturing sanitary soil-pipes treated by this method, which is described by Mr. H. Haupt as follows: "After the pipes have been lowered into the retorts by means of a traveller, the retorts are closed for about fifteen minutes until the contents are heated to the proper temperature. Steam from a boiler at sixty pounds pressure is then introduced into the superheater, which it traverses, and from which it escapes at the temperature of the iron, upon which it acts for about one hour. A measured quantity of some hydrocarbon is then admitted with a jet of steam, followed again by a fixing bath of superheated steam, which completes the process." Professor Gesner, the director of the works, says there is no pressure in the retort, and that there are no free explosive gases. The water-seals attached to the retorts show only slight oscillations, but not an inch of pressure; and when the covers are removed and air admitted there is no explosion, as there always is when free hydrogen or carbonic oxide is present. The absence of pressure and of explosive gases is a proof that all the operations have been so nicely regulated as regards material used, quantity, and time of application, that a perfect absorption and union of the carbon, oxygen, and hydrogen with the iron has been effected. The protection thus afforded to the iron is not a mere coating, like paint, but is said to be an actual conversion, to a greater or less depth, into a new material. When properly treated, this material does not seem to be detachable by pounding, bending, hammering, rolling, or heating. The pipes treated at Port Chester have been immersed in baths of dilute sulphuric acid and exposed to the salt air for weeks without change, while untreated pipes were quickly covered with red oxide, or with sulphate of iron.

LETTERS TO THE EDITOR.

Re-appearance of Song-Birds.

THE appearance of birds is always quite irregular, so far as numbers are concerned, with the possible exception of one or two varieties like the migratory thrush. We will find in any locality that the oriole is very plentiful for a few years, and then comparatively scarce for a few years. This cannot be mistaken by those on whose gardens he makes his inroads. The absence of grosbeaks and then their great abundance is equally marked. So of nearly all familiar birds. The cause is probably that they range over a large territory, and select different nesting-centres. It is well known that pigeons will cover the sky for two or three springs, moving to a camp in the farther north, and then for years not a pigeon be seen. I believe my catbirds alone have so taken to me that I can always count on their familiar forms and delicious notes.

The extraordinary abundance of song-birds is no doubt a simple coincidence or accidental agreement of action on the part of several species. In my own grounds I do not see any such unusual migration; for the reason, probably, that I have for many years so protected and fed them, that it is a paradise for birds. Yet it is true that several sorts of birds are on the increase here; owing, possibly, to finding their quarters disturbed elsewhere. The line of migration can be much more easily swerved than the ponderous and slow movements of animals. I think you may be sure that the abundance in some quarters is balanced by the deficit in other quarters. New influences constantly arise, affecting the peace and content of birds. I have all summer been fighting a band of pseudo-scientists; that is, boys who carry papers permitting them to shoot our birds to make collections for so-called scientific purposes. Before the law to protect our song-birds, no decent young man would prowl about near our residences to shoot the pets. But now they are 'scientists;' and we have no rights to be considered. They crack their guns under our very noses. But I have vowed to have a lawsuit with every budding Audubon that comes this way, and am at present ahead.

Now, here is a law that works not at the muzzle, but the but. Its effect is to scatter our birds in their favorite haunts. My grounds cover nine acres only, but several neighbors are in full accord; and there are full fifty acres of flowers, hedges, and fruit where the song-birds are wonderfully abundant. But how long would they remain with us if one after another fell victims the moment they flew outside our lines? Another year we should lament the absence of our birds, and somewhere else people would rejoice in their superabundance. E. P. POWELL.

Clinton, N.Y., Aug. 7.

The Physical Aspect of the Planet Mars.

THERE has been so much said of late, in the newspapers and elsewhere, in regard to the parallel canals of Mars, that perhaps a brief discussion of the facts observed in regard to them may be of interest. And first of all it may be remarked, that, of all the different methods of accounting for the appearances observed, perhaps the least probable is that they are water-canals.

Let us see what are the facts in the case. According to the observations of Schiaparelli (*Reale Accademia dei Lincei* 1881 and 1886) they lie almost entirely between 50° north and south latitude (that is, in the torrid and warmer portions of the temperate zones), and extend across the continent from the northern to the southern

ocean. They are in general two or three thousand miles in length, though sometimes much longer, by from perhaps thirty to one hundred and fifty miles in breadth. They are generally arranged in pairs two or three hundred miles apart, drawn on the arcs of great circles, and so exactly parallel that usually no deviation can be detected. They run in all directions, but there are about a dozen points which seem marked as special centres from which they radiate. Thus ten start from the Trivium Charontis as a centre, and eight from the Lacus Phœnicis. They cut up the continental surface of the planet so that there is no spot more than four hundred miles distant from one of these markings. They are usually so fine that no color can be assigned to them, and they can be merely spoken of as dark lines ; but in a few instances where they broaden out, as in the Lyrtis Major (if this conspicuous marking can be considered one of them), they are decidedly darker than the oceans, and of a grayish or perhaps greenish tint.

Of a well-defined canal called by Schiaparelli, Hades, M. Perrotin (*Annales de l'Observ. de Nice*, c. 58) remarks, "Since our first observations, the canal *LN* has suffered a considerable change: we can distinguish it no longer save to a feeble extent on the side marked *N*. Though drawn on the map of M. Schiaparelli of 1882, this canal does not exist on that of 1879. Our observations, then, not only confirm the changes already stated, but they show further that these changes may be produced in a short period of time." Other evidences of change have since been observed. It is thought that a large portion of the red region known as Libya had changed to green, and afterwards in part back to red. But the latest evidence of change, according to M. Perrotin (*Comptes Rendus*, cvi. 1718, and cvii. 161), is the carrying of several of the so-called 'canals' across the northern ocean up to the polar ice-cap. If the observation is correct, it is clear that either the ocean is not an ocean, or the canals are not canals. If the observation were confirmed, I should be inclined to deny both propositions. Indeed, the northern ocean as represented by M. Perrotin at this point is but little more than an enlarged canal, while M. Schiaparelli does not indicate it at all upon his maps.

The latter has thought that many of these canals appear only for a short time, and then disappear again; and some of them he has only seen shortly after the passage of the vernal equinox on Mars, and thinks that there may be some relation between the two.

To every argument as to the inherent improbability of an hypothesis made with regard to a remote planet, we may be met by the statement that under different conditions these very things may happen, — a statement easily made, and hard to refute. The best we can do, however, is to reason by means of the laws which we have found to apply in the case of the earth. Certainly no such straight canals could be made here naturally, and, if they were made, they would soon be filled up again. If, on the other hand, the canals were artificial, what could be the use of making them so wide, why arrange them always in duplicate, and why fill certain of them up every year, later to be re-opened? Think of the labor involved in covering over, and then re-opening, a canal, say, sixty miles wide by three thousand miles long, and all in the space of a few weeks. Moreover, in the case of those which are sufficiently wide for us to see distinctly, why should the color be so much darker than that of the neighboring oceans?

Mr. R. A. Proctor has suggested (*Monthly Notices Roy. Ast. Soc.*, xlviii. 307) that the canals are the diffraction-images of rivers produced by mist which hangs over the river-beds. To this suggestion, however, some of the same objections apply as to the other.

M. Fizeau's suggestion (*Comptes Rendus*, cvi. 1759), that the stripes are cracks between huge masses of ice, presents some difficulty in accounting for the red color of the ice; and also, as was pointed out by M. Flammarion (*Comptes Rendus*, cvii. 19), since the temperature of Mars as indicated by the size of the polar spots, is, if any thing, higher than that of the earth, it is surprising that the ice does not melt.

Before going further let us see what is the probability that these supposed markings are really genuine. Several astronomers, — Dawes, Perly, Burton, and others — have independently constructed maps of Mars, or made observations from which such maps could be constructed; and it is found, on comparison, that a number of these stripes are common to several of the maps. It is therefore probable that these particular stripes are really there. M. Perrotin has confirmed the doubling of the stripes previously mapped by M. Schiaparelli: it is therefore quite possible that these are genuine also, although the observation is one of extreme difficulty, requiring the steadiest possible atmospheric conditions. But the statement that a change in the markings has been observed is one that must be received with extreme caution, and, although a most interesting one, must for this very reason be only accepted as proved, when confirmed by observations made with the most powerful telescopes at our disposal, and under the most favorable circumstances.

Starting out from the generally accepted fact that there are stripes upon the planet, we find there are five possible hypotheses to explain their existence. Three, that they are due to water in the vaporous, liquid, or solid condition, we have already noticed. Fourth, we may explain them by supposing them to depend on the color of the rock or soil, and that their shape depends on some peculiar geological formation. We have, to be sure, no such formations upon our globe; but we have something analogous, though on a somewhat smaller scale, upon the moon. There we find numerous long narrow streaks radiating from the crater Tycho, as also in a lesser degree from some of the other craters. The streaks are perfectly straight, of very light color, and in a few cases we find them arranged parallel to one another.

As to the color of Mars, it is probable that the earth would appear of the same color as seen from a distance, if deprived of its vegetation, owing to the red color of its soil in most parts of the world, particularly in the warmer regions.

If it can be shown, however, that at certain seasons the stripes on Mars really disappear, through some other cause than that of passing clouds or haze in its own atmosphere, then this hypothesis, like that of the water-canals, must fail.

The fifth and last of the possible explanations is that the stripes are due to differences in vegetation. Whether the stripes indicate vegetation, and the rest is a barren waste, or whether a large proportion of the vegetation of Mars is of a reddish color, as suggested by Lambert among others, and approaches in tint to our coleus and autumn leaves, is a matter of no consequence at present. If it can be shown that the stripes on Mars really change, this will be the hypothesis that we shall be forced to adopt, or, rather, we should say it is the only one left presenting no serious improbabilities.

Let us now review the already ascertained facts with regard to the planet. We are reasonably certain that the surface of Mars is composed of land and water; that it has snow at its poles, and therefore an atmosphere containing clouds. As the snow does not extend over the whole planet, but varies in extent at different times, and what are apparently clouds have been observed in other regions of its surface, it is probable that they likewise have rain. Their temperature cannot be very different from ours, judging by the extent of the snow at the poles, which is rather less in proportion than with us, and has in some instances been known to entirely disappear. Their days are but forty minutes longer than ours; and their seasons, owing to the inclination of the axis of Mars, are practically the same. The most marked difference between the two planets, of which we are certain, is, that, owing to the lesser attraction of Mars, bodies there would weigh but two-fifths as much as with us: a man, for instance, weighing one hundred and sixty pounds here, would weigh but sixty-four pounds upon Mars. All the conditions as far as we can determine, save that their sunlight is somewhat weaker, are as favorable to the growth of organic life there as here.

The spectroscope teaches us that the same elements are found throughout the universe: therefore, if we define vegetable life as consisting of organized structures absorbing carbonic acid and giving out oxygen, it will be seen that the admission that vegetable life exists upon Mars carries with it animal life also as a corollary, or vegetation would soon cease for lack of fresh air.

As Mars is a smaller planet than the earth, and more remote from the sun, it probably reached a suitable temperature to support organic life at an earlier date. The laws of evolution have therefore had sufficient time to develop reasonably highly organized animal as well as vegetable life.

This is as far as we are justified in carrying our hypothesis, unsupported by other facts; but now let us give rein to our fancy for

a moment, and suppose an observer on Mars were to examine the earth with successive increasingly powerful telescopes. The first artificial production that he would probably be able to see would be some of the great grain-fields of our Western States. These he would find of irregular shape, but bounded more or less by straight lines. They would appear of a greenish color, not very different from that of our oceans; and he would find them subject to great changes at certain seasons, sometimes perhaps entirely disappearing from sight, when of the same tint as the surrounding country. In fact, if an observer were placed on Mars, and furnished with one of our more powerful telescopes, he would see just about as much of our grain-fields as we do of their stripes, and the only noticeable difference between the two would lie in their shape. Indeed, assuming an artificial origin, it would be easy to frame hypotheses accounting for their form, dependent upon the peculiar conformation of the land surface of Mars, or for their radiating in several instances from particular points as centres.

But to return to our hypothesis, that the stripes are of vegetable origin. If it is correct, there is one test to which it must submit. If a change is noted in a given stripe, this change should be in general more or less progressive from the equator towards the poles, or *vice versa*. I say in general, because it is not probable that the same kind of vegetation would exist all the way from the equator to 50° north or south latitude, nor would it be the same in all stripes having the same latitude. Moreover, in the stripes running east and west, or in those situated near the equator, successive changes would not usually be noticeable. Stripes containing the same kind of vegetation should be similarly affected. Now, in the stripe known as Hades, previously referred to, this very phenomenon was observed. Hades runs in a direction nearly north and south, and extends from latitude 20° to 45° north. The observation in question was made about two and a half of our months after the passage of the northern solstice on Mars. It was therefore in the latter part of their summer when it was found that the southern portion of what had but a few weeks before been a well-defined stripe had completely disappeared.

As an illustration of the formation of a stripe running from the equator towards the pole, let us take the latest observations of M. Perrotin (*Comptes Rendus*, cvii. 161). According to these observations in the regions as far north as between latitudes 50° and 60°, the stripes did not appear this year until June 4, or four months after the summer solstice. Unfortunately, Mars is now getting so near the sun that it will be probably impracticable to determine the date of their disappearance, should they be found later to have vanished.

WM. H. PICKERING.

Observatory, Cambridge, Mass., Aug. 9.

The Philippine Islands.

MR. WALLACE, in his great work, 'The Geographical Distribution of Animals,' divides the Oriental or Indian region of Mr. Sclater into four sub-regions, of which Java, Sumatra, Malacca, Borneo, and the Philippine Islands form one, which he calls the Indo-Malayan. In his discussion of the Indo-Malayan sub-region, Mr. Wallace recognizes several subdivisions of it, and treats of the Philippine group as one of the most important of these. Though acknowledging the existence of divisions of his sub-regions, he failed to give them technical names, as at that time uncalled for. The purpose of this paper is to show that the Philippines themselves are separated into several distinct zoölogical divisions; and it therefore seems necessary, for their study, to give technical names to the primary and secondary divisions of the already recognized sub-regions. The terms 'province' and 'sub-province' seem least objectionable, and will be used here; the Philippine Islands thus forming one of the provinces of the Indo-Malayan sub-region, and the divisions of the group itself sub-provinces.

The zoölogical province of the Philippines is co-extensive with the political division of the same name, with the exception, perhaps, of the islands of Sulu and Tawi Tawi, which lie between the Philippines and Borneo, but are claimed by the Spanish.

The sub-provinces proposed are, first, the northern Philippines, consisting of Luzon, Marinduque, and a number of other small islands about Luzon; second, Mindoro; third, the central Philippines, made up of the islands of Panay, Guimaras, Negros, Cebu, Bojol, and Masbate; fourth, the eastern Philippines, comprising the islands of Samar and Leite; fifth, the southern Philippines, embracing the great island of Mindanao, with Basilan; and, sixth, the western Philippines, consisting of the islands of Paragua or Palawan, and Balabac.

The geographical positions of these sub-provinces are fortunately such that these simple names show their relation to each other very closely, as may be seen by consulting a map of the archipelago.

Of these sub-provinces, the western Philippines, made up of Paragua and Balabac, and perhaps the Calamianes, is of most importance, its animal life being much more closely allied to that of Borneo than that of any other sub-province of the group. This is especially noticeable in its mammals, of which it possesses, in common with Borneo, the genera *Tragulus*, *Tupaia*, and *Manis*, which are apparently absent from the rest of the archipelago. Of Bornean genera of birds not found elsewhere in the group, *Jora*, *Criniger*, *Polyphetron*, *Tiga*, and *Batrachostomus* are examples The sub-province has evidently received a large part of its fauna from North Borneo, through Balabac, and at a comparatively recent date, and since its separation on the north from the rest of the Philippines, so that these genera have not flown over into Mindoro and Luzon. In addition to these apparently late arrivals from Borneo, the sub-province possesses a large number of peculiarly Philippine birds and mammals, which show that it is an integral part of the province.

The rest of the Philippines would seem to have received its Malayan fauna at another time and by the other way of Sulu and Mindanao. They possess the mammalian genera *Galeopithecus*, *Tarsius*, and *Cervus*, which are apparently wanting to the western sub-province, and the genera *Macacus*, *Sus*, *Viverra*, *Paradoxurus*, and *Sciurus* in common with it. Of birds, the genera *Loriculus*, *Cyclopsitta*, *Buceros*, and *Penelopides* are examples which are more or less generally distributed over the archipelago outside of the western sub-province.

The grounds for dividing the Philippines east of Paragua into sub-provinces are to quite an extent based upon species, and especially upon the existence in each of representative forms of the genera *Loriculus*, *Buceros*, *Penelopides*, *Brachiurus*, *Chrysocolaptes*, *Dicæum*, *Cinnyris*, etc. The hornbills form, perhaps, the most striking example of this distribution of representative species. Of the eleven species of hornbills collected in the islands, the western sub-province has one, the southern three, the central two, the eastern two, Mindoro one, and the northern two; and we have found no case of a single species occupying more than one sub-province, or of more than one species of a genus in a single sub-province. The genera *Chrysocolaptes* of woodpeckers is also noticeable, each sub-province possessing its own species, with the exception of Mindoro, which apparently lacks the genus altogether. The genus *Loriculus* of the parrots is of the same character.

Of other animals than birds, the genus *Sciurus* of mammals, and *Draco*, the flying lizards, seem to have representative species in each sub-province, and the land mollusca are probably distributed according to the same plan.

The above examples are a few that come to mind before a careful study of our collections has been made, and they do not by any means represent all the reasons for the conclusions arrived at. These are the result, rather, of the observation of five careful men who have been collecting and studying in the Philippines during the last year. During this time we have visited and collected in fifteen of the islands of the group, and these the largest and most important. I am satisfied that the study of our collections, with the aid of the libraries and collections at home, will only strengthen the conclusions of this paper. It may prove necessary to make the so-called western sub-province of more importance in the arrangement, but the non-existence in nature of exactly equivalent divisions of any kind is well recognized. It is hoped that our work may aid in untangling some of those puzzles in which students of Philippine zoölogy have found themselves involved, and that it will also add considerably to the sum of knowledge concerning this as yet imperfectly known corner of the earth.

J. B. STEERE.

Manila, July 2.